Minnesota Pollution Control Agency
520 Lafayette Road North | St. Paul, MN 55155-4194 | 651-296-6300 | 800-657-3864 | 651-282-5332 TTY | www.pca.state.mn.us

August 17, 2011

Mr. Mike Fix
Commander's Representative
Twin Cities Army Ammunition Plant
470 West Highway 96
Suite 100
Shoreview, MN 55126

RE: Consistency Test for the Fiscal Year 2010 Annual Performance Report, New Brighton/Arden Hills Superfund Site

Dear Mr. Fix:

Staff at the U.S. Environmental Protection Agency (U.S. EPA) and the Minnesota Pollution Control Agency (MPCA) have completed review of the Fiscal Year 2010 Annual Performance Report for the New Brighton/Arden Hills Superfund Site (FY10 APR). Our review of the FY10 APR included the following documents and communications:

1. Fiscal Year 2010 Annual Performance Report, draft report, prepared for the Commander, by Wenck Associates, Inc. on February, 2011;
2. U.S. EPA and MPCA comments on the Draft FY10 APR (dated March 30, 2011 and May 23, 2011 respectively);
3. U.S. Army responses to U.S. EPA and MPCA comments and redlines dated June 3, 2011;
4. U.S. Army additional redlines dated July 28, 2011;
5. MPCA's edits to the additional redlines dated August 4, 2011.

Based upon our review of the referenced documentation, the U.S. EPA and MPCA have determined that, in accordance with Chapter XIV of the TCAAP Federal Facility Agreement, the Fiscal Year 2010 Annual Performance Report passes the Consistency Test.

If you have any questions, please contact Thomas Barounis at 312-353-5577, or Deepa de Alwis at 651-757-2572.

Sincerely

Deepa de Alwis
Project Manager
Closed Landfill and Superfund Section
Remediation Division

for Tom Barounis
Remedial Project Manager
U.S. EPA
Region V

DDA/TB:csa

FISCAL YEAR 2010 ANNUAL PERFORMANCE REPORT
NEW BRIGHTON/ARDEN HILLS SUPERFUND SITE

Prepared for:

Commander
Twin Cities Army Ammunition Plant
470 West Highway 96, Suite 100
ATTN: DAIM-BD-TW
Shoreview, Minnesota 55126-3218

WENCK ASSOCIATES, INC.
ALLIANT TECHSYSTEMS INC.
CONESTOGA-ROVERS & ASSOCIATES, INC.
STANTEC CONSULTING CORPORATION

August 2011
Final Report

Table of Contents
NEW BRIGHTON/ARDEN HILLS SUPERFUND SITE
Fiscal Year 2010 Annual Performance Report

Table of Contents (cont'd.)

Table of Contents (cont'd.)

Table of Contents (cont'd.)

TABLES

Table of Contents (cont'd.)

TABLES (continued)

Table of Contents (cont'd.)

FIGURES

Table of Contents (cont'd.)

<u>FIGURES</u> (continued)

Table of Contents (cont'd.)

APPENDICES

List of Acronyms

ATK	-	Alliant Techsystems Inc.
APR	-	Annual Performance Report
Army	-	United States Army
Barr	-	Barr Engineering
BGRS	-	Boundary Groundwater Recovery System
COC	-	Chemical of Concern
CRA	-	Conestoga-Rovers & Associates, Inc.
DNAPL	-	Dense Non-Aqueous Phase Liquid
EE/CA	-	Engineering Evaluation/Cost Analysis
ERIS	-	Environmental Restoration Information System
ESD	-	Explanation of Significant Difference
EW	-	Extraction Well
FFA	-	Federal Facility Agreement
FY	-	Fiscal Year
GAC	-	Granular Activated Carbon
GOS	-	TGRS Global Operation Strategy
gpm	-	gallons per minute
HBV	-	Health Based Value
HRC	-	Hydrogen Release Compound™
HRL	-	Health Risk Limits
IRA	-	Interim Remedial Action
LUC	-	Land Use Control
LUCRD	-	Land Use Control Remedial Design
MCES	-	Metropolitan Council Environmental Services
MCLs	-	Maximum Contaminant Levels
MCLGs	-	Maximum Contaminant Level Goals
MDH	-	Minnesota Department of Health
MDL	-	Method Detection Limit

List of Acronyms (Cont.)

MNA	-	Monitored Natural Attenuation
MOS	-	TGRS Micro Operation Strategy
MPCA	-	Minnesota Pollution Control Agency
MW	-	Monitoring Well
NB/AH	-	New Brighton/Arden Hills
NBCGRS	-	New Brighton Contaminated Groundwater Recovery System
NBM	-	New Brighton Municipal
O&M	-	Operation and Maintenance
OM	-	Operating Minimum
OS	-	TGRS Operating Strategy
OU	-	Operable Unit
OU1TG	-	OU1 Technical Group
PAR	-	Performance Assessment Report
PCBs	-	Polychlorinated Biphenyls
PGAC	-	Permanent Granular Activated Carbon
PGRS	-	Plume Groundwater Recovery System
PLC	-	Programmable Logic Controller
PM	-	Preventative Maintenance
POTW	-	Publicly-Owned Treatment Works
ppb	-	parts per billion
QAPP	-	Quality Assurance Project Plan
RAWP	-	Remedial Action Work Plan
RD/RA	-	Remedial Design/Remedial Action
ROD	-	Record of Decision
scfm	-	Standard Cubic Feet per Minute
SDWA	-	Safe Drinking Water Act
Stantec	-	Stantec Consulting Corporation (formerly SECOR International, Inc.)

List of Acronyms (Cont.)

Shaw	-	Shaw Environmental & Infrastructure, Inc. (formerly Stone & Webster)
SVE	-	Soil Vapor Extraction
SW	-	Surface Water
TCAAP	-	Twin Cities Army Ammunition Plant
TGRS	-	TCAAP Groundwater Recovery System
TWISS	-	Tecumseh/Wenck Installation Support Services
µg/L	-	Micrograms per liter
USAEC	-	United States Army Environmental Command
USACHPPM	-	US Army Center for Health Promotion & Preventive Medicine
USEPA	-	United States Environmental Protection Agency
VOC	-	Volatile Organic Compound
Wenck	-	Wenck Associates, Inc.
WWP	-	Wet Well Pump

List of Chemical Abbreviations

Note: The abbreviations below are those that were required for data entry into the U.S. Army Environmental Center (USAEC) Installation Restoration Data Management Information System (IRDMIS), which was replaced by the USAEC Environmental Restoration Information System (ERIS) in November 2001. These abbreviations, though not used in ERIS, are still used in some tables and appendices presented in this report.

111TCE	-	1,1,1-Trichloroethane
112TCE	-	1,1,2-Trichloroethane
11DCE	-	1,1-Dichloroethene
11DCLE	-	1,1-Dichloroethane
12DCE	-	1,2-Dichloroethenes (*cis* and *trans* isomers)
12DCLB	-	1,2-Dichlorobenzene
12DCLE	-	1,2-Dichloroethane
12DCLP	-	1,2-Dichloropropane
13DCLB	-	1,3-Dichlorobenzene
14DCLB	-	1,4-Dichlorobenzene
2CLEVE	-	2-Chloroethyl vinyl ether
AG	-	Silver
BRDCLM	-	Bromodichloromethane
C12DCE	-	cis-1,2-Dichloroethene
C13DCP	-	cis-1,3-Dichloropropene
C2H3CL	-	Vinyl chloride
C2H5CL	-	Chloroethane
C6H6	-	Benzene
CCL3F	-	Trichlorofluoromethane
CCL4	-	Carbon tetrachloride
CH2CL2	-	Methylene chloride
CH3CL	-	Chloromethane
CHBR3	-	Bromoform
CHCL3	-	Chloroform

List of Chemical Abbreviations (Cont.)

CLC6H5	-	Chlorobenzene
CU	-	Copper
CYN	-	Cyanide
DBRCLM	-	Dibromochloromethane
EDTA	-	Ethylenediaminetetraacetic Acid
ETC6H5	-	Ethylbenzene
HG	-	Mercury
MEC6H5	-	Toluene
P4	-	Phosphorus
PB	-	Lead
SB	-	Antimony
T12DCE	-	trans-1,2-Dichloroethene
T13DCP	-	trans-1,3-Dichloropropene
TCLEA	-	Tetrachloroethane
TCLEE	-	Tetrachloroethene
TCLTFE	-	1,1,2-Trichloro-1,2,2-trifluoroethane
TRCLE	-	Trichloroethene
XYLEN	-	Xylenes
ZN	-	Zinc

1.0 Executive Summary

This Fiscal Year 2010 (FY 2010) Annual Performance Report:

- Summarizes the status of remedy implementation; and
- Addresses how the remedies are performing,

for each of the three operable units related to the New Brighton/Arden Hills Superfund Site. Figure 2-1 shows the approximate locations of the three operable units. Fiscal Year 2010 is defined as the period from October 1, 2009 through September 30, 2010.

Records of Decision (RODs) have been signed for each of the three operable units (OUs):

- OU1 ROD signed 1993, Amended 2006
- OU2 ROD signed 1997, Amended 2007 and 2009
- OU3 ROD signed 1992, Amended 2006

The RODs, and subsequent Amendments and Explanations of Significant Differences, present the major components of the final remedies for the media of concern. This report looks at each of the major components and addresses:

1. *Are the remedies being implemented? (Compliance check with the RODs and ROD Amendments)*
2. *Are the remedies doing what they are supposed to?*

Table 1-1 summarizes the status of remedial actions at the end of FY 2010. Following are highlights of the accomplishments for each operable unit, as well as other activities during FY 2010.

Operable Unit 1 (OU1)

OU1 consists of the "north" plume of Volatile Organic Compound (VOC) groundwater contamination. The final remedy for OU1 consists of pumping from six municipal wells (New Brighton Municipal wells NBM #3, #4, #5, #6, #14, and #15) and treating the extracted groundwater through the Permanent Granular Activated Carbon (PGAC) system. Treated water is piped to the New Brighton water supply system for distribution as potable water. Other remedy components include providing alternate water supply and/or well abandonment to affected private wells, and drilling advisories for new well construction. Highlights for FY 2010 are:

- The Minnesota Department of Health (MDH) Special Well Construction Area remains in effect. The MDH has the regulatory responsibility to assure that wells constructed in the advisory area meet appropriate well construction and human health requirements. In FY 2010, there were no new recommendations for abandonment or alternate water supply.
- The PGAC treated 1.20 billion gallons of water and removed 573 pounds of VOCs during FY 2010. Approximately 21,517 pounds of VOCs have been removed since system startup.
- The effluent of the PGAC was in compliance with the applicable Safe Drinking Water Act criteria for the OU1 chemicals of concern.
- The treated groundwater was beneficially used in the New Brighton and Fridley municipal water supply systems.
- FY 2010 was a minor sampling event. The statistical trend analysis, as developed by the OU1 Technical Group, indicate that aquifer restoration is occurring.

Operable Unit 2 (OU2)

OU2 is defined as the area occupied by TCAAP in 1983, when the New Brighton/Arden Hills Superfund Site was placed on the National Priorities List. The remedial action requirements were set forth in the OU2 ROD (1997), ROD Amendment #1 related to Site C-2 (2007), ROD Amendment #2 related to Site I groundwater (2009), ROD Amendment #3 related to various soil sites (2009), Explanation of Significant Differences #1 related to groundwater (2009), and Explanation of Significant Differences #2 related to various soil sites (2009). Highlights for activities within OU2 during FY 2010 are:

- The OU2 Land Use Control Remedial Design (OU2 LUCRD) was approved in September 2010, and is being implemented by the Army.

- Shallow Soil Sites
  - Approval of the OU2 LUCRD allowed for final regulatory approval of various closeout reports that had previously received partial approval (final approval for these reports was to be given after the OU2 LUCRD was approved).

- Deep Soil Sites
  - Approval of the OU2 LUCRD allowed for final regulatory approval of closeout reports for Sites D and G that had previously received partial approval (final approval for these reports was to be given after the OU2 LUCRD was approved).

- Site A Shallow Groundwater
  - In accordance with the “Site A Shallow Groundwater: 10-Year Evaluation Report” (July 2008), and with regulatory approval, the groundwater extraction system was shut down on September 24, 2008, in order to evaluate Monitored Natural Attenuation (through abiotic degradation) as a potential remedy component in lieu of groundwater extraction and discharge. The groundwater

system remains in stand-by mode in the event that MNA does not adequately control plume migration and one or more extraction wells need to be restarted.

- As predicted in the 10-Year Report, water quality results for the second year of MNA show some wells with increasing VOC concentrations and some wells with decreasing concentrations.
- Monitoring results from the four contingency wells located along the north side of County Road I did not exceed the approved trigger levels.
- The results from FY 2009 and FY 2010 have shown that the axis of the highest concentrations of cis-1,2-dicloroethene shifted from the vicinity of EW-2 to the vicinity of EW-3 (i.e., a more westerly direction relative to the source area).
- Given the previous item and given that a third year of quarterly monitoring at select wells will have been completed at the end of FY 2011, changes to monitoring frequencies at some wells are recommended to begin in FY 2012. In summary, most of the quarterly locations are proposed to change to semiannual, with a few annual locations proposed to change to semiannual. Also, a few quarterly/semiannual locations are proposed to change to annual.
- Continued monitoring and evaluation of MNA is recommended prior to any decision on whether or not to formally change the remedy to MNA.
- The MDH Special Well Construction Area remains in effect. In FY 2010, there were no locations identified in need of well abandonment or alternate water supply.

- Site C Shallow Groundwater
  - In accordance with the "Site C Groundwater Extraction System Evaluation Report" (November 2008), and with regulatory approval, the groundwater extraction system was shut down on November 13, 2008. The system was shut off because lead concentrations in the three extraction wells had been below the groundwater cleanup level since March 2008 (i.e., the area of lead concentrations that exceeded the groundwater cleanup level was not even

reaching the extraction wells, so operation of the extraction system was no longer required to contain the plume). The groundwater system remains in stand-by mode in the event that one or more extraction wells need to be restarted.

  - Only the four monitoring wells nearest to the source area exceeded the groundwater cleanup level for lead in FY 2010.
  - None of the groundwater or surface water contingency locations exceeded the approved trigger levels in FY 2010.
  - Given the previous item, and given that a third year of quarterly monitoring at select wells and the three surface water monitoring locations will have been completed at the end of FY 2011, changing to an annual monitoring frequency for the wells and surface water locations that are currently being monitored quarterly is recommended to begin in FY 2012.
  - Continued monitoring is recommended prior to any decision on whether or not to formally change the remedy to eliminate the groundwater extraction component.

- Site I Shallow Groundwater
  - Sampling at Site I indicated no significant changes in VOC concentrations in Unit 1 monitoring wells in FY 2010. Three of the nine wells scheduled for sampling and hydraulic monitoring were dry, and two other wells had insufficient water to collect samples. Therefore, groundwater samples were collected from four of the nine wells scheduled for sampling in FY 2010.
  - Although four wells were unable to be sampled, previous investigations indicate the Unit 1 groundwater is discontinuous and does not extend beyond Site I; rather, the Unit 1 contaminants leak downward into Unit 3, which is hydraulically contained by the TGRS.

- Site K Shallow Groundwater
  - At Site K, the groundwater extraction trench and treatment system continued to operate as designed. The system captured and treated 6,197,380 gallons of water and maintained a continuous zone of capture downgradient of the former Building 103. A total of 21.9 pounds of VOCs were removed in FY 2010.
  - The extracted water was treated and discharged to Rice Creek. The October 2010 sample exhibited a copper concentration of 25 mg/L. The maximum daily concentration for copper, as stated in the Substantive Requirement Document, is 21 mg/L. Because copper is not a contaminant of concern and the system does not treat copper, no further actions were proposed.
  - Groundwater samples were collected from all eleven wells scheduled for sampling in FY 2010. With the exception of relatively stable trichloroethene concentrations in 01U615, the overall trend throughout Site K Unit 1 monitoring wells continues to show a gradual decrease in trichloroethene concentrations over the last fifteen years of sampling.
  - In addition to the 11 wells routinely sampled, well 01U609 was sampled in June 2010 to monitor the effectiveness of the granular potassium permanganate placement during the 2009 Site K soils excavation. Review of the VOC concentrations over time at well 01U609 does not reveal any apparent trend.
- Deep Groundwater
  - The TCAAP Groundwater Recovery System (TGRS) operated in accordance with the OU2 ROD.
  - The TGRS operated at a rate sufficient to support the conclusion that the 5-μg/L TRCLE contour is hydraulically contained. In FY 2010, the total extraction well water pumped averaged 1,777 gpm, which is greater than the Global Operation Strategy (GOS) Operating Minimum (OM) (1,745 gpm).

- In FY 2010, the TGRS extracted and treated approximately 933,789,205 gallons of water. The mass of VOCs removed was 2,096 pounds and is 71 pounds less than that achieved in FY 2009. The total VOC mass removed by the TGRS through FY 2010 is 203,545 pounds.
- Groundwater analytical data of the source area shows a general decrease in TRCLE concentration. This demonstrates that the TGRS is effectively removing VOC mass from the aquifer.
- Effluent VOC concentrations were below contaminant-specific requirements for all sampling events.

Operable Unit 3 (OU3)

- Groundwater monitoring in FY 2010 was conducted during this annual event. Overall, the statistical evaluation showed the South Plume is decreasing in concentration at its center and stable at its edge. In addition, there is evidence of the North Plume commingling with the South Plume at the boundary between the two plumes.

Other Investigation and/or Remediation Activities Not Prescribed by a Current ROD

- Building 102 shallow groundwater contamination is not part of the OU2 ROD and is being addressed by the Army as a non-time critical removal action. The EE/CA documenting groundwater investigation work and recommending MNA received regulatory approval in FY 2008. The Army Action Memorandum documenting the selection of MNA for Building 102 groundwater was signed early in FY 2009. Ongoing groundwater sampling is being conducted for performance monitoring, and this monitoring is conducted in accordance with the Quality Assurance Project Plan for MNA that is updated and approved annually. Highlights from FY 2010 monitoring include:

    - The FY 2010 groundwater quality results were generally comparable to the FY 2009 results, suggesting that the plume remains stable due to the natural attenuation that is occurring at this site.
    - The well adjacent to Rice Creek continued to show that shallow groundwater discharging to Rice Creek was below the cleanup levels for this site.

- Site K Soil Removal Action
  In FY 2010, the Completion Report for the soil removal action received regulatory approval.

- Building 535 Primer/Tracer Area Soil Removal Action
  In FY 2010, the Closeout Report for the soil removal action received regulatory approval.

- Feasibility Study for Aquatic Sites
  In FY 2010, the Army submitted a revised FS. After review of this report, USEPA requested that the Army prepare a work plan for collection of additional Round Lake sediment data. The Army, USEPA, and MPCA agreed to separate the FS into two documents: one for Round Lake and one for Rice Creek, Sunfish Lake, Marsden Lake, and Pond G. At the end of FY 2010, the Army was preparing a QAPP for Round Lake sediment investigation, and the Army, USEPA, and MPCA were in the process of resolving comments on the FS for Rice Creek, Sunfish Lake, Marsden Lake, and Pond G.

Table 1-1

Status of Remedial Actions: FY 2010

Remedy Component		Is the component being implemented?	Is the component doing what it is supposed to?	Has the component undergone final closeout?	Comments
Operable Unit 1: Deep Groundwater					
#1:	Alternate Water Supply/Well Abandonment	Yes	Yes	No	
#2:	Drilling Advisories	Yes	Yes	No	
#3:	Extract Groundwater	Yes	Yes	No	
#4:	Removal of VOCs by GAC (Discharge Quality)	Yes	Yes	No	
#5:	Discharge of Treated Water	Yes	Yes	No	
#6:	Groundwater Monitoring with Verification of Continuing Aquifer Restoration	Yes	Yes	No	
Overall Remedy		Yes	Yes	No	
Operable Unit 2: Shallow Soil Sites					
#1-7:	Soil Remediation				
	Site A	Yes	Yes	Yes	
	Site C	Yes	Yes	Yes	
	Site E	Yes	Yes	Yes	
	Site H	Yes	Yes	Yes	
	Site 129-3	Yes	Yes	Yes	
	Site 129-5	Yes	Yes	Yes	

Table 1-1 (continued)

Status of Remedial Actions: FY 2010

Remedy Component	Is the component being implemented?	Is the component doing what it is supposed to?	Has the component undergone final closeout?	Comments
Operable Unit 2: Shallow Soil Sites (continued)				
#1-7: Soil Remediation (continued)				
Grenade Range	Yes	Yes	Yes	
Outdoor Firing Range	Yes	Yes	Yes	
135 PTA Stormwater Ditch	Yes	Yes	Yes	
Trap Range Site	Yes	Yes	Yes	
Water Tower Area	Yes	Yes	Yes	
#8: Groundwater Monitoring	Yes	Yes	Yes	
#9: Characterization of Dumps:				
Site B	Yes	Yes	Yes	
Site 129-15	Yes	Yes	Yes	
#10: Land Use Controls	Yes	Yes	No	The OU2 Land Use Control Remedial Design (LUCRD) document was approved in September 2010. Implementation is an ongoing requirement.
Overall Remedy	Yes	Yes	Partially	

Table 1-1 (continued)

Status of Remedial Actions: FY 2010

Remedy Component		Is the component being implemented?	Is the component doing what it is supposed to?	Has the component undergone final closeout?	Comments
Operable Unit 2: Deep Soil Sites					
#1:	Groundwater Monitoring	Yes	Yes	Yes	
#2:	Restrict Site Access During Remediation	Yes	Yes	Yes	Long-term land use controls are addressed by Remedy Component #8.
#3:	SVE Systems	Yes	Yes	Yes	
#4:	Enhancements to SVE Systems	Yes	Yes	Yes	Neither system required operation with enhancements. Both SVE systems have been dismantled.
#5:	Maintain Existing Site Caps	Yes	Yes	No	Ongoing requirement.
#6:	Maintain Surface Drainage Controls	Yes	Yes	No	Ongoing requirement.
#7:	Characterize Shallow Soils and Dump	Yes	Yes	Yes	
#8:	Land Use Controls	Yes	Yes	No	The OU2 Land Use Control Remedial Design (LUCRD) document was approved in September 2010. Implementation is an ongoing requirement.
Overall Remedy		Yes	Yes	Partially	

Table 1-1 (continued)

Status of Remedial Actions: FY 2010

Remedy Component		Is the component being implemented?	Is the component doing what it is supposed to?	Has the component undergone final closeout?	Comments
Operable Unit 2: Site A Shallow Groundwater					
#1:	Groundwater Monitoring	Yes	Yes	No	
#2:	Groundwater Containment/Mass Removal	Yes	Yes	No	The groundwater extraction system was shut off on 9/24/08 and is currently in standby while implementation of MNA is evaluated. If MNA is ultimately deemed an acceptable remedy, a ROD modification will be prepared to document the change in this remedy component
#3A	Land Use Controls	Yes	Yes	No	The OU2 Land Use Control Remedial Design (LUCRD) document was approved in September 2010. Implementation is an ongoing requirement.
#3B:	Drilling Advisory/Alternate Water Supply/Well Abandonment	Yes	Yes	No	
#4:	Discharge of Extracted Water	Yes	Yes	No	See comment for Remedy Component #2.
#5:	Source Characterization/Remediation	Yes	Yes	Yes	
Overall Remedy		Yes	Yes	No	

Table 1-1 (continued)

Status of Remedial Actions: FY 2010

Remedy Component	Is the component being implemented?	Is the component doing what it is supposed to?	Has the component undergone final closeout?	Comments
Operable Unit 2: Site C Shallow Groundwater				
#1: Groundwater and Surface Water Monitoring	Yes	Yes	No	
#2: Groundwater Containment	Yes	Yes	No	Since the lead plume no longer extends to the extraction wells, the groundwater extraction system was shut off on 11/13/08 and is currently in standby while ongoing groundwater and surface water monitoring continue.
#3: Discharge of Extracted Water	Yes	Yes	No	See comment for Remedy Component #2.
#4: Land Use Controls	Yes	Yes	No	The OU2 Land Use Control Remedial Design (LUCRD) document was approved in September 2010. Implementation is an ongoing requirement.
Overall Remedy	Yes	Yes	No	
Operable Unit 2: Site I Shallow Groundwater				
#1: Groundwater Monitoring	Yes	Yes	No	
#2: Additional Investigation	Yes	Yes	Yes	
#3: Land Use Controls	Yes	Yes	No	The OU2 Land Use Control Remedial Design (LUCRD) document was approved in September 2010. Implementation is an ongoing requirement.
Overall Remedy	Yes	Yes	No	

Table 1-1 (continued)

Status of Remedial Actions: FY 2010

Remedy Component	Is the component being implemented?	Is the component doing what it is supposed to?	Has the component undergone final closeout?	Comments
Operable Unit 2: Site K Shallow Groundwater				
#1: Groundwater Monitoring	Yes	Yes	No	
#2: Sentinel Wells	Yes	Yes	Yes	
#3: Hydraulic Containment	Yes	Yes	No	
#4: Groundwater Treatment	Yes	Yes	No	
#5: Treated Water Discharge	Yes	Yes	No	
#6: Discharge Monitoring	Yes	Yes	No	
#7: Additional Investigation	Yes	Yes	Yes	
#8: Land Use Controls	Yes	Yes	No	The OU2 Land Use Control Remedial Design (LUCRD) document was approved in September 2010. Implementation is an ongoing requirement.
Overall Remedy	Yes	Yes	No	

Table 1-1 (continued)

Status of Remedial Actions: FY 2010

Remedy Component	Is the component being implemented?	Is the component doing what it is supposed to?	Has the component undergone final closeout?	Comments
Operable Unit 2: Deep Groundwater				
#1: Hydraulic Containment and Contaminant Mass Removal	Yes	Yes	No	
#2: Groundwater Treatment	Yes	Yes	No	
#3: Treated Water Discharge	Yes	Yes	No	
#4: Land Use Controls	Yes	Yes	No	The OU2 Land Use Control Remedial Design (LUCRD) document was approved in September 2010. Implementation is an ongoing requirement.
#5: Review of New Technologies	Yes	Yes	No	
#6: Groundwater Monitoring	Yes	Yes	No	
Overall Remedy	Yes	Yes	No	
Operable Unit 3: Deep Groundwater				
#1: Monitored Natural Attenuation	Yes	Yes	No	
#2: Groundwater Monitoring	Yes	Yes	No	
#3: Drilling Advisories	Yes	Yes	No	
Overall Remedy	Yes	Yes	No	

2.0 Introduction

2.1 PURPOSE

This Fiscal Year 2010 Annual Performance Report is intended to:

- Summarize the status of remedy implementation; and
- Address how the remedies are performing,

for remedial actions at the New Brighton/Arden Hills Superfund Site (NB/AH Site). Fiscal Year 2010 (FY 2010) extended from October 1, 2009 through September 30, 2010.

The NB/AH Superfund Site has been divided into three areas designated "Operable Units." Operable Unit 1 (OU1) encompasses deep groundwater sometimes referred to as the "North Plume." Operable Unit 2 (OU2) includes soil, sediment, surface water, and groundwater contamination on the area that comprised the Twin Cities Army Ammunition Plant (TCAAP) in 1983, when the NB/AH Site was placed on the National Priorities List (NPL). OU2 also includes the Site A groundwater plume that extends off the north end of the federally-owned property. Operable Unit 3 (OU3) consists of the deep groundwater sometimes referred to as the "South Plume." Figure 2-1 shows the approximate locations of the three operable units.

Records of Decision (RODs) have been signed for each of the three operable units (OUs):

- OU1 ROD signed 1993, Amended 2006
- OU2 ROD signed 1997, Amended 2007 and 2009
- OU3 ROD signed 1992, Amended 2006

The RODs, and subsequent Amendments and Explanations of Significant Differences (ESDs), present the major components of the final remedies for the media of concern.

Monitoring activities and submittal of this report are in fulfillment of the Federal Facility Agreement (FFA) signed in 1987 between the United States Army (Army), United States Environmental Protection Agency (USEPA), and Minnesota Pollution Control Agency (MPCA).

Assessment of performance is answered with two questions:

1. *Are all of the remedies being implemented? (Compliance check with the RODs)*
2. *Are the remedies performing as required?*

To address these two questions, this report is broken into the three Operable Units. Using each ROD (along with subsequent modifications), the report addresses the major components of the selected remedy for each media. Performance standards are then presented for each of the major remedy components. The performance standards are used to determine when a remedy component has been successfully implemented and/or completed.

For some of the remedy components, the performance standards are clearly defined in the RODs (e.g., soil or groundwater cleanup levels). For other remedy components (e.g., alternate water supply) the performance standards are less clear in the RODs, but may have been agreed to through Work Plans or design documents.

With the performance standards identified, this report then addresses the two questions described above, often through a series of sub-questions. The questions are written in the text in an attempt to make the report focused and user friendly. To the extent possible, answers are in the form of figures, graphs, etc.

In addition to reporting on FY 2010, this document presents proposed monitoring for future years (Appendix A). Monitoring locations or frequencies that are new in this year's report are shown highlighted in yellow. The monitoring plan shows FY 2010 through FY 2014. The monitoring plan covers a moving 5-year time span (i.e., next year FY 2010 will drop off and FY 2015 will be added).

This report represents the collaboration of work performed by the Army and Alliant Techsystems Inc. (ATK). On behalf of the Army, Wenck Associates, Inc. (Wenck) prepared Sections 2.0 through 7.0, 12.0, and 13.0 of this report. On behalf of ATK, Stantec Consulting Corporation (Stantec) prepared Sections 8.0 and 9.0, and Conestoga-Rovers & Associates, Inc. (CRA) prepared Sections 10.0 and 11.0. Wenck, Stantec, and CRA all contributed to Section 1.0.

2.2 BRIEF OVERVIEW OF TCAAP

TCAAP was constructed between August 1941 and January 1943 in the northern portion of the Minneapolis – St. Paul metropolitan area, in Ramsey County, and is surrounded by the cities of New Brighton, Arden Hills, Mounds View, and Shoreview, Minnesota (Figure 2-1).

TCAAP primarily produced and proof-tested small-caliber ammunition and related materials for the Army. Other uses included manufacture of munitions-related components, handling/storage of strategic and critical materials for other government agencies, and various non-military tenant activities. Production began in 1942 and then alternated between periods of activity and standby related to wars. The last manufacturing operations ceased in 2004.

During periods of activity, solvents were utilized as part of some manufacturing operations. Disposal of solvents and other wastes at the TCAAP property resulted in soil contamination and also groundwater contamination, which has migrated beyond the original TCAAP boundary. Groundwater contamination was first discovered in July 1981, which led to investigation of the soil and groundwater on and off the TCAAP property. It was determined that TCAAP was the source of contamination, and so the TCAAP property and area of affected groundwater contamination was placed on the National Priorities List (NPL) in 1983 as the New Brighton/Arden Hills Superfund Site.

A number of known and potential contaminant source areas were initially identified on the TCAAP property: Sites A, B, C, D, E, F, G, H, I, J, K, 129-3, 129-5, and 129-15 (see Figure 2-2 for locations). The 1997 OU2 ROD specified requirements for all of these sites except Site F (which was remediated prior to 1997) and Site J (a sewer line that was determined not to have a release of contamination). Other areas have also undergone investigation and/or remediation, namely the Grenade Range, Outdoor Firing Range, Trap Range, 135 Primer/Tracer Area (and adjacent stormwater ditch), 535 Primer/Tracer Area, Water Tower Area, and Building 102. These areas are also shown on Figure 2-2.

Since 1983, when the NB/AH Site was placed on the NPL, the size of TCAAP has periodically shrunk as a result of property transfers. Some property has been transferred out of federal-ownership to the Minnesota Department of Transportation, Ramsey County, and the City of Arden Hills. Other property is still owned by the federal government, but control has been reassigned to the Army Reserve or the National Guard Bureau. The National Guard Bureau has licensed the property it controls to the Minnesota Army National Guard. Figure 2-3 shows the property presently under federal ownership, along with the organizations responsible for control. The remaining 585 acres that is still controlled by TCAAP is in the process of being transferred out of federal control. It is likely that within the next few years, there will no longer be an organization or property called TCAAP. These property transfers do not alter the responsibilities of the U.S. Army under the FFA.

2.3 HYDROGEOLOGIC UNITS AND WELL NOMENCLATURE

For purposes of studies and work related to the NB/AH Superfund Site, four hydrogeologic units have been designated: Unit 1 through Unit 4. Descriptions of these four units are presented in Appendix B, along with a description of the nomenclature system used for well designations (e.g., 03U704). A well-designation cross-reference guide is included in Table B-1 in Appendix B. The well index includes all wells that are owned by or have been used by the Army in the past to gather groundwater elevation or water quality data sorted by Minnesota unique number. Well information in the Appendix includes the Army designation (IRDMIS number), Minnesota unique number, and any other name(s) the wells may have. The Appendix also includes information about each well. Locations of wells that are included in the monitoring plan are shown on Figure B-2 (OU1/OU3 wells) and Figure B-3 (OU2 wells) in Appendix B. With a known well name, the location of that well can be determined using the "Edit, Find" or "Edit, Search" function and typing in the well name, which will highlight the desired well name on the figure. Available information concerning a well, including well logs and other information, can be viewed in the Appendix B Attachment sorted by Minnesota unique number.

See the instructions on the attached DVD for more information on using Appendix B.

2.4 DATA COLLECTION, MANAGEMENT, AND PRESENTATION

Performance monitoring data was collected in accordance with the:

- FY 2010 Monitoring Plan for Groundwater Monitoring Wells
- FY 2010 Monitoring Plan for Remedial Treatment Systems
- FY 2010 Monitoring Plan for Surface Water
- New Brighton Water System Sampling and Analysis Plan

Data was collected principally by four parties: Wenck on behalf of the Army; CRA and Stantec on behalf of ATK; and Barr Engineering (Barr) on behalf of the City of New Brighton. Appendix C presents information on data collection, management, and presentation. Data tables are presented following the text at the end of each section in which it is referenced. The comprehensive groundwater level and groundwater quality databases from 1987 through FY 2010 are contained in Appendix D.1.

Is the data complete and representative (are we making decisions based on complete and technically-sound information)?

Yes. The data was collected in accordance with the FY 2010 Monitoring Plan. Data was collected, verified, and validated in accordance with three separate Quality Assurance Project Plans (QAPPs): “QAPP for Performance Monitoring”, (Wenck, Revision 8, April 3, 2009), “QAPP for Site C Groundwater and Surface Water”, (Wenck, Revision 8, April 3, 2009), and “QAPP for Monitored Natural Attenuation of Building 102 Groundwater”, (Wenck, Revision 2, April 3, 2009). The Site C and Building 102 QAPPs are applicable to only those specific sites, and all other sites are covered by the Performance Monitoring QAPP.

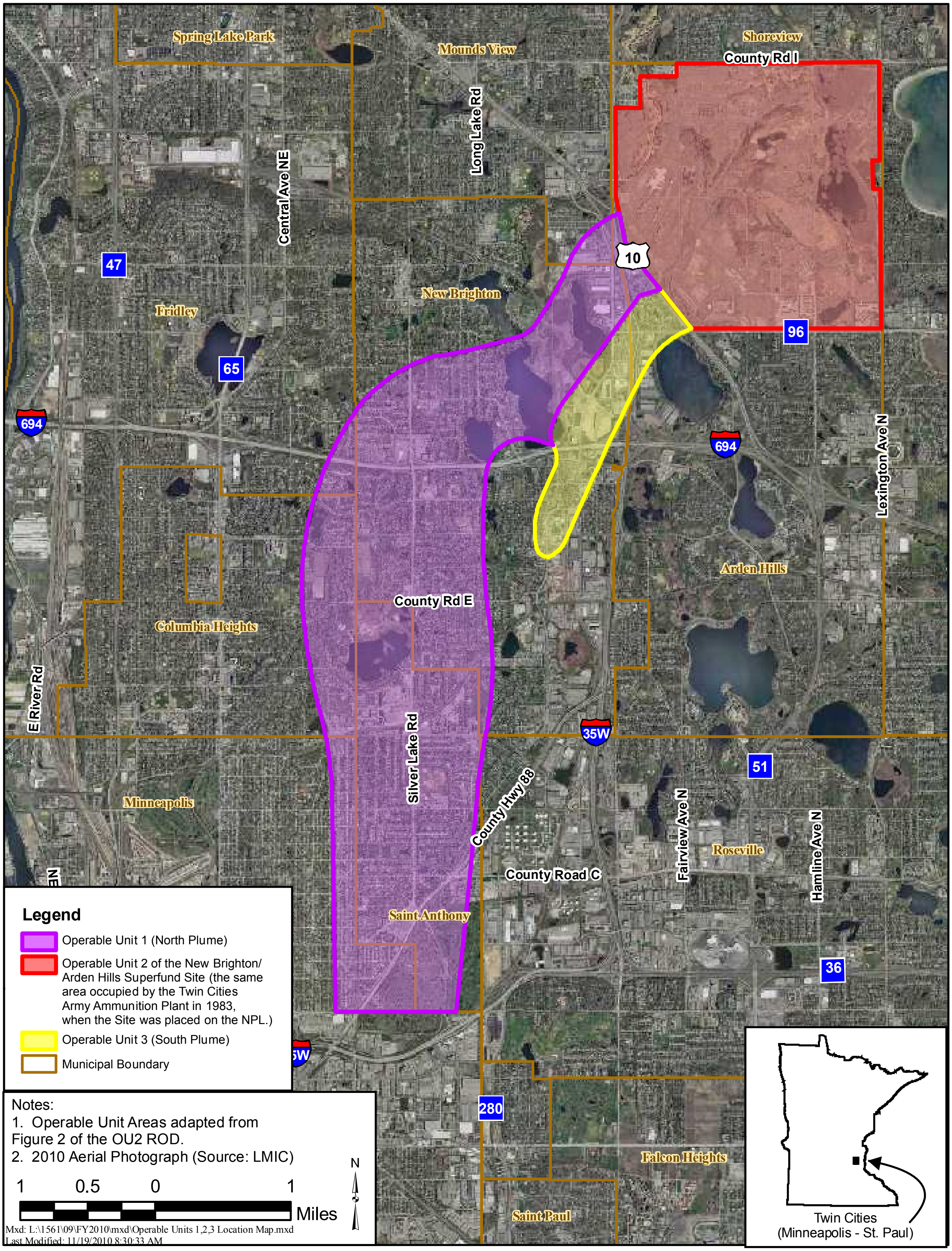
The data tables in the various report sections and the comprehensive water quality databases (Appendix D.1) show the data qualifiers that were assigned to the data as a result of data verification and/or data validation. The data qualifiers assigned to FY 2010 data are explained in the footnotes of the data tables in the various report sections. Data verification (performed on 100 percent of the data) and data validation (performed on a minimum of 10 percent of the data) were provided to the USEPA and MPCA via submittal of quarterly Data Usability Reports (DURs) covering the data collected in FY 2010. The final MPCA/USEPA approval letter for the FY 2010 DURs is included in Appendix C.3.

With regard to completeness, Appendix C.2 summarizes any deviations from the FY 2010 Monitoring Plan. The field and laboratory completeness goals for performance monitoring are both 95%, except that the completeness goals for TGRS effluent, Site K effluent, and well inventory are 100%. Actual field and laboratory completeness were both 100%, meeting the overall completeness goals (wells that were dry, frozen or inoperative were not considered as missed samples, nor were well inventory locations where the well owner refused sample collection or was nonresponsive). Also, the actual field and laboratory completeness for the subset of samples with 100% completeness goals was 100%, meeting this goal. For Site C shallow groundwater, the field and laboratory completeness goals are both 95%. Actual field and laboratory completeness were 100%, meeting the completeness goals. For Building 102 shallow groundwater, the field and laboratory completeness goals are both 95%, except that the completeness goals for well 01U048 (adjacent to Rice Creek) are 100%. Actual field and laboratory completeness were 100%, meeting the completeness goals.

With regard to QC samples, all three QAPPs specify that field duplicates, equipment rinse blanks, and matrix spike/matrix spike duplicates are to be collected at overall frequencies of 10%, 10%, and 5%, respectively. Actual QC sample frequencies were met in all three cases, with respective frequencies of 19%, 9% and 15% for performance monitoring; 11%, 11% and 9% for Site C shallow groundwater; and 17%, 17% and 8% for Building 102 shallow groundwater. These actual frequencies met the desired frequencies except that the performance monitoring rinse blank frequency of 9% was just below the intended rate of 10%. This slight deviation is noted, but does not affect data usability.

With regard to data validation, the performance monitoring QAPP specifies that data validation be completed at an overall rate of 10%, with 100% validation of Site A antimony data and well inventory samples. The actual validation rate was 35%, and all of the data requiring 100% data validation was fully validated, meeting the specified validation rates for performance monitoring. For Site C shallow groundwater, the QAPP specifies that data validation be completed at an overall rate of 10%. The actual data validation rate was 38%, meeting the specified validation rate. For Building 102 shallow groundwater, the QAPP specifies a 100% data validation rate, and all of the data was fully validated.

The data for FY 2010 is deemed to be representative and meet data quality objectives based on: 1) adherence to QAPP-specified sampling and laboratory analytical procedures; 2) completion of data verification and data validation; and 3) comparability to historical results (any substantial deviations from historical and/or anticipated results are discussed within the site-specific sections of this report).



ANNUAL PERFORMANCE REPORT

Conceptual Illustration of Operable Units

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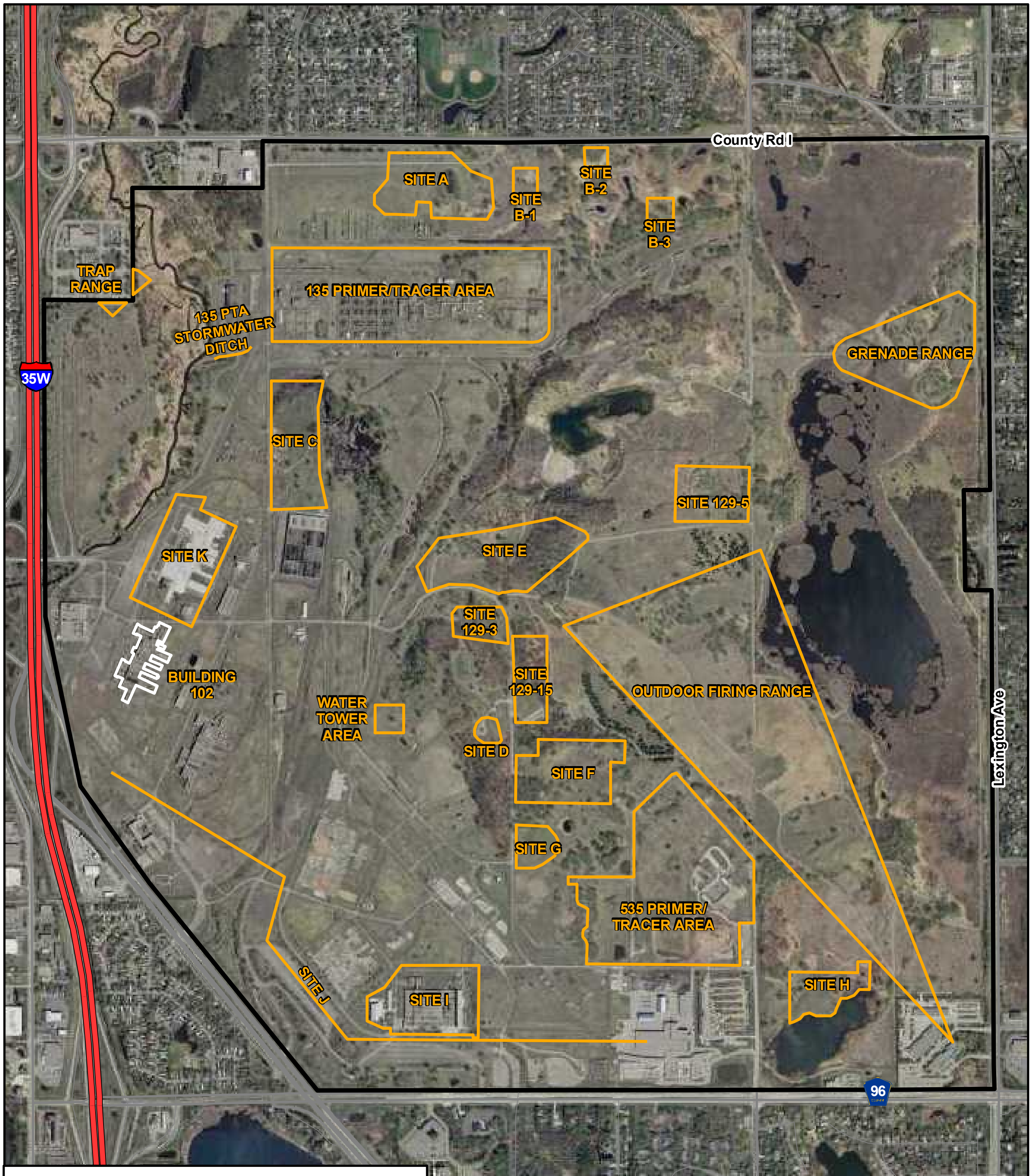
Environmental Engineers

1800 Pioneer Creek Center
Maple Plain, MN 55359-0429

FY 2010

Figure 2-1



Notes:
1. General NPL site boundaries determined during the initial site investigations. Please refer to the latest site reports for the current boundary definitions.
2. 2010 Aerial Photograph (Source: LMIC)

1,600 800 0 1,600
Feet

Mxd: L:\1561\09\FY2010\mxd\TCAAP Site Boundaries.mxd
Last Modified: 11/19/2010 8:30:38 AM

Legend

Operable Unit 2 of the New Brighton/ Arden Hills Superfund Site (the same area occupied by the Twin Cities Army Ammunition Plant in 1983, when the Site was placed on the NPL.)

General NPL Site Boundary (See Note 1)

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Operable Unit 2 Site Boundaries

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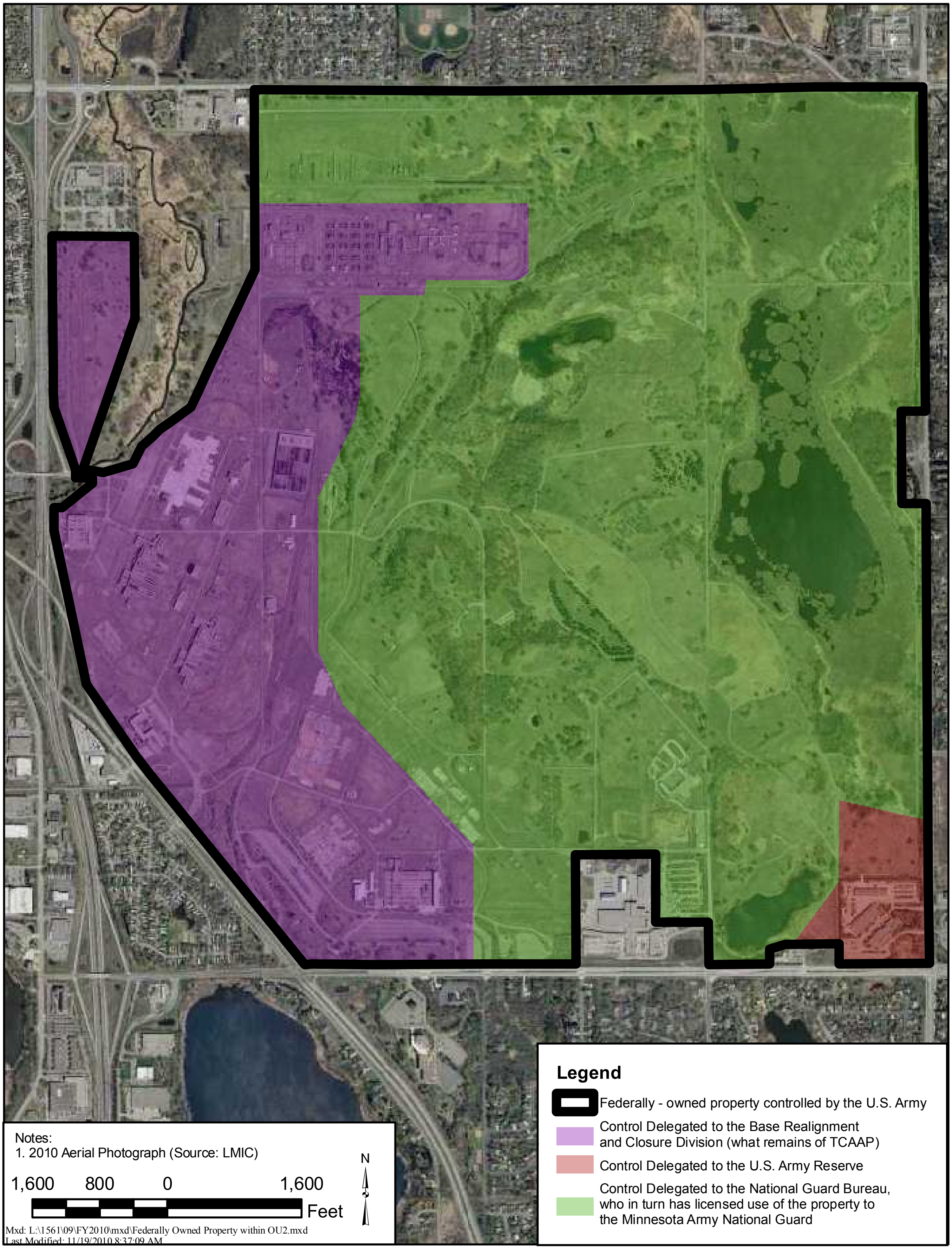
FY 2010

Figure 2-2



ANNUAL PERFORMANCE REPORT

Federally - Owned Property
Within Operable Unit 2

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FY 2010

Figure 2-3

3.0 Operable Unit 1: Deep Groundwater

The reference for the OU1 ROD is:

RECORD OF DECISION
Groundwater Remediation
Operable Unit 1
At New Brighton/Arden Hills Superfund Site
1993, Amended 2006

The 2006 ROD amendment formalized the adoption of the statistical analysis of groundwater quality presented in the Annual Performance Reports since FY 2003.

Following are the six primary elements of the amended ROD, with the changed elements shown in italics:

1. Providing alternate water supplies to residents with private wells within the North Plume.

2. Implementing drilling advisories that would regulate the installation of new private wells within the North Plume as a Special Well Construction Area.

3. *Extracting groundwater from the North Plume using the New Brighton Contaminated Groundwater Recovery System (NBCGRS), subject to the following:*
   a. the initial aggregate groundwater extraction rate shall be consistent with the long-term operating history of the NBCGRS;
   b. future decreases in the aggregate extraction rate shall be determined by the Army, USEPA, and MPCA using a transparent public process and rational

engineering, scientific, and economic analyses at least as rigorous as those employed in the feasibility study that was the basis for the original remedy selection;

c. future changes to the aggregate or individual well extraction rates shall be made so as to assure that the rate of restoration of the aquifer will not be slowed or result in a duration of remedy longer than was contemplated by the original ROD;

d. the facilities comprising the NBCGRS may be modified as necessary to assure the restoration of the full areal and vertical extent of the aquifer in a timeframe as contemplated in 3.c, above.

4. Pumping the extracted groundwater to the PGAC Water Treatment Facility in New Brighton for removal of VOCs by a pressurized granular activated carbon (GAC) system.

5. Discharging all of the treated water to the New Brighton municipal distribution system.

6. *Monitoring the groundwater to verify effectiveness of the remedy through measurement of overall plume shrinkage (geographically) and decreasing contaminant concentrations*.

The last requirement (No. 6) is met by evaluating the groundwater chemical data according to statistical methods contained in the "OU1 Technical Group Technical Memorandum Statistical Evaluation Method For Water Quality Data, Operable Unit 1", dated December 2004 (and any subsequent addendums or revisions approved by the USEPA and MPCA). The statistical analysis is conducted annually and is reported in the Annual Performance Reports.

Groundwater extraction is provided by six municipal wells: New Brighton Municipal (NBM) #3, #4, #5, #6, #14, and #15. The extracted water is treated in the Permanent Granular Activated

Carbon (PGAC) treatment facility for removal of VOCs, and is then used as part of the municipal water supply. NBM #3 through #6 were pre-existing wells. NBM #14 and NBM #15 began pumping in December 1996 and March 1998, respectively.

The remedy also relies on provision of an alternate water supply and/or well abandonment, as necessary, to manage risks for existing private water supply wells, and land use controls (drilling advisory) to prevent new water supply wells from being constructed into the affected portion of the aquifer.

The six major components of the remedy prescribed by the amended ROD are evaluated in the following sections.

3.1 REMEDY COMPONENT #1: ALTERNATE WATER SUPPLY/WELL ABANDONMENT

Description: "Providing an alternative water supply to residents with private wells within the North Plume." (OU1 ROD, page 2)

- Clarified by the OU1 Alternate Water Supply Plan (Montgomery Watson, October 1995) to delete "residents with" since the remedy applies to other wells in addition to residential wells. This plan also identifies the criteria for determining what wells are eligible for an alternate water supply.
- Clarified by the OU1 Alternate Water Supply Plan to also include well abandonment.
- Clarified by the OU1 Alternate Water Supply Plan (page i-2) to also encompass OU3 and the OU2 Site A shallow groundwater plume.

Performance Standard (how do you know when you're done):

- For alternate water supply, when the owners of all wells that meet all of the following criteria have been offered and provided with an alternate water supply (or when the well owners have rejected the offers):

  i. The well is located within the area affected by groundwater plumes that originate at OU2, as shown on Figures E-2 and E-3 in Appendix E; and
  ii. The well is completed in an affected aquifer; and
  iii. The well contains detectable concentrations of the New Brighton/Arden Hills Superfund Site-related chemicals of concern identified on page 18 of the OU1 ROD (or page 26 of the OU3 ROD, or Table 1 of the OU2 ROD, as appropriate for the well location); and
  iv. The well is used in a manner to cause exposure (uses are defined in the Alternate Water Supply Plan); and
  v. The well owner does not already have an alternate water supply.

  If eligible well owners refuse the offer to have an alternate water supply provided, this also satisfies the performance standard.

- For well abandonment, when the owners of all wells that meet all of the following criteria have been offered and provided abandonment (or when the well owners have rejected the offers):

  i. The well is located within the area affected by groundwater plumes that originate at OU2; and
  ii. The well is completed in an affected aquifer; and
  iii. The well contains detectable concentrations of the New Brighton/Arden Hills Superfund Site-related chemicals of concern identified on page 18 of the OU1 ROD (or page 26 of the OU3 ROD, or Table 1 of the OU2 ROD, as appropriate for the well location); and

iv. The well was constructed prior to the MDH Special Well Construction Area advisory; and

v. The well is being used by the well owner or use was discontinued due to contamination; and

vi. The well is used in a manner to cause exposure (uses are defined in the Alternate Water Supply Plan).

If eligible well owners refuse the offer for abandonment, this also satisfies the performance standard. An exception to abandonment would be if the well is needed for groundwater monitoring.

Is this remedy component being implemented?

Yes. The Alternate Water Supply and Well Abandonment Program has been implemented and is an ongoing program maintained by the Army. The process of identifying wells eligible for alternate water supply and/or abandonment is accomplished by maintaining a "well inventory" (information on the well inventory is presented in Appendix E). The well inventory is a database that was initially developed in 1992, and which has been periodically updated since then. For the purposes of the well inventory, a study area was established which encompasses the groundwater plume (the study area boundary is the same as the MDH Special Well Construction Area). The well inventory is intended to include all wells within the study area. Within the study area, areas of concern are defined by the edge of the groundwater plume, plus additional buffer area. The wells are grouped into categories based on factors such as location relative to the area of concern, type of use, active/non-active status, sealed, etc. Wells in categories with the potential to be impacted are periodically sampled to see if they qualify for alternate water supply and/or abandonment.

Thus, maintenance of the well inventory consists of the following tasks:

1. Check if the area of concern needs to be adjusted based on the extent of contamination,
2. Check if there are any previously unknown wells to be added to the database (in coordination with the MDH as described in Appendix E),
3. Sample wells on a prescribed schedule,
4. Take the appropriate course of action depending on the results,
5. Update the well inventory database with any new information (e.g., water quality results, owner information, construction information, well re-categorizing),
6. Report findings through the Annual Performance Report.

The following questions and answers summarize developments since the last Annual Performance Report with respect to Operable Unit 1.

Did the area of concern within OU1 change during FY 2010, as defined by the 1 μg/l contour line?

No. There was not a comprehensive sampling round conducted in FY 2010. The last comprehensive sampling round was conducted in FY 2009. The 1 μg/l contour line remained essentially the same in FY 2009 as in FY 2007, which was the previous comprehensive sampling round (see Figure 3-1).

Were any additional water supply wells discovered within the area of concern for OU1 that are completed within an aquifer of concern?

No. (see Appendix E for additional information)

Were any water supply wells within the area of concern for OU1 sampled during FY 2010 (outside of those included in the OU1 performance monitoring plan)? If yes, what were the findings? No water supply wells within the area of concern for OU1 were sampled during FY 2010.

Were any well owners offered an alternate water supply and/or well abandonment during FY 2010? No.

For OU1, are there any well owners that meet the criteria, but have not yet been provided an alternate water supply? No.

For OU1, are there any wells that meet the criteria, but have not yet been abandoned? No.

Is any sampling of water supply wells (excluding those included in the OU1 performance monitoring plan) proposed prior to the next report?
No. FY 2011 is not a sampling event for well inventory wells as shown in Appendix A.1. The next major event is in FY 2013.

Are there any changes or additional actions required for this remedy component? No.

3.2 REMEDY COMPONENT #2: DRILLING ADVISORIES

Description: "Implementing drilling advisories that would regulate the installation of new private wells within the North Plume as a Special Well Construction Area." (OU1 ROD, page 2)

Performance Standard (how do you know when you're done):
For initial implementation, when the MDH has issued a Special Well Construction Area Advisory. Implementation will continue until such time that the groundwater concentrations are below the cleanup levels.

Has the MDH issued a Special Well Construction Area Advisory?
Yes. It was issued in June 1996. In addition to covering OU1, the Special Well Construction Area also encompasses OU3 and the OU2 Site A shallow groundwater plume. In June 1999, the

MPCA requested that the MDH extend the boundary of the Special Well Construction Area further to the southwest to the Mississippi River and Marshall Avenue to ensure that the southern boundary fully encompassed the plume. The MDH revised the Special Well Construction Area in December 1999. The current boundary is shown on Figure E-1 (Appendix E).

Are any changes or additional actions required for this remedy component? No.

3.3 REMEDY COMPONENT #3: EXTRACT GROUNDWATER

Description: "Extracting groundwater from the North Plume using the New Brighton Contaminated Groundwater Recovery System (NBCGRS), subject to the following:

a. the initial aggregate groundwater extraction rate shall be consistent with the long-term operating history of the NBCGRS;

b. future decreases in the aggregate extraction rate shall be determined by the Army, USEPA, and MPCA using a transparent public process and rational engineering, scientific, and economic analyses at least as rigorous as those employed in the feasibility study that was the basis for the original remedy selection;

c. future changes to the aggregate or individual well extraction rates shall be made so as to assure that the rate of restoration of the aquifer will not be slowed or result in a duration of remedy longer than was contemplated by the original ROD;

d. the facilities comprising the NBCGRS may be modified as necessary to assure the restoration of the full areal and vertical extent of the aquifer in a timeframe as contemplated in 3.c, above." (2006 OU1 ROD Amendment, page 5-2 & 5-3)

Through January 2008, the remedy component consisted of recovering deep (Unit 4) groundwater using three primary City of New Brighton municipal wells (NBM #4, #14, and #15) with three alternate wells (NBM #3, #5, and #6). NBM #3 and #4 were existing wells completed in both the Prairie du Chien and Jordan. NBM #5 and #6 were existing wells completed in the Jordan. NBM #14 and NBM #15 were constructed in the Prairie du Chien as part of the remedy and began pumping in December 1996 and March 1998, respectively. The locations of the recovery wells are shown on Figure 3-1.

The extracted groundwater is used as part of the New Brighton water supply system, and as such, New Brighton took the lead on design and construction of the system, and is responsible for operation of the system. New Brighton contracted Barr Engineering to provide design and construction oversight services. The Army is paying for the OU1 remedy.

In 2006, New Brighton proposed to the Army modifying the agreement between the two parties to allow more flexibility in how they operate the NBCGRS, and to increase removal of contaminant mass from the aquifer. In November 2007, the USEPA and MPCA provided consistency approval of the revised pumping rates. Appendix A.5 (Table D-1 and Table D-2 from the settlement agreement between the Army and New Brighton) presents the new pumping rates in effect as of January 2008. Following is additional background discussion that explains the scope of the changes.

New Brighton expressed interest in pumping from wells NBM #5 and/or NBM #6, completed in the Jordan aquifer. New Brighton indicated they do not want to sacrifice cleanup in the Prairie du Chien; rather, they want to supplement these efforts with additional pumping in the Jordan. They observed that contaminant concentrations have declined in the Prairie du Chien wells to the point where the contamination is now higher in Jordan wells #5 and #6.

New Brighton proposed the pumping rates in Appendix A.5. The tables show a column for "Normal Operation" that has the revised lower and upper limits for pumping, along with the "priority" for each well. Well NBM #15 was considered the highest priority because it was located near the center of the plume and had the highest contaminant concentrations of the wells completed in the Prairie du Chien. Well pair NBM #3/4 was the second priority because it was the next highest concentrations in the Prairie du Chien. New Brighton deemed Jordan well pair NBM #5/6 as the next highest priority because these wells had the highest contaminant concentrations of all the extraction wells. Finally, well NBM #14 was assigned the lowest priority because it was near the edge of the plume in the Prairie du Chien with relatively low contaminant concentrations. The priorities reflected New Brighton's desire to still focus on the core of the Prairie du Chien plume (wells NBM #15 and NBM #3/4), while starting to enhance mass removal in the Jordan (well pair NBM #5/6). The lower limit for well NBM #14 is zero. New Brighton proposed this in anticipation that this well will likely be the first to reach remediation goals (NBM #14 has since fallen below the remediation standard for TCE of 5 µg/L), and its use could be discontinued for remediation purposes. In practice, New Brighton intends to keep pumping from NBM #14 (albeit at a lower rate than previously) in order to meet their water supply demand.

The revised pumping approach does not affect the approved statistical analysis used to evaluate the effectiveness of the remedy as set forth by the OU1 ROD Amendment. The Army believes that the changes should enhance the overall aquifer restoration by re-allocating some pumping to wells with higher contaminant concentrations. Nevertheless, the Army has made it clear to New Brighton that if the changes somehow cause statistical evaluation results that are not in compliance with the OU1 ROD Amendment, then the pumping allocations will revert back to the previous scheme.

Performance Standard (how do you know when you're done):
When the NBCGRS is operating consistent with long-term NBCGRS operating rates.

During FY 2010, did the OU1 extraction system operate according to the New Brighton operational plan and consistent with past operations?
Yes. Based on past operations, the target average daily pumping rate is 3.168 million gallons per day (MGD) as shown in Appendix A.5. Table 3-1 shows the volume of water pumped by the

NBCGRS during FY 2010 was 1,202 million gallons, which translates to a daily average of 3.293 MGD. Hence, the pumping in FY 2010 exceeded the target and the system was operated in compliance with the amended ROD.

Are any changes or additional actions required for this remedy component? No.

3.4 REMEDY COMPONENT #4: REMOVAL OF VOCS BY GAC

Description: "Pumping the extracted groundwater to the Permanent Granular Activated Carbon (PGAC) Water Treatment Facility in New Brighton for removal of VOCs by a pressurized GAC system." (OU1 ROD, page 2)

- Treatment by the PGAC (along with iron and manganese removal and chlorination) makes the recovered groundwater suitable for municipal drinking water purposes. The PGAC is located approximately one-third mile south of Interstate 694 near Silver Lake Road. The City of New Brighton is responsible for operation and maintenance of the PGAC, with cost reimbursement from the Army for the operations related to the remedy.

Performance Standard (how do you know when you're done):
When the treated water meets the Maximum Contaminant Levels (MCLs) and non-zero Maximum Contaminant Level Goals (MCLGs) established by the Safe Drinking Water Act (SDWA) for the chemicals of concern, as identified on page 18 of the OU1 ROD.

Did the treated water meet the MCLs and non-zero MCLGs established by the SDWA for the OU1 chemicals of concern?
Yes. Table 3-2 shows that the PGAC effluent met the performance standard during FY 2010.

Treatment of extracted groundwater in the PGAC water treatment facility (remedy component #4) continues to provide effective treatment prior to its discharge into the City of New Brighton municipal water distribution system (remedy component #5). The treatment system is comprised of eight GAC vessels plumbed in parallel. Another eight GAC vessels are plumbed in series with the first eight to provide back-up treatment. The GAC vessels are labeled A or B and water is normally run in series (i.e., water passes through A then B, or B then A, depending on whether the most recent carbon change-out was the A or B vessel). Routine sampling occurs between the two sets of GAC vessels, such that when a detection occurs, a clean set of GAC vessels is present downstream of the sampling point. Upon detection, change-out of carbon in the lead vessels is conducted as soon as possible (typically about 1 to 2 months later). Upon changing carbon, the direction of flow is reversed so that the eight vessels with the new carbon become the downstream vessels (the "clean" vessels are always rotated into the downstream position).

Table 3-2 shows that two carbon change-outs occurred in FY 2010: one in October/November and one in April/May.

Is any sampling of the treated water proposed prior to the next report?
Yes. Sampling will continue to be performed by the City of New Brighton or their contractor.

Are any changes or additional actions required for this remedy component? No.

3.5 REMEDY COMPONENT #5: DISCHARGE OF TREATED WATER

Description: "Discharging all of the treated water to the New Brighton municipal distribution system." (OU1 ROD, page 2)

Performance Standard (how do you know when you're done):
When the connection to the New Brighton municipal supply system has been completed and water is being discharged.

Is the treated water being discharged to the New Brighton municipal distribution system?
Yes.

Are any changes or additional actions required for this remedy component? No.

3.6 REMEDY COMPONENT #6: GROUNDWATER MONITORING WITH VERIFICATION OF CONTINUING AQUIFER RESTORATION

Description: "Monitoring the groundwater to verify the effectiveness of the remedy through measurement of overall plume shrinkage (geographically) and decreasing contaminant concentrations." (2006 OU1 ROD Amendment, page 5-3)

Performance Standard (how do you know when you're done):
When performance groundwater monitoring verifies aquifer restoration.

Is this remedy component being implemented?
Yes. Performance monitoring programs have been established to collect the data required to verify the effectiveness of remedy components #1 through #6. Table 3-3 summarizes the performance monitoring requirements, implementing parties, and the specific documents that contain the monitoring plans.

Were the groundwater monitoring requirements for this remedy met?

Yes, FY 2010 was a minor sampling year.

Is any groundwater monitoring proposed prior to the next report? Yes.

- Monitoring of the extraction wells and treatment system effluent will be performed by the City of New Brighton in accordance with the "New Brighton Water System Sampling and Analysis Plan," June 1997.
- Other groundwater monitoring will be in accordance with the Groundwater Monitoring Plan included as Appendix A.1. The next "major" event will be in FY 2011.

Does groundwater monitoring show aquifer restoration is occurring? Yes.

Trend graphs for trichloroethene in NBM #3, #4, #5, #6, #14, and #15 are shown in Figure 3-2. Historical water quality values for the wells can be found in Appendix D. At both NBM #3 and NBM #4, trichloroethene decreased between the start of pumping and 1991 and 1998, and have been relatively stable since then. NBM#3 shows a slight upward trend since 1998. At NBM #5 and #6, trichloroethene was trending downward in FY 2010, but remained within the historical range. At NBM #14, the trichloroethene concentrations show a continuing downward trend in addition to being below the cleanup level for TCE in OU1 (5 µg/L). At NBM #15, the trichloroethene continued to show a downward trend. Overall, the water quality data from the extraction wells supports the interpretation that the system is providing aquifer restoration.

The trichloroethene plumes in the aquifers were not mapped in FY 2010 because it was a minor sampling year.

The OU1 Technical Memorandum was prepared to develop statistical methods specifically selected to evaluate the long-term progress of remediation, plume evolution, and aquifer restoration in OU1. The OU1 Technical Memorandum states the objective of the statistical evaluation as follows:

> "Verify progress in cleanup of the plume through measurement of overall geographic plume shrinkage and decreasing contaminant concentrations."

The OU1TG identified five issues that need to be statistically addressed, now and over time, to achieve this objective:

1. Measure changing concentrations immediately downgradient of the TGRS, as this area is the first to be affected by any potential escape of contaminants from TCAAP.

2. Measure changes in the geographical size of the plume over time.

3. Measure changes in concentrations immediately downgradient of the NBCGRS, as this is the first area to be affected by any potential escape of contaminants from NBCGRS capture.

4. Measure any unforeseen changes in plume configuration. This addresses the possibility that changing flow patterns may cause a shift in the plume but not necessarily any change in size. A plume shift may require a redistribution of pumping.

5. Measure the long-term trends in overall VOC concentrations (as an indicator of contaminant mass). This provides an overall picture of remedial progress.

The OU1TG developed a series of five well groups designed to address each of the issues listed above. For each group, the appropriate statistical tools were specified and the statistical response threshold was identified that would trigger closer scrutiny by the Army and regulators (USEPA and MPCA). Table D.2.8 in Appendix D.2 shows the factors to consider and potential additional actions that may be implemented if statistical threshold is triggered. As Table D.2.8 shows, a threshold trigger initiates a closer look at the data and the context of the data in terms of remedy performance or potential risk. A threshold trigger does not automatically require any specific action. The five groups, corresponding to the five issues discussed above, are:

1. Group 1: Downgradient of the TGRS. This zone is the area downgradient of the TGRS capture zone. This zone should show overall reductions over time in response to TGRS mass removal and containment. However, it is also the stagnation zone of the TGRS so groundwater velocities are reduced and response may be slow. Furthermore, individual wells near the stagnation zone may show increases in contaminant concentrations during some points in time, as the plume shifts in response to changes in pumping.

2. Group 2: Plume Edge Wells. This zone includes wells that define the edges of the plume downgradient of the TGRS. These are wells with low concentrations of VOCs (<100 µg/l) that will indicate a reduction in overall plume size if VOC concentrations continue to decline.

3. Group 3: Downgradient Sentinel Wells. This is a zone downgradient of the NBCGRS stagnation zone. This group includes three wells but more accurately is defined as a geographic area immediately downgradient of the NBCGRS. This group should help demonstrate improvement due to the VOC mass removal by the NBCGRS over time, analogous to Group 1 and the TGRS.

4. Group 4: Lateral Sentinel Wells. These are "clean" wells downgradient of the TGRS that are beyond the current plume boundaries. These wells should help identify large, unexpected, lateral changes in plume configuration, such as a shifting or expansion of the plume boundary.

5. Group 5: Global Plume Mass Wells. This group includes all the monitoring wells necessary to construct a contour map of the VOC plume. Production wells are not used in Group 5 since the data may not be comparable to monitoring well data. Some wells located within OU2 are included in Group 5 to support the contouring near the OU2 boundary. This group reflects the overall VOC mass in the aquifer and should show an overall reduction in VOC mass over time.

In October 2005, the Army received a consistency determination on:

Modification #1 to:
OU1 Technical Group Technical Memorandum Statistical Evaluation Method For Water Quality Data, Operable Unit 1" prepared by the Army, dated December 2004.

This modification created well Group 6 to address the Jordan portion of the Unit 4 aquifer.

6. Group 6: Jordan Wells. The group includes all Jordan monitoring wells, the Prairie du Chien wells nested with them, and New Brighton Municipal Wells 3, 4, 5, and 6. The inclusion of the Prairie du Chien wells is to facilitate comparing the trends between it and the Jordan at these locations. This group will help identify any changes in the plume occurring in the Jordan portion of the aquifer.

Additional detail on the well groups and analysis is presented in the OU1 Technical Memorandum, Modification #1, and Appendix D.2.

FY 2010 was a minor sampling year, so new comprehensive plume mapping was not completed. Three wells were sampled in FY 2010, in support of continuing data needs for statistical Group 6 and eleven wells were sampled for Group 1. Table 3-4 presents groundwater quality data for OU1. These data were collected to support the statistical analysis developed by the OU1TG.

The statistical analysis in Appendix D.2 follows the format described in the OU1 Technical Memorandum and Modification #1.

Table 3-5 presents a summary of the statistical results for all groups, from Appendix D.2, reflecting the data collected through FY 2010. Table 3-5 includes an assessment of the statistical thresholds that were triggered in the analysis and brief comments addressing these threshold triggers. Further discussion is presented below.

Group 1:

The Group 1 (downgradient of the TGRS) response threshold was not triggered for the North Plume sub-group, with a decreasing outcome. North Plume statistics continued to show a decreasing trend in FY 21010. The Area Weighted Concentration (AWC) concentration for the Group 1 North Plume was 38 µg/L in FY 2010, down from 42 µg/L in FY 2009. This value represents a weighted estimate of the average total VOC concentration just downgradient of the TGRS.

The Group 1 (downgradient of the TGRS) response threshold was not triggered for the South Plume sub-group. The South Plume trend was decreasing in FY 2010, improved from a stable trend in FY 2009. The AWC for the South Plume was 4 µg/L and has been 4 or 5 µg/L over the analysis period (since 2001). The analysis of this sub-group is driven by the concentration at 03U801. The concentration in FY 2010 was 29 µg/L. Historically, this well peaked at 11,000 µg/L in 1993 and has consistently been below 70 µg/L since 1998. It has been stable at between 39 µg/L and 15 µg/L since 2002. Upgradient of the TGRS (within the capture zone) in this area, the South Plume concentrations continue to be over 100 µg/L.

Group 2:

No statistical analyses were performed for Group 2 in FY 2010.

Group 3 and Group 5:

No statistical analyses were performed for Groups 3 and 5 in FY 2010.

Group 4:

No statistical analyses were performed for Group 2 in FY 2010.

Group 6:

The three wells installed and sampled since FY 2005 provide additional data points between OU2 and the NBCGRS to help complete the understanding of the extent and magnitude of VOC concentrations in the Jordan portion of the aquifer.

04J847 remains stable and therefore the threshold was triggered. To examine the history more thoroughly a second trend was run utilizing all ten rounds of data collected since 2004. This represents the entire history of sampling at this well. This ‘extended trend’ is included in Appendix D and on Table 3.5. The extended trend is decreasing, suggesting improvement over the six years of monitoring. Based on this extended trend, continued annual monitoring is appropriate at this well given its stability and central location in the plume.

04J849 continued to show No Trend, which triggered the threshold for Group 6. However, the concentrations are below 0.5 µg/l, and are therefore not of concern. It is likely the trend is an artifact of analytical variability at these levels.

The well 04J822 trend improved from increasing in FY 2007 to decreasing in FY 2010. This well is in the central part of the plume and downgradient of the hot spot at well nest 04U847 to the northeast. The trend suggests there is not a horizontal expansion of the plume.

The New Brighton Municipal well trends were analyzed using a linear regression for data since 1998 (see Appendix D.2.5). Due to the large number of data points, regression was considered superior to the Mann-Kendall analysis. Data from FY 1998 were used to reflect the approximate time window used throughout the statistical analysis and to avoid skewing the analysis from the earlier high concentrations. All the New Brighton wells showed downward concentration trends, except NBM #3 and #4, which show a slight upward trend. This suggests that overall concentrations are decreasing at the New Brighton municipal well field, which agrees with the decreasing mass removal observed over the life of the system.

Overall Statistical Assessment:

There were individual threshold triggers identified in FY 2010 for Group 6. The thresholds triggered do not suggest any problems with the remedial systems, but suggest movement within the established plumes. The area weighted analysis for Group 1 improved in FY 2010. Overall, therefore, the limited FY 2010 monitoring data indicates that aquifer restoration is occurring in the Prairie du Chien and Jordan.

Overall, the data meet the statistical criteria developed in this document for assessing the remedial progress in the OU1 aquifers. There are no additional actions needed to address the individual threshold triggers identified. The data show continuing improvement in the OU1 plume through FY 2010. The statistical behavior of the OU3 plume is addressed in Section 11.0.

How much VOC mass has been removed (at each well and total)?
Table 3-1 shows that the NBCGRS removed 573 pounds of VOCs during FY 2010. The total cumulative VOCs removed by the NBCGRS is 21,517 pounds. The relative contribution from each extraction well is also shown on Table 3-1.

Figure 3-3 shows the annual VOC mass removed (listed at the top of the graph), annual pumping volumes, and the trend in annual mass removal per unit volume pumped since FY 1997 (when NBM #14 was brought online). The mass removal in FY 2010 slightly decreased compared to FY 2009. The trend in annual mass removal per unit volume pumped increased slightly in FY 2008 from FY 2007 and then decreases slightly from FY 2008 to FY 2009 and then again from FY 2009 to FY 2010. The mass removal has been on a general decreasing trend since FY 1998, when the last extraction well was brought online (NBM #15). This overall decline in the mass removal trend agrees with the trichloroethene trends in OU1 deep groundwater, which generally show a decreasing trend, and suggests that aquifer restoration is progressing.

Are any changes or additional actions required for this remedy component? No.

Table 3-1

OU1 Pumping / VOC Mass Removal Data

Fiscal Year 2010

	WELL #3			WELL #4			WELL #5			WELL #6			WELL #14			WELL #15			System Totals	
MONTH	VOC (µg/l)	WATER TREATED (mgallons)	VOC Mass Removed (lbs)	VOC (µg/l)	WATER TREATED (mgallons)	VOC Mass Removed (lbs)	VOC (µg/l)	WATER TREATED (mgallons)	VOC Mass Removed (lbs)	VOC (µg/l)	WATER TREATED (mgallons)	VOC Mass Removed (lbs)	VOC (µg/l)	WATER TREATED (mgallons)	VOC Mass Removed (lbs)	VOC (µg/l)	WATER TREATED (mgallons)	VOC Mass Removed (lbs)	TOTAL WATER TREATED BY EXTRACTION SYSTEM (mgallons)	TOTAL VOC'S REMOVED BY EXTRACTION SYSTEM (lbs)
TOTAL GALLONS PUMPED AND VOC'S REMOVED THROUGH SEPTEMBER 30, 2009																			21,341	20,944
OCTOBER	75	30.365	19.007	72	0.147	0.088	100	12.927	10.789	66	2.378	1.310	3	0.207	0.004	28	40.444	9.451	86	40.653
NOVEMBER	83	34.346	23.792	80	1.887	1.260	100	27.838	23.234	65	0.645	0.350	2	0.306	0.006	25	38.638	8.062	104	56.707
DECEMBER	75	15.693	9.823	75	16.682	10.442	94	18.428	14.457	59	15.512	7.638	2	0.309	0.005	23	39.805	7.641	106	50.011
JANUARY	80	23.715	15.834	68	18.301	10.386	94	15.706	12.322	72	15.709	9.440	2	0.148	0.003	21	39.562	6.934	113	54.922
FEBRUARY	71	18.174	10.769	59	16.008	7.883	91	21.634	16.431	56	2.399	1.121	2	0.516	0.010	19	38.278	6.070	97	42.287
MARCH	85	15.764	11.183	0	0.000	0.000	96	16.958	13.587	0	0.002	0.000	3	3.131	0.071	30	38.480	9.635	74	34.478
APRIL	79	18.069	11.914	0	0.035	0.000	78	23.191	15.097	0	0.002	0.000	0	0.197	0.000	24	38.831	7.778	80	34.791
MAY	100	5.509	4.598	86	3.751	2.692	82	17.014	11.644	0	0.027	0.000	3	0.143	0.004	27	42.663	9.614	69	28.554
JUNE	86	30.936	22.204	81	11.254	7.608	84	23.669	16.593	0	5.035	0.000	3	7.696	0.199	29	39.559	9.575	118	56.184
JULY	77	34.212	21.986	81	6.683	4.518	110	7.621	6.997	60	40.593	20.327	3	0.141	0.004	29	39.737	9.618	129	63.454
AUGUST	81	34.310	23.194	79	9.278	6.117	110	9.206	8.452	61	35.751	18.201	3	0.273	0.007	26	40.156	8.714	129	64.690
SEPTEMBER	66	22.429	12.355	63	1.140	0.599	93	32.345	25.105	56	1.661	0.776	3	0.213	0.005	22	38.116	6.999	96	45.843
Subtotal			186.660			51.594			174.707			59.164			0.318			100.089		
% of Total Mass			32.6			9.0			30.5			10.3			0.1			17.5		
TOTAL GALLONS TREATED AND VOC'S REMOVED FOR FISCAL YEAR 2010																			1,202	573
TOTAL GALLONS TREATED AND VOC'S REMOVED SINCE SYSTEM START UP																			22,543	21,517

Table 3-2

OU1, PGAC Effluent Water Quality
Fiscal Year 2010

	Influent Well Monitoring						Operational Performance Monitoring															
Sampling Date	Well #3	Well #4	Well #5	Well #6	Well #14	Well #15	Contactor #1		Contactor #2		Contactor #3		Contactor #4		Contactor #5		Contactor #6		Contactor #7		Contactor #8	
							A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
GAC replaced in contactors 1A, 2A, 3A, 4A, 5A, 6A, 7A, 8A October 5-November 3, 2009. "B" Vessels become the Lead Vessels.																						
5-Oct-09	75	72	100	66	3	28	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
4-Nov-09	83	80	100	65	2	25	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
GAC Contactor #3 not in operation at time of December sampling event, therefore not sampled in December.																						
2-Dec-09	75	75	94	59	2	23	NS	0	NS	0	NS	NS	NS	0	NS	0	NS	0	NS	0	NS	0
5-Jan-10	80	68	94	72	2	21	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
1-Feb-10	71	59	91	56	2	19	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
Well #4 and #6 pulled out for maintenance on February 22, 2010 and were not in operation at time of March sampling event, therefore not sampled in March.																						
1-Mar-10	85	NS	96	NS	3	30	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
Well #4, #6, and #14 not in operation at time of April sampling event, therefore not sampled in April.																						
5-Apr-10	79	NS	78	NS	NS	24	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0
GAC replaced in contactors 1B, 2B, 3B, 4B, 5B, 6B, 7B, 8B April 6-May 27, 2010. "A" Vessels become the Lead Vessels.																						
Well #6 not in operation at time of May or June sampling event, therefore not sampled in May or June.																						
26-May-10	100	86	82	NS	3	27	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS
7-Jun-10	86	81	84	NS	3	29	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS
12-Jul-10	77	81	110	60	3	29	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS
3-Aug-10	81	79	110	61	3	26	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS
1-Sep-10	66	63	93	56	3	22	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS	0	NS

Notes:

1) All water quality results shown are for Total VOCs (µg/l).

2) NS = Not Sampled.

Table 3-3

Summary of OU1 Monitoring Requirements
Fiscal Year 2010

Remedy Component	Monitoring Requirements	Implementing Party	Documents Containing the Monitoring Plan
#1: Alternate Water Supply/Well Abandonment	a. Water quality data for the perimeter of the plume to define the area of concern	Army	OU1 Groundwater Monitoring Plan in the Annual Report
	b. Water quality data for water supply wells to determine eligibility for alternate supply/abandonment	Army	Well Inventory Report
#2: Drilling Advisories	a. Verification that drilling advisories are in place and functioning as intended	Army/MDH	N/A
#3: Extract Groundwater	a. Pumping volume and rates for each extraction well for comparison to target flowrates	New Brighton	New Brighton Water System Sampling and Analysis Plan
	b. Water levels from monitoring wells to draw contour maps showing the influences of pumping	Army	OU1 Groundwater Monitoring Plan in the Annual Report
	c. Water quality, to assist in evaluation of statistical improvements in groundwater quality.	Army	OU1 Groundwater Monitoring Plan in the Annual Report
#4: Removal of VOCs	a. Effluent water quality to demonstrate compliance with the Safe Drinking Water Act	New Brighton	New Brighton Water System Sampling and Analysis Plan
#5: Discharge of Treated Water	a. Verification of discharge	New Brighton	N/A
#6: Groundwater Monitoring with Verification of Continuing Aquifer Restoration	a. Water quality, to assist in evaluation of statistical improvements in groundwater quality.	Army	OU1 Groundwater Monitoring Plan in the Annual Report
	b. Water quality data throughout the North Plume to evaluate remedial progress	Army	OU1 Groundwater Monitoring Plan in the Annual Report

Table 3-4
OU1 Groundwater Quality Data

Fiscal Year 2010

			Trichloro-ethene (µg/l)	1,1-Dichloro-ethene (µg/l)	cis-1,2-Dichloro-ethene (µg/l)	1,1,1-Trichloro-ethane (µg/l)	1,1,2-Trichloro-ethane (µg/l)	1,1-Dichloro-ethane (µg/l)
OU1 Cleanup Level (1)			5	6	70	200	3	70
04U871		6/9/10	**21**	1.7	JP 0.26	1.1	<1	3.1
04U871	D	6/9/10	**22**	1.7	JP 0.28	1.2	<1	3.3
04U872		6/8/10	**5.2**	JP 0.45	<1	JP 0.27	<1	JP 0.55
04U877		6/8/10	JP 0.47	<1	<1	<1	<1	<1
04J822		6/9/10	**55**	**10**	1.6	11	<1	6.5
04J847		6/10/10	**770**	**47**	6.6	35	<2	36
04J849		6/8/10	<1	<1	<1	<1	<1	<1

Notes:

(1) Cleanup levels for OU1 deep groundwater are from page 18 of the OU1 ROD. Bolding (in red color) indicates exceedance of the cleanup level.

D Duplicate sample.

JP The value is below the reporting level, but above the method detection limit. Results should be considered estimated.

Table 3-5
Group 1, 2, 3, 5, and 6 Mann-Kendall Summary and MAROS Conclusion

Group	Kendall S	N	Raw Trend	Confidence	COV	Raw Trend Decision	MAROS Conclusion	Threshold Triggered?	Comments
Group 2	--	--	--	--	--	--	--	--	Not sampled in FY 2010
Group 3	--	--	--	--	--	--	--	--	Not sampled in FY 2010
Group 5	--	--	--	--	--	--	--	--	Not sampled in FY 2010
Group 1 NP	-9	6	Decreasing	93.00%	0.2377	Probable	**Decreasing**	no	Changed to decreasing in FY10
Group 1 SP	-9	6	Decreasing	93.00%	0.1217	Probable	**Decreasing**	no	Changed to decreasing in FY10

Notes:
S or NT = Stable or No Trend
N = Number of data points
COV = Coefficient of Variance

MAROS Decision Matrix

M-K S	Confidence	COV	Trend
S > 0	> 95%	na	Increasing
S > 0	90-95%	na	Pr. Incr.
S > 0	< 90%	na	No Trend
S</= 0	< 90%	>/= 1	No Trend
S </= 0	< 90%	< 1	Stable
S < 0	90-95%	na	Pr. Decr.
S < 0	>95%	na	Decreasing

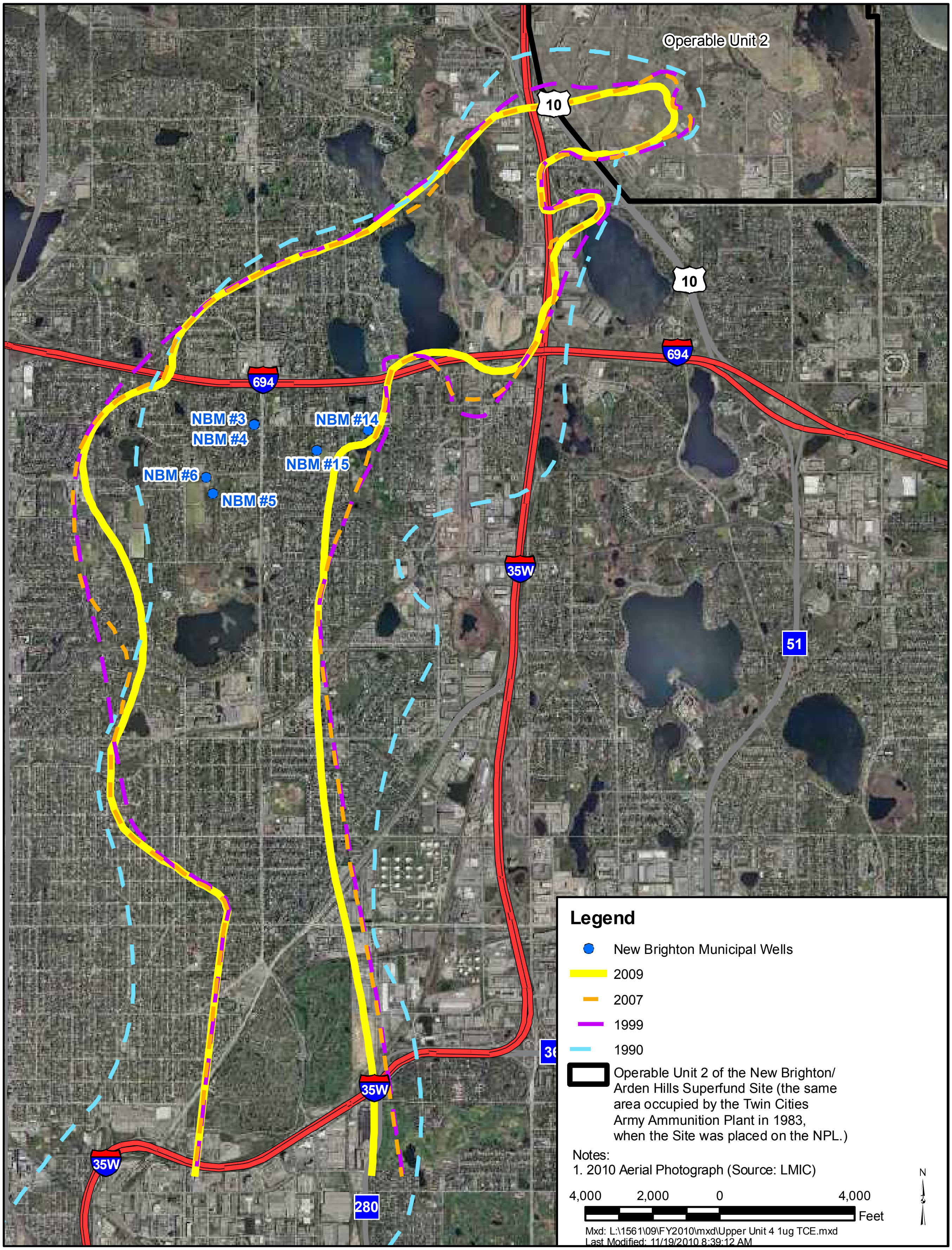
Table 3-5
Group 1, 2, 3, 5, and 6 Mann Kendall Summary and MAROS Conclusion

Group	Kendall S	N	Raw Trend	Confidence	COV	Raw Trend Decision	MAROS Conclusion	Threshold Triggered?	Comments
Group 6 OU1 Jordan Wells:									
04J822	-15	6	Decreasing	99.00%	0.1940	Definite	**Decreasing**	No	Improved from increasing in FY 2007 to decreasing
04J847	-3	6	Decreasing	64.00%	0.1137	S or NT	**Stable**	Yes	Down from 1100 µg/l in 2004, see extended trend below
04J849	-3	6	Decreasing	64.00%	1.5543	S or NT	**No Trend**	Yes	All detections below 0.5 µg/l, 4 of 6 ND
04J847 (ext.)	-29	45	Decreasing	99.00%	0.1345	Definite	**Decreasing**	no	Extended trend for all ten data sets since FY 2004

Notes:
S or NT = Stable or No Trend
N = Number of data points
COV = Coefficient of Variance

MAROS Decision Matrix

M-K S	Confidence	COV	Trend
S > 0	> 95%	na	Increasing
S > 0	90-95%	na	Pr. Incr.
S > 0	< 90%	na	No Trend
S</= 0	< 90%	>/= 1	No Trend
S </= 0	< 90%	< 1	Stable
S < 0	90-95%	na	Pr. Decr.
S < 0	>95%	na	Decreasing



ANNUAL PERFORMANCE REPORT

Upper Unit 4,
1 µg/l Trichloroethene Isoconcentration Map

Wenck

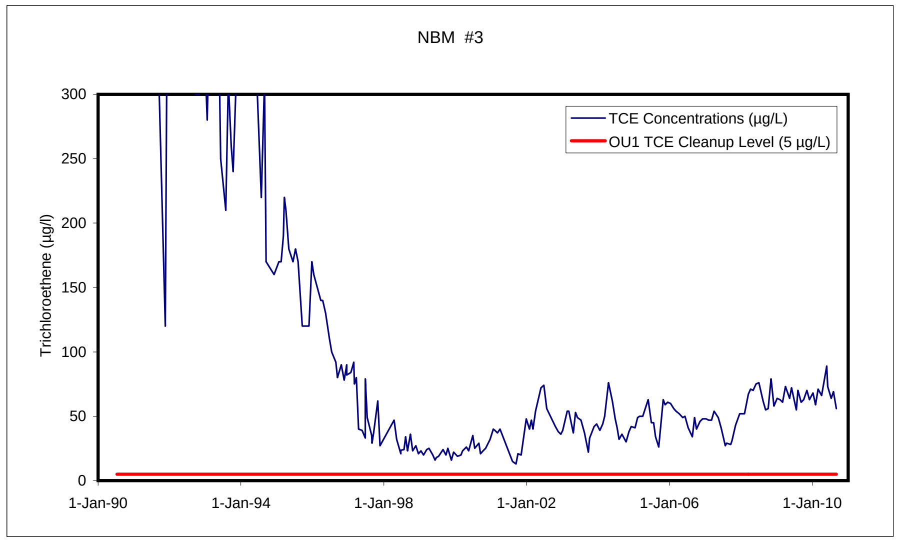
Wenck Associates, Inc.
Environmental Engineers

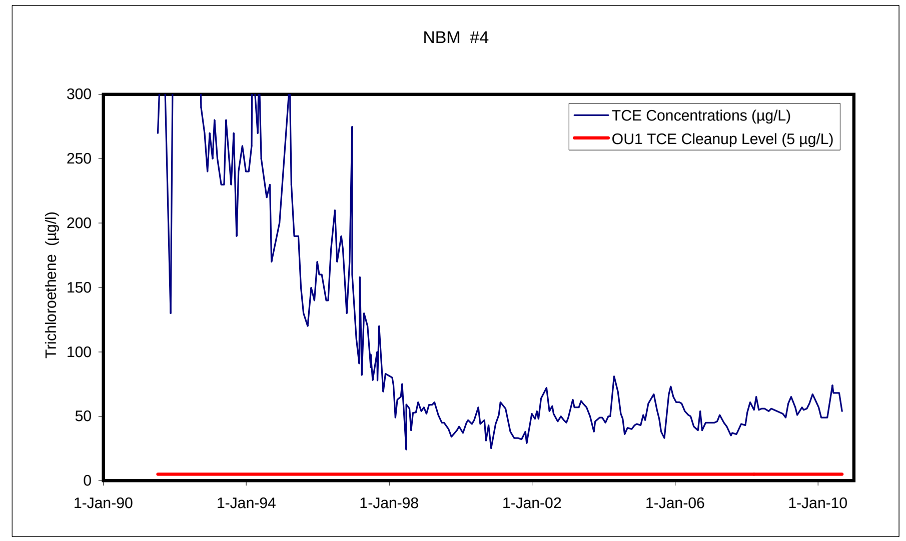
1800 Pioneer Creek Center
Maple Plain, MN 55359-0429

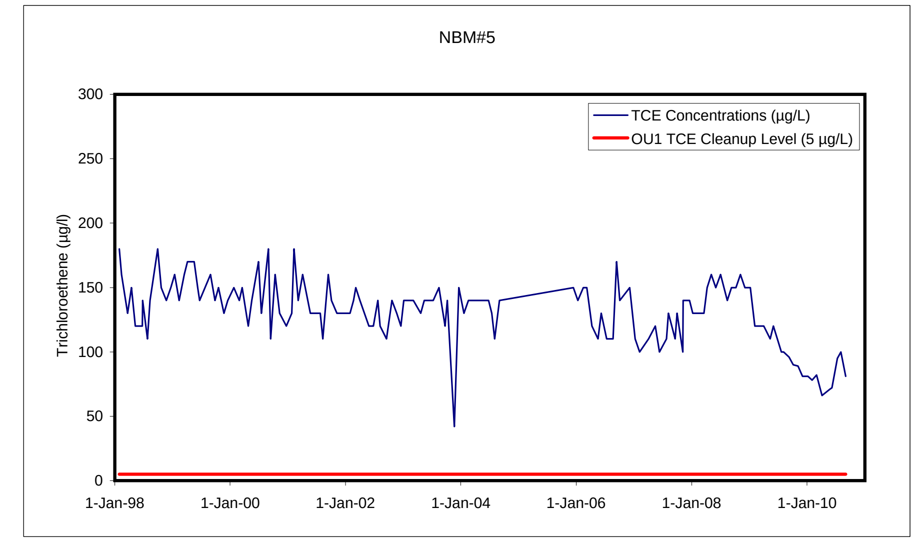
FY 2010

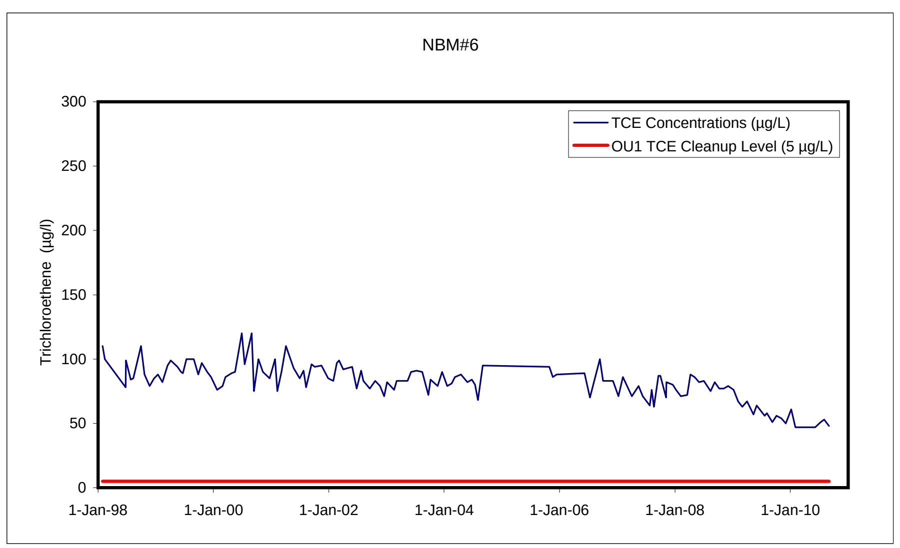
Figure 3-1

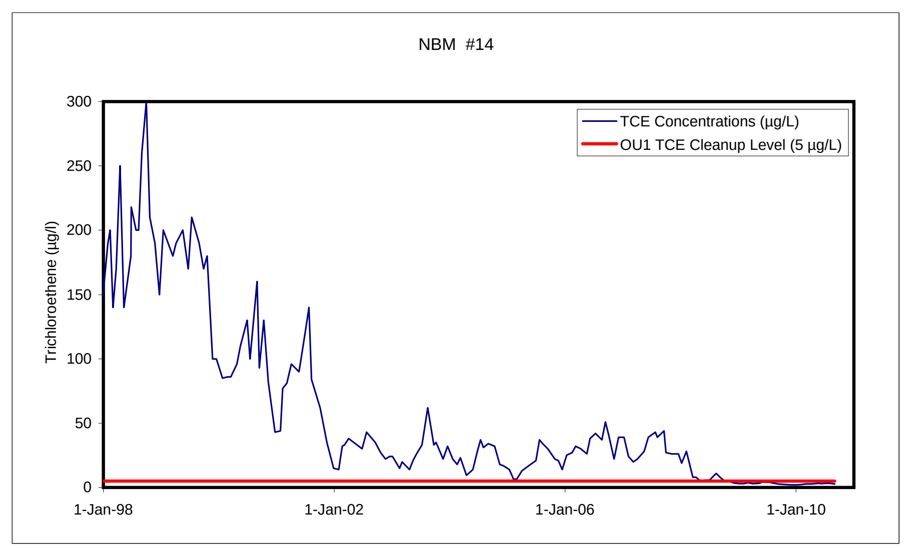
FIGURE 3-2
NEW BRIGHTON MUNICIPAL WELLS: TRICHLOROETHENE WATER QUALITY TRENDS
Annual Performance Report











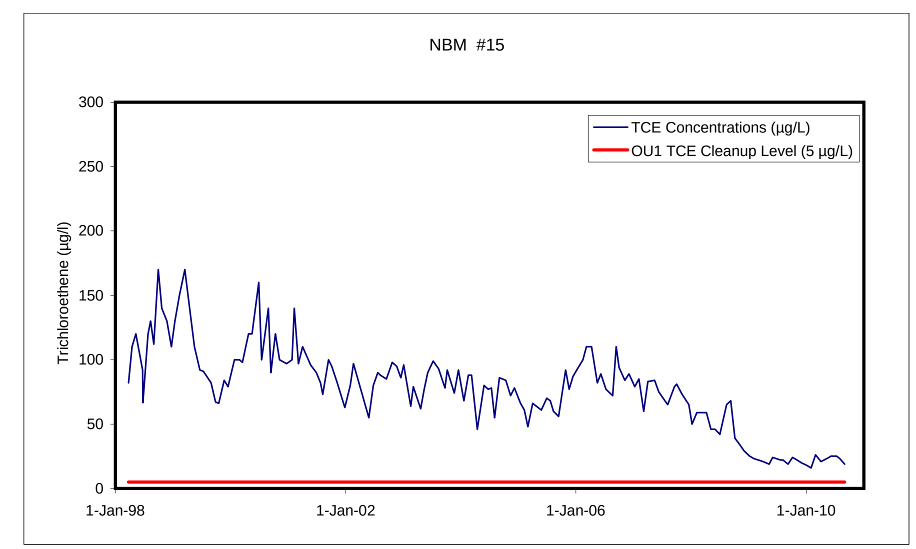
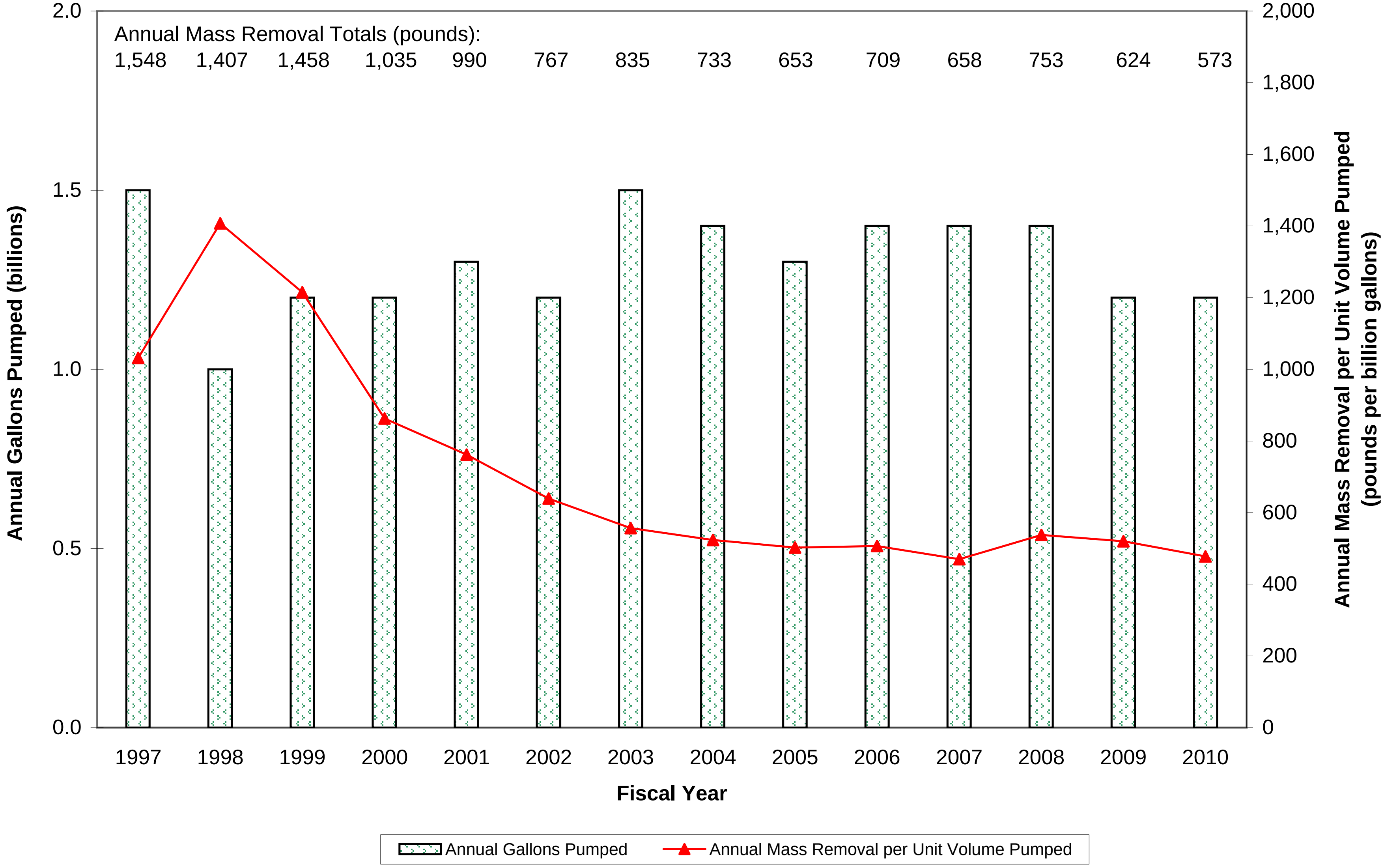


FIGURE 3-3
OU1, NBCGRS MASS REMOVAL HISTORY
Annual Performance Report



4.0 Operable Unit 2: Shallow Soil and Dump Sites

The reference for the OU2 ROD is:

Twin Cities Army Ammunition Plant
New Brighton/Arden Hills Superfund Site
Operable Unit 2
RECORD OF DECISION
1997
Amendment #1: 2007
Amendment #2 and #3: 2009
ESD #1 and #2: 2009

Sections 4.0 through 10.0 of this report address the various media and requirements prescribed by the OU2 ROD and/or subsequent Amendments and ESDs. This section, 4.0, specifically addresses the shallow soil and dump sites.

Through the OU2 Remedial Investigation/Feasibility Study (RI/FS) process, Sites A, C, E, H, 129-3, and 129-5 were found to have inorganic and/or organic contaminants above the cleanup goals specified in Table 1 of the OU2 ROD. Unpermitted landfills, or dumps, were identified within Sites A, B, E, H, and 129-15. The OU2 ROD (page 2) describes nine remedy components to address the shallow soil and dump sites.

The requirements for Site C-2 soil and sediment were later modified through ROD Amendment #1 (note: Site C groundwater and surface water is addressed separately in Section 7.0). Because the depth to groundwater is shallow at Site C-2, it was not feasible to remove all of the contaminated soil and sediment. The Amendment modified remedy component #2 related to excavation of soil, to allow the placement of a 4-foot thick soil cover over areas where contamination remains in-place above the cleanup levels. ROD Amendment #1 also specified an additional remedy component for Site C-2, namely land use controls.

OU2 ROD Amendment #2 addressed shallow groundwater at Site I, which is discussed in Section 8.0.

OU2 ROD Amendment #3 affected the shallow soil and dump sites in four principal ways:

- The Amendment documented as final remedies the additional actions performed for shallow soil at Site D and the dump at Site G, after completion of the deep soil requirements set forth for these two sites in the OU2 ROD (see Section 5.0 of this report for discussion of the deep soil).
- The Amendment documented the use of soil covers as part of the final remedy at Sites E, G, H, and 129-15.
- The Amendment documented final remedies for five sites with soil contamination that were not originally included in the OU2 ROD: Grenade Range, Outdoor Firing Range, 135 Primer/Tracer Area Stormwater Ditch, Trap Range, and Water Tower Area. At these sites, either previous removal actions had been completed that reduced soil contamination to below cleanup levels, or investigations had determined that no action or no further action was needed. The work performed at these sites was similar in nature to the soil remediation requirements set forth in the OU2 ROD, and so through the Amendment, these sites were in essence folded into the OU2 ROD.
- The Amendment specified land use controls as an additional remedy component for shallow soil and dump Sites D, E, G, H, 129-15, Grenade Range, and Outdoor Firing Range. Land use controls are not needed for the 135 Primer/Tracer Area Stormwater Ditch, Trap Range, or Water Tower Area because contamination levels are suitable for unlimited use or unrestricted exposure.

ESD #1 is discussed in Section 6.0 (Site A shallow groundwater), Section 9.0 (Site K shallow groundwater), and Section 10.0 (OU2 deep groundwater).

ESD #2 specified land use controls as an additional remedy component for Sites A, C-1, 129-3, and 129-5. ESD #2 also documented that no further action is required at Site B, and it is available for unrestricted use.

4.1 REMEDY COMPONENTS #1 THROUGH #9: SOIL REMEDIATION

The nine remedy components specified in the OU2 ROD (page 2) have been completed for the shallow soils and dumps at Sites A, C, D, E, G, H, 129-3, 129-5, 129-15, Grenade Range, Outdoor Firing Range, 135 Primer/Tracer Area Stormwater Ditch, and Water Tower Area. Remedy Components #1 through #8 addressed the characterization, excavation, sorting, treatment, disposal, site restoration, site access restrictions (during remedial actions), and limited period of post-remediation groundwater monitoring. Remedy Component #9 addressed the characterization of dumps at Sites B and 129-15. The characterization work at both sites led to a determination that no further action was required at Site B and construction of a cover at Site 129-15, which were documented through ESD #2 and OU2 ROD Amendment #3, respectively.

4.2 REMEDY COMPONENT #10: LAND USE CONTROLS

Description: OU2 ROD Amendments and ESDs made land use controls a part of the remedy for shallow soil and dump sites where contamination remains in-place above levels that allow for unlimited use and unrestricted exposure. Land use controls are also necessary to protect the integrity of the soil covers constructed at various sites.

Performance Standard (how do you know when you're done):
Initial implementation will be done when the USEPA and MPCA have provided consistency approval for an OU2 Land Use Control Remedial Design (LUCRD) document. Implementation

will continue indefinitely unless further action is taken that would allow for unlimited use and unrestricted exposure.

Has a LUCRD document been approved to address land use control (LUC) issues for OU2, and is it being implemented?

Yes. The USEPA and MPCA provided consistency approval for the OU2 LUCRD in September 2010 and it is being implemented by the Army.

Was an annual site inspection for land use controls conducted in FY 2010?

Yes. On July 14, 2010, the Army, National Guard, and Wenck conducted the annual inspection of OU2 sites. The checklist that was completed during the inspection is included as Appendix I.

Did the inspection identify any follow-up actions needed to maintain the protectiveness of the LUCs?

No.

5.0 Operable Unit 2: Deep Soil Sites

For purposes of the OU2 ROD, Sites D and G were considered deep soil sites because VOC contamination extended to depths between 50 and 170 feet. Some additional shallow soil contaminants were also present at Site D, and Site G also contains a dump. The OU2 ROD (pages 2-3) describes seven remedy components to be implemented for these two sites:

- Remedy Component #1: Groundwater Monitoring
- Remedy Component #2: Restrict Site Access (During Remedial Actions)
- Remedy Component #3: SVE Systems
- Remedy Component #4: Enhancements to the SVE Systems
- Remedy Component #5: Maintain Existing Site Caps
- Remedy Component #6: Maintain Surface Drainage Controls
- Remedy Component #7: Characterize Shallow Soils and Dump

For Remedy Component #1, ongoing groundwater monitoring in the vicinity of these two sites is completed as part of OU2 deep groundwater monitoring (Section 10.0) and is not discussed separately in this section.

Remedy Components #2 to #6 were related to continued operation of the SVE systems (that had been installed in 1986), along with modifications to the systems to enhance performance. The caps were in-place primarily to minimize short-circuiting of air flow, and also to minimize infiltration. Studies conducted after the 1997 ROD showed that enhancements to the SVE systems were not necessary, and in fact, the soil VOC concentrations had achieved the soil VOC cleanup levels. The systems were turned off in 1998 and were subsequently removed, hence completing Remedy Components #2 to #6 related to deep soil.

Regarding Remedy Component #7, additional shallow soil investigation work (for non-VOC contaminants) was completed at Site D, and characterization work of the dump was completed at Site G. Thus, this remedy component has been completed. The investigation/characterization work at both sites led to removal of shallow soils at Site D and construction of a cover at Site G, which were documented through OU2 ROD Amendment #3.

In summary, the deep soil requirements of the OU2 ROD have been completed. There are ongoing land use control requirements for the shallow soil at Site D and dump at Site G that are addressed in Section 4.0.

6.0 Operable Unit 2: Site A Shallow Groundwater

Shallow groundwater at Site A has been impacted by VOCs and antimony. The selected remedy in the OU2 ROD incorporates the use of a groundwater extraction system, which began operation May 31, 1994. When operating, this system discharged the extracted groundwater to the sanitary sewer for treatment at a Publicly-Owned Treatment Works (POTW). However, as further discussed below, the groundwater system was shut off (with regulatory approval) on September 24, 2008, while implementation of Monitored Natural Attenuation (MNA) is evaluated as a potential remedy component in lieu of groundwater extraction and discharge. The groundwater system has not been removed and will be kept in place in the event that MNA does not adequately control plume migration and one or more extraction wells need to be restarted. The ROD prescribes five major components of the remedy, and until a decision is made to formally change the remedy, the original components of the ROD will be retained in this section (with discussion that is appropriate to the ongoing evaluation period for MNA).

The original 8-well groundwater extraction system that was selected in the OU2 ROD began operation May 31, 1994. On July 11, 2000, with regulatory approval, EW-5 through 8 (the "second line" of extraction wells) were shut down due to their VOC concentrations having declined below cleanup levels. In July 2008, the USEPA and MPCA approved the "Site A Shallow Groundwater: 10-Year Evaluation Report." The 10-Year Report was prepared to fulfill a requirement of the ROD, which states that for shallow groundwater contamination at Site A, "should aquifer restoration not be attained within the ten-year lifespan of the remedy, additional remedial measures will be addressed". Since the 10-year mark had been reached and contamination was still present above the cleanup levels, the 10-Year Report was prepared to discuss the status of the site and to evaluate any potential changes to the remedy that would be beneficial. MNA (through abiotic degradation) was the recommended alternative for Site A that was approved by the USEPA and MPCA.

In September 2008, the USEPA and MPCA approved the "Site A Shallow Groundwater: Monitoring and Contingency Plan," and EW-1 through 4 (the "first line" of extraction wells) were then shut off on September 24, 2008. The Monitoring and Contingency Plan presented the monitoring plan to be implemented at the point that the extraction wells were shut off, and presented the contingency actions that will be taken by the Army if groundwater monitoring indicates that any of the identified trigger points are exceeded. These monitoring and contingency actions were incorporated into the APR and any changes to monitoring and contingency actions must be approved by the USEPA and MPCA through revisions to the APR.

The decision to proceed with MNA was based in part on the MPCA and USEPA natural attenuation study at this site (2000), and also on follow-up MPCA/USEPA microcosm studies that have verified that abiotic degradation of VOCs in Site A groundwater is occurring at substantial rates. Such degradation acts to reduce contaminant mass and mobility by breaking down the contaminants as they move downgradient. The decision to proceed with MNA was also based on the absence of any likely receptors. The closest potential groundwater receptor is located approximately 1,000 feet downgradient from 01U352 (EW-2), and this domestic well has not been operable for many years (and even when it was, the water was only used for irrigation purposes). Beyond this unlikely receptor, there are no other existing downgradient receptors between it and Rice Creek, which is approximately 1,800 feet away.

If, after the initial trial period of extraction system shutdown, MNA is proven to be an acceptable long-term remedy for Site A shallow groundwater, the remedy will be formally changed. This change would presumably require an Explanation of Significant Difference (ESD), at a minimum, or possibly a ROD amendment. The length of the trial period is anticipated to be three to five years; however, review of future water quality data in future APRs will ultimately determine when the USEPA, MPCA, and Army are comfortable that the extraction system can be dismantled and the remedy can be formally changed to MNA.

6.1 REMEDY COMPONENT #1: GROUNDWATER MONITORING

Description: "Groundwater monitoring to track plume migration and remedy performance." (OU2 ROD, page 3)

Performance Standard (how do you know when you're done):
When a performance groundwater monitoring program has been established and ongoing monitoring is in compliance with the program.

Is this remedy component being implemented?
Yes. Table 6-1 summarizes the performance monitoring requirements, the implementing parties, and the documents that contain the monitoring plans. The FY 2010 Monitoring Plan is included in Appendix A, and the FY 2010 water quality monitoring locations and frequencies are also summarized on Figure 6-1. Figure 6-2 presents groundwater elevation contours based on measurements in June 2010. The inferred groundwater flow direction confirms that the monitoring plan specifies the appropriate locations to track plume migration, though changes in sampling frequencies at some of the locations are proposed, beginning in FY 2012 (see discussion in Section 6.7).

Were the groundwater monitoring requirements for this remedy met? Yes.

Is any groundwater sampling proposed prior to the next report? Yes.

- Groundwater sampling of water supply wells related to alternate water supply and well abandonment will be in accordance with recommendations in Appendix E. The next "major" event will be in FY 2013.
- Other groundwater monitoring at Site A will be in accordance with the monitoring plan shown in Appendix A.1.

Are any changes or additional actions required for this remedy component? Yes. Monitoring locations are to remain unchanged; however, changes in sampling frequencies at some of the locations are proposed to begin in FY 2012 (see discussion in Section 6.7).

6.2 REMEDY COMPONENT #2: GROUNDWATER CONTAINMENT AND MASS REMOVAL

Description: "Use of existing gradient control wells to contain the contaminant plume and remove mass." (OU2 ROD, page 3)

Is this remedy component being implemented?
No. As discussed previously, since the groundwater extraction system is currently shut off for evaluation of MNA, this remedy component is not currently being implemented.

6.3 REMEDY COMPONENT #3A: LAND USE CONTROLS

Description: The OU2 ROD (page 3) listed the following: "Institutional controls to restrict new well installations and provide alternate water supplies and well abandonment as necessary." For ease of discussion, the requirement has been broken into two pieces, with this section focusing on the land use controls. OU2 ESD #1 clarified the land use control component to include protection of the groundwater monitoring and extraction system infrastructure.

Performance Standard (how do you know when you're done):
For initial implementation, when the MDH has issued a Special Well Construction Area Advisory, and when the USEPA and MPCA have provided consistency approval for an OU2 Land Use Control Remedial Design (LUCRD) document. Implementation will continue until such time that the groundwater concentrations are below the cleanup levels.

Has the MDH issued a Special Well Construction Area Advisory for the area impacted by Site A?

Yes, it was issued in June 1996 and revised in December 1999; however, this revision did not affect the boundary for the Site A vicinity.

Has a LUCRD document been approved to address land use control (LUC) issues for OU2, including Site A groundwater, and is it being implemented?

Yes. The USEPA and MPCA provided consistency approval for the OU2 LUCRD in September 2010 and it is being implemented by the Army.

Was an annual site inspection for land use controls conducted in FY 2010?

Yes. On July 14, 2010, the Army, National Guard, and Wenck conducted the annual inspection of OU2 sites. The checklist that was completed during the inspection is included as Appendix I.

Did the inspection identify any follow-up actions needed to maintain the protectiveness of the LUCs?

No.

6.4 REMEDY COMPONENT #3B: ALTERNATE WATER SUPPLY/WELL ABANDONMENT

Description: The OU2 ROD (page 3) listed the following: "Institutional controls to restrict new well installations and provide alternate water supplies and well abandonment as necessary." For ease of discussion, the requirement has been broken into two pieces, with this section focusing on the alternate water supplies and well abandonment.

Performance Standard (how do you know when you're done):

When well owners who qualify have been offered and provided with alternate water supply and/or have had their wells abandoned (or the offers have been rejected).

Is the remedy component being implemented?

Yes. The OU1 Alternate Water Supply and Well Abandonment Program is underway and was expanded to cover the area affected by the OU2 Site A shallow groundwater plume. See Section 3.1 of this report for more information on this program.

Did the boundary of the Site A plume get any bigger during FY 2010, as defined by the 1 μg/L contour?

Yes. Table 6-2 presents the FY 2010 groundwater quality data for Site A. Using this data, Figure 6-3 shows the tetrachloroethene concentrations and Figure 6-4 shows the cis-1,2-dichloroethene concentrations. The latter is a degradation product of the former, and represents the larger areal footprint. The footprint did increase in size from the previous year. However, the increase was small and was limited to the southern edges of the plume, with these areas being located on Army-controlled property.

Were any additional water supply wells discovered within the area of concern for the Site A plume that are completed within the aquifer of concern? No.

Were any water supply wells within the Site A plume sampled during FY 2010? If yes, what were the findings? No wells were sampled.

Were any well owners offered an alternate supply and/or well abandonment in FY 2010? No.

Within the Site A plume, are there any well owners that meet the criteria, but have not yet been provided an alternate water supply? No.

Within the Site A plume, are there any wells that meet the criteria, but have not yet been abandoned? No.

Is any sampling of water supply wells proposed prior to the next report? No.

Are any changes or additional actions required for this remedy component? No.

6.5 REMEDY COMPONENT #4: DISCHARGE OF EXTRACTED WATER

Description: "Discharge of extracted groundwater to a publicly-owned treatment works (POTW)." (OU2 ROD, page 3)

Is this remedy component being implemented?
No. As discussed previously, since the groundwater extraction system is currently shut off for evaluation of MNA, this remedy component is not currently being implemented.

6.6 REMEDY COMPONENT #5: SOURCE CHARACTERIZATION/ REMEDIATION

Description: "Source characterization/remediation." (OU2 ROD, page 3)

Performance Standard (how do you know when you're done):
For characterization, when the investigation has answered the questions needed to prepare remedial design documents. For remediation, when the contaminant concentrations in soil are below the cleanup levels specified in Table 1 of the OU2 ROD.

Is this remedy component being implemented?

Yes. Characterization work has been completed. Stone & Webster performed investigation work in 1997 and the final "Site A Investigation Report" was issued December 12, 1997. The report delineated the extent of both VOC-contaminated and metal-contaminated soils requiring remediation. The source of VOC-contaminated soils was found to be the "1945 Trench".

Remediation has been completed. Shaw completed removal of metal-contaminated soils in FY 1999. Construction of an air sparging/soil vapor extraction (AS/SVE) system to remediate VOC-contaminated soils was completed by Stone & Webster in FY 2000, which began operation in early FY 2001. The AS system was shut off permanently in June 2001 due to a lack of increase in SVE VOC levels and due to concern regarding potential plume spreading. The AS system was being implemented voluntarily by the Army and was not a requirement of the OU2 ROD. Soil samples were collected within the source area in July 2002 (and previously in August 2001). In both events, the results showed minimal reduction in soil VOC concentrations. Since it appeared that many years of SVE system operation would be required before soil cleanup levels would be reached (if ever), the Army ceased SVE system operation on August 21, 2002, and submitted a work plan clarification to the USEPA and MPCA for excavation of the VOC-contaminated soils in the source area. The work plan clarification received regulatory approval in early FY 2003, and 688 cubic yards of contaminated soil were excavated by Shaw and transported off-site to a permitted disposal facility (see Figure 6-3 and 6-4 for the location of soil excavation area at the former 1945 Trench). The Site A Former 1945 Trench Closeout Report (prepared by Shaw) received regulatory consistency in FY 2004.

Are any changes or additional actions required for this remedy component? Yes. For existing monitoring wells/piezometers, changes in sampling frequencies at some of the locations are proposed to begin in FY 2012 (see discussion in Section 6.7). Also, at the time of this report, MPCA indicated that an additional monitoring well may be needed to the south/west of 01U158, where cis-1,2-dichloroethene concentrations have increased above the action level (see also Section 6.7). Discussions were underway between the Army and the MPCA when this report was finalized, and depending on the outcome of the discussions, an additional monitoring well may be installed and added to the monitoring plan at an agreed-upon monitoring frequency (with installation and monitoring subject to MPCA and USEPA approval).

6.7 OVERALL REMEDY FOR SITE A SHALLOW GROUNDWATER

Performance Standard (how do you know when you're done):
When the cleanup levels in Table 1 of the OU2 ROD have been attained throughout the areal and vertical extent of the Site A plume (OU2 ROD, page 54).

Has the Site A shallow groundwater remedy been completed (i.e., have the cleanup levels in Table 1 of the OU2 ROD been attained throughout the areal and vertical extent of the Site A plume)?
No. Table 6-2 presents the FY 2010 groundwater quality data and highlights the values that exceed a cleanup level. FY 2010 was the second year of data for evaluation of MNA performance. Tetrachloroethene exceeds the cleanup level of 7 µg/L in only two wells near the source area: 01U126 (22 and 13 µg/L) and 01U350 (7.5 µg/L). The only other wells with exceedances of cleanup levels are 01U353 (EW-3), where cis-1,2-dichloroethene declined from 950 µg/L in December 2009 to 290 µg/L in September 2010 (versus the cleanup level of 70 µg/L), and 01U158 (located downgradient from EW-3), where cis-1,2-dichloroethene ranged from 67 to 170 µg/L. Benzene in EW-3 exceeded the cleanup level of 10 µg/L in December 2009, but was below the cleanup level in the other three quarterly sampling events.

What impact is MNA having on contaminant concentrations?
As evident in Table 6-2, and on Figure 6-3 and 6-4, tetrachloroethene and trichloroethene continue to be degraded to cis-1,2-dichloroethene via natural attenuation. This degradation occurs within the distance between the source area and the first line of extraction wells. Figure 6-5 shows the cis-1,2-dichloroethene concentrations plotted on geologic cross sections for Site A to illustrate the vertical extent of contamination (the cross section locations are illustrated on Figure 6-4).

After the extraction system was shut off, the axis of the highest cis-1,2-dichloroethene concentrations shifted to the south during FY 2009, as evidenced by the concentration trends in the extraction wells (Figure 6-6). In June 2008, just prior to shutting the extraction system off, the cis-1,2-dichloroethene concentration in EW-2 was much higher than in EW-3 (350 versus 4.3 µg/L), with EW-1 and EW-4 both less than 3 µg/L. In December 2008, about three months after the extraction system was shut off, the cis-1,2-dichloroethene concentration in EW-2 dropped down to 16 µg/L and has remained near this level. Conversely, EW-3 remained at a relatively low concentration in December 2008 and March 2009, but increased sharply in subsequent events, reaching 950 µg/L in December 2009 and thereafter declining to 290 µg/L in September 2010. VOC concentrations in EW-1 and EW-4 have remained low. This data shows that the axis of the highest concentrations of cis-1,2-dicloroethene shifted from the vicinity of EW-2 to the vicinity of EW-3. Also, since the cis-1,2-dicloroethene reached a peak concentration in EW-2 in December 2009 (and has since been declining), and since the other three recovery wells have also shown a generally stable or declining trend in FY 2010, it appears that the VOC concentrations in the vicinity of EW-1 through 4 have likely seen the approximate maximum concentrations that are likely to occur.

Among the six monitoring wells located downgradient of these extraction wells and south of County Road I, the cis-1,2-dicloroethene concentrations remained comparable to the FY 2009 concentrations (Figure 6-7), with two exceptions. First, a slight increase was observed in 01U157 during FY 2010, increasing from approximately 1.5 µg/L in December 2009 and March 2010, to 8.2 µg/L in September 2010. Well 01U157 is located near the north edge of the 10 µg/L plume contour. The other exception was 01U158, which is located approximately 250 feet downgradient of EW-3. This well had increased slightly in the last quarter of FY 2009, and then increased further in FY 2010. In December 2009 and March 2010, the concentration was 120 µg/L, up from 14 µg/L in September 2009. The concentration decreased to 67 µg/L in June 2010, and then increased to 170 µg/L in September 2010. Given that 01U158 is located approximately 250 feet downgradient of EW-3, and given a groundwater velocity of approximately 200 feet per year (10-Year Report), the peak concentration observed at EW-3 in December 2009 would be expected to be seen in 01U158 in the first half of FY 2011. Going downgradient from 01U158, 01U140 is the next well (Figure 6-2). No increase in the cis-1,2-dicloroethene concentration in 01U140 has been observed, nor has any increase been observed in other wells downgradient thereof (i.e., 01U039, 01U901, or 01U904). Note that increases in the cis-1,2-dicloroethene concentrations in wells downgradient of EW-1 through 4 were anticipated (10-Year Report), and were the reason for the increased monitoring frequency in some of the Site A wells.

Were any trigger levels exceeded at any of the contingency locations?

No. The four contingency locations are 01U901, 902, 903 and 904, which are the four monitoring wells located along the north side of County Road I. The trigger level is equal to groundwater cleanup levels and no compounds of concern at Site A exceeded their respective cleanup levels in these four wells in FY 2010 (Table 6-2). Concentrations of the only detected compound of concern in these four wells, cis-1,2-dichloroethene, remained comparable to the FY 2009 concentrations, as shown on Figure 6-8. All of the FY 2010 cis-1,2-dichloroethene results in these wells were below 4 µg/L, versus the cleanup level (trigger level) of 70 µg/L.

Can it be determined whether MNA is an adequate long-term remedy for Site A in lieu of groundwater extraction and discharge? (If MNA is determined to be adequate, a recommendation to formally change the remedy should be made.)

No, the determination cannot be made yet. FY 2010 was the second year of evaluation following extraction system shutdown, and a time period of three to five years was anticipated before this determination could be made. The changes in concentrations observed in some of the wells in FY 2010 (particularly 01U158) suggest that additional monitoring is needed before this determination can be made. The two years of data also suggest that some changes in the monitoring frequencies at some well locations should be made, particularly given the southward shift of the axis of highest cis-1,2-dichloroethene concentrations. Beginning in FY 2012, the following changes should be made:

- 01U115, 01U116, and 01U351 (EW-1) should be changed from quarterly to annual monitoring. These wells have shown no increase in VOC concentrations in the two years of monitoring. Also, given the relatively low concentrations in 01U139, 01U157, and 01U352 (EW-2), the above four wells appear to be well north (sidegradient) of the higher plume concentrations (see Figure 6-4) and hence a reduction to annual monitoring will be appropriate.

- The remaining six wells that were being sampled quarterly should be changed to semiannual, which includes 01U139, 01U157, 01U158, and EW-2, 3, and 4. With the stable or declining trends observed in EW-2, 3, and 4 in FY 2010, and with the already planned quarterly monitoring of all 6 of these wells through FY 2011, reduction to semiannual frequency will be appropriate.
- 01U039, 01U140, and 01U901 should be changed from annual to semiannual monitoring, given their locations generally downgradient of 01U158.
- 01U902 and 01U904 should remain at a semiannual frequency.
- 01U126 should be changed from semiannual to annual monitoring. The wells immediately downgradient of 01U126 remained stable or decreased after the extraction system was shut off, and hence a reduction to annual monitoring will be appropriate.

The above changes are shown on Figure 6-9, which indicates the monitoring plan that will be implemented beginning in FY 2012.

Do additional remedial measures need to be addressed?

No. The water quality monitoring plan that is shown on Figure 6-1 will be implemented in FY 2011; however, beginning in FY 2012, the monitoring plan shown on Figure 6-9 should be implemented (these monitoring plans are also documented in Appendix A). Continued monitoring will provide the additional data needed for evaluation of MNA as a potential remedy.

Table 6-1

Summary of Site A Shallow Groundwater Monitoring Requirements
Fiscal Year 2010

Remedy Component	Monitoring Requirements	Implementing Party	Documents Containing the Monitoring Plan
#1: Groundwater Monitoring	Outlined below		
#2: Containment and Mass Removal	a. None. The groundwater extraction system was shut down in September 2008 and implementation of Monitored Natural Attenuation (MNA) is being evaluated.		
#3A: Land Use Controls	a. None		
#3B: Alternate Water Supply/Well Abandonment	a. See OU1, Remedy Component #1 which also includes the area north of Site A		
#4: Discharge of Extracted Water	a. None (see #2 above).		
#5: Source Characterization/ Remediation	a. None. VOC-contaminated soils in the source area (1945 Trench) were excavated and transported to a permitted offsite disposal facility in FY 2003.		
OR: Overall Remedy (Attainment of cleanup goals)	a. Water quality data throughout the Site A plume to evaluate attainment and to verify that Natural Attenuation is adequately controlling plume migration.	Army	Site A Monitoring Plan in the Annual Performance Report

Table 6-2
Site A Groundwater Quality Data

Fiscal Year 2010

			Tetra-chloro-ethene (µg/l)	Tri-chloro-ethene (µg/l)	1,1-Di-chloro-ethene (µg/l)	1,2-Di-chloro-ethane (µg/l)	cis-1,2-Di-chloro-ethene (µg/l)	Chloro-form (µg/l)	Benzene (µg/l)	Antimony (µg/l)
Site A Cleanup Level (1)			7	30	6	4	70	60	10	6
01U039		6/23/10	<1	<1	<1	<1	<1	<1	<1	---
01U102		6/22/10	1.2	JP 0.45	<1	<1	2.2	<1	<1	---
01U103		6/22/10	<1	<1	<1	<1	<1	<1	<1	JP 1.3
01U108		6/22/10	2.2	JP 0.45	<1	<1	JP 0.43	<1	<1	---
01U115		12/3/09	<1	<1	<1	<1	JP 0.16	<1	<1	---
01U115		3/8/10	<1	<1	<1	<1	JP 0.48	<1	<1	---
01U115		6/22/10	<1	<1	<1	<1	<1	<1	<1	---
01U115		9/8/10	<1	<1	<1	<1	JP 0.36	<1	<1	---
01U116		12/3/09	<1	<1	<1	<1	JP 0.39	<1	<1	---
01U116		3/8/10	<1	<1	<1	<1	JP 0.59	<1	<1	---
01U116		6/22/10	<1	<1	<1	<1	<1	<1	<1	---
01U116		9/8/10	<1	<1	<1	<1	JP 0.58	<1	<1	---
01U116	D	9/8/10	<1	<1	<1	<1	JP 0.49	<1	<1	---
01U117		6/22/10	5.1	JP 0.59	<1	<1	8.9	<1	<1	---
01U126		12/3/09	**22**	<1	<1	<1	<1	<1	<1	---
01U126		6/22/10	**13**	<1	<1	<1	<1	<1	<1	---
01U127		6/22/10	<1	<1	<1	<1	<1	<1	<1	---
01U138		6/22/10	<1	<1	<1	<1	<1	<1	<1	---
01U139		12/3/09	<1	JP 0.17	<1	<1	13	<1	JP 0.80	---
01U139		3/8/10	<1	JP 0.38	<1	<1	12	<1	JP 0.64	---
01U139		6/22/10	<1	<1	<1	<1	9.7	<1	JP 0.54	---
01U139		9/8/10	<1	JP 0.34	<1	<1	9.6	<1	JP 0.50	---
01U140		6/23/10	<1	<1	<1	<1	2.1	<1	JP 0.54 JQ	---
01U157		12/3/09	<1	JP 0.42	<1	<1	1.6	<1	<1	---
01U157	D	12/3/09	<1	JP 0.43	<1	<1	1.5	<1	<1	---
01U157		3/8/10	<1	JP 0.63	<1	<1	1.5	<1	<1	---
01U157		6/23/10	<1	JP 0.95	<1	<1	5.2	<1	<1	---
01U157		9/8/10	<1	1.3	<1	<1	8.2	<1	<1	---
01U158		12/3/09	<1	JP 0.34	<1	<1	**120**	<1	2.2	---
01U158		3/8/10	<1	JP 0.46	JP 0.17	<1	**120**	<1	3.2	---
01U158		6/23/10	<1	JP 0.30	<1	<1	67	<1	1.6	---
01U158		9/8/10	<1	JP 0.57	<1	<1	**170**	<1	1.7	---
01U350		6/22/10	**7.5**	1.5	<1	<1	3.4	<1	<1	---

Table 6-2
Site A Groundwater Quality Data

Fiscal Year 2010

			Tetra-chloro-ethene (µg/l)	Tri-chloro-ethene (µg/l)	1,1-Di-chloro-ethene (µg/l)	1,2-Di-chloro-ethane (µg/l)	cis-1,2-Di-chloro-ethene (µg/l)	Chloro-form (µg/l)	Benzene (µg/l)	Antimony (µg/l)
Site A Cleanup Level [(1)]			7	30	6	4	70	60	10	6
01U901		6/22/10	<1	<1	<1	<1	JP 0.28	<1	<1	---
01U902		12/4/09	<1	<1	<1	<1	3.3	<1	<1	---
01U902		6/23/10	<1	<1	<1	<1	2.5	<1	<1	<2
01U902	D	6/23/10	<1	<1	<1	<1	2.9	<1	<1	---
01U903		6/22/10	<1	<1	<1	<1	<1	<1	<1	---
01U904		12/4/09	<1	<1	<1	<1	1.4	<1	<1	---
01U904		6/23/10	<1	<1	<1	<1	1.6	<1	<1	<2
01U904	D	6/23/10	<1	<1	<1	<1	1.3	<1	<1	<2
Extraction Wells:										
01U351 (EW-1)		12/3/09	JP 0.41	JP 0.17	<1	<1	<1	<1	<1	---
01U351 (EW-1)		3/9/10	JP 0.25	JP 0.18	<1	<1	JP 0.18	<1	<1	---
01U351 (EW-1)	D	3/9/10	JP 0.25	JP 0.21	<1	<1	JP 0.18	<1	<1	---
01U351 (EW-1)		6/23/10	<1	<1	<1	<1	<1	<1	<1	---
01U351 (EW-1)		9/8/10	<1	JP 0.29	<1	<1	<1	<1	<1	---
01U352 (EW-2)		12/3/09	1.0	2.0	<1	<1	32	<1	JP 0.13	---
01U352 (EW-2)		3/9/10	JP 0.37	JP 0.99	<1	<1	18	<1	<1	---
01U352 (EW-2)		6/23/10	<1	<1	<1	<1	6.9	<1	<1	---
01U352 (EW-2)		9/8/10	<1	JP 0.32	<1	<1	8.2	<1	<1	---
01U353 (EW-3)		12/3/09	<1	JP 0.59	JP 0.85	<1	**830**	<1	**25**	---
01U353 (EW-3)	D	12/3/09	<1	JP 0.52	JP 0.77	<1	**950**	<1	**24**	---
01U353 (EW-3)		3/9/10	<1	JP 1.4	JP 0.81	<1	**580**	<1	8.4	---
01U353 (EW-3)		6/23/10	<1	JP 0.82	<1	<1	**310**	<1	3.2	---
01U353 (EW-3)	D	6/23/10	<1	JP 0.86	<1	<1	**310**	<1	3.3	---
01U353 (EW-3)		9/8/10	<1	1.1	<1	<1	**290**	<1	4.4	---
01U354 (EW-4)		12/3/09	<1	JP 0.93	<1	<1	13	<1	JP 0.43	---
01U354 (EW-4)		3/9/10	<1	1.0	<1	<1	5.3	<1	JP 0.15	---
01U354 (EW-4)		6/23/10	<1	JP 0.71	<1	<1	1.3	<1	<1	---
01U354 (EW-4)		9/8/10	<1 JD25	JP 0.91	<1 JD21	<1	1.5	<1	<1	---

Notes:

(1) Cleanup levels for Site A Shallow Groundwater are from Table 1 of the OU2 ROD. Bolding (in red color) indicates exceedance of the cleanup level.

--- Not Sampled.

D Duplicate sample.

JD The relative percent difference (rpd) between the matrix spike and matrix spike duplicate exceeded the QC limit (the rpd is listed after "JD"). Results should be considered estimated.

JP The value is below the reporting level, but above the method detection limit. Results should be considered estimated.

JQ Matrix intereferences were noted in the quantification. Results should be considered estimated, with a potential high bias.

ANNUAL PERFORMANCE REPORT	Wenck	FY 2010
Site A, Groundwater Monitoring Plan (Current)	Wenck Associates, Inc. Environmental Engineers 1800 Pioneer Creek Center Maple Plain, MN 55359-0429	Figure 6-1

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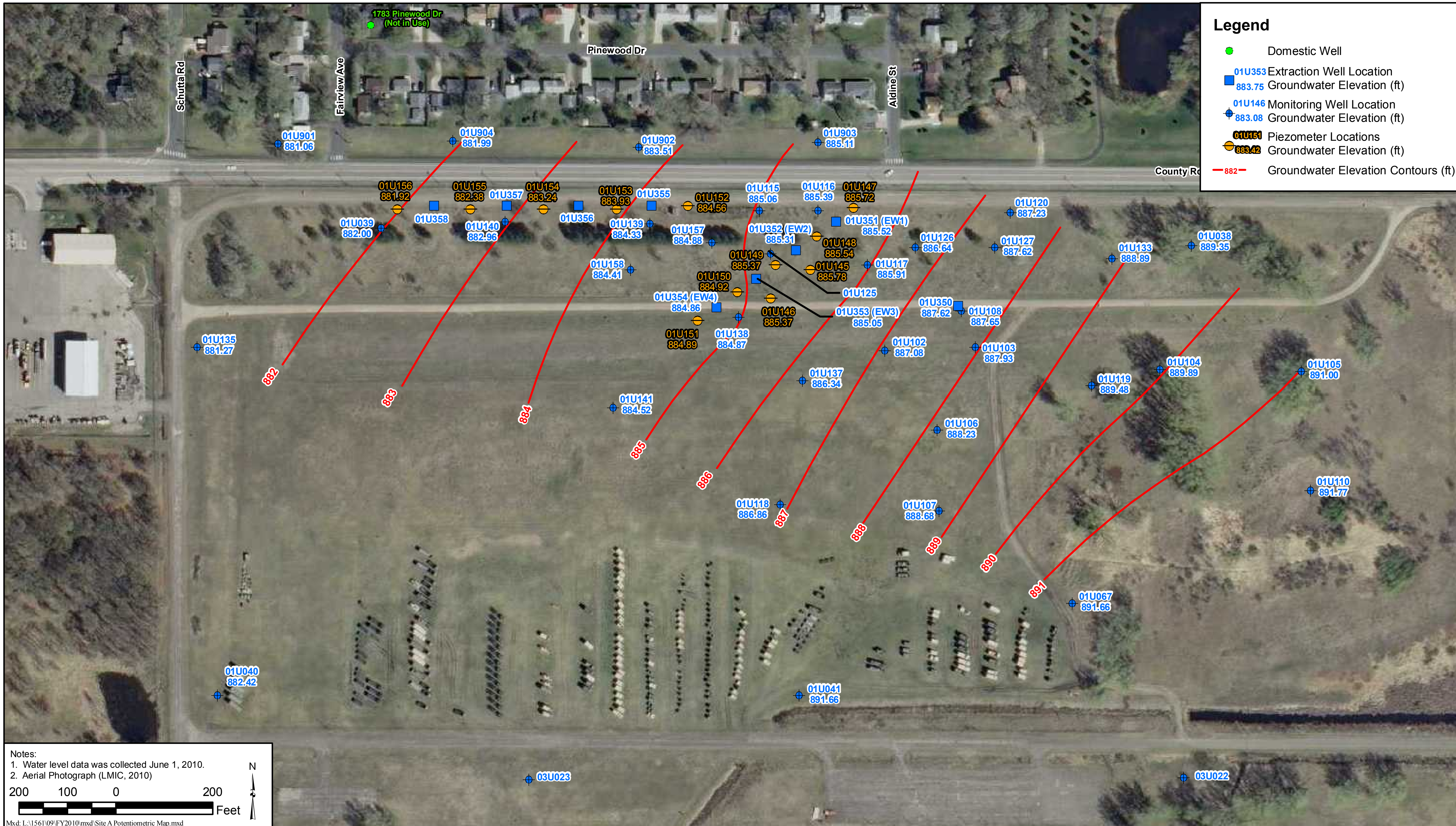
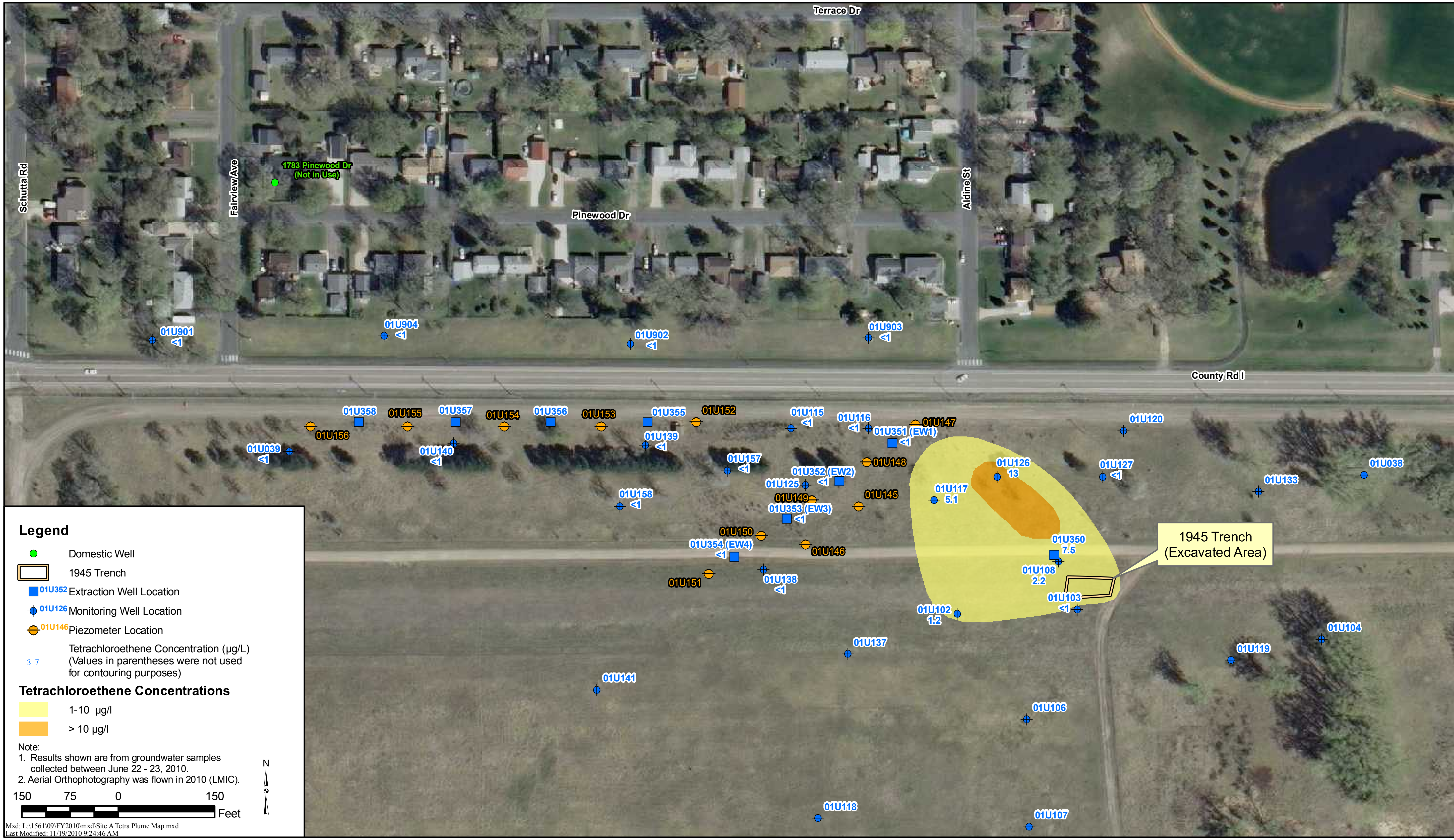
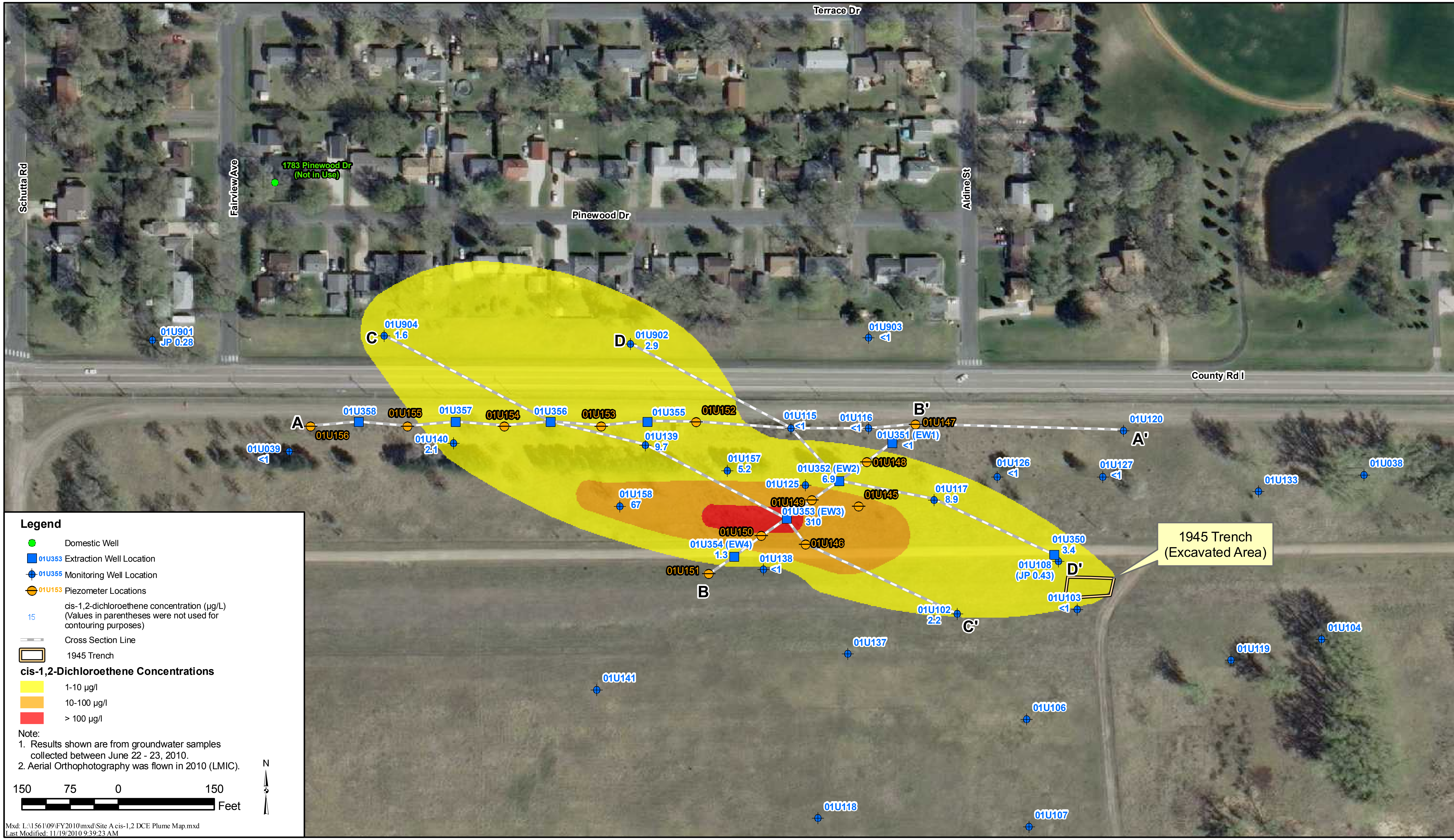


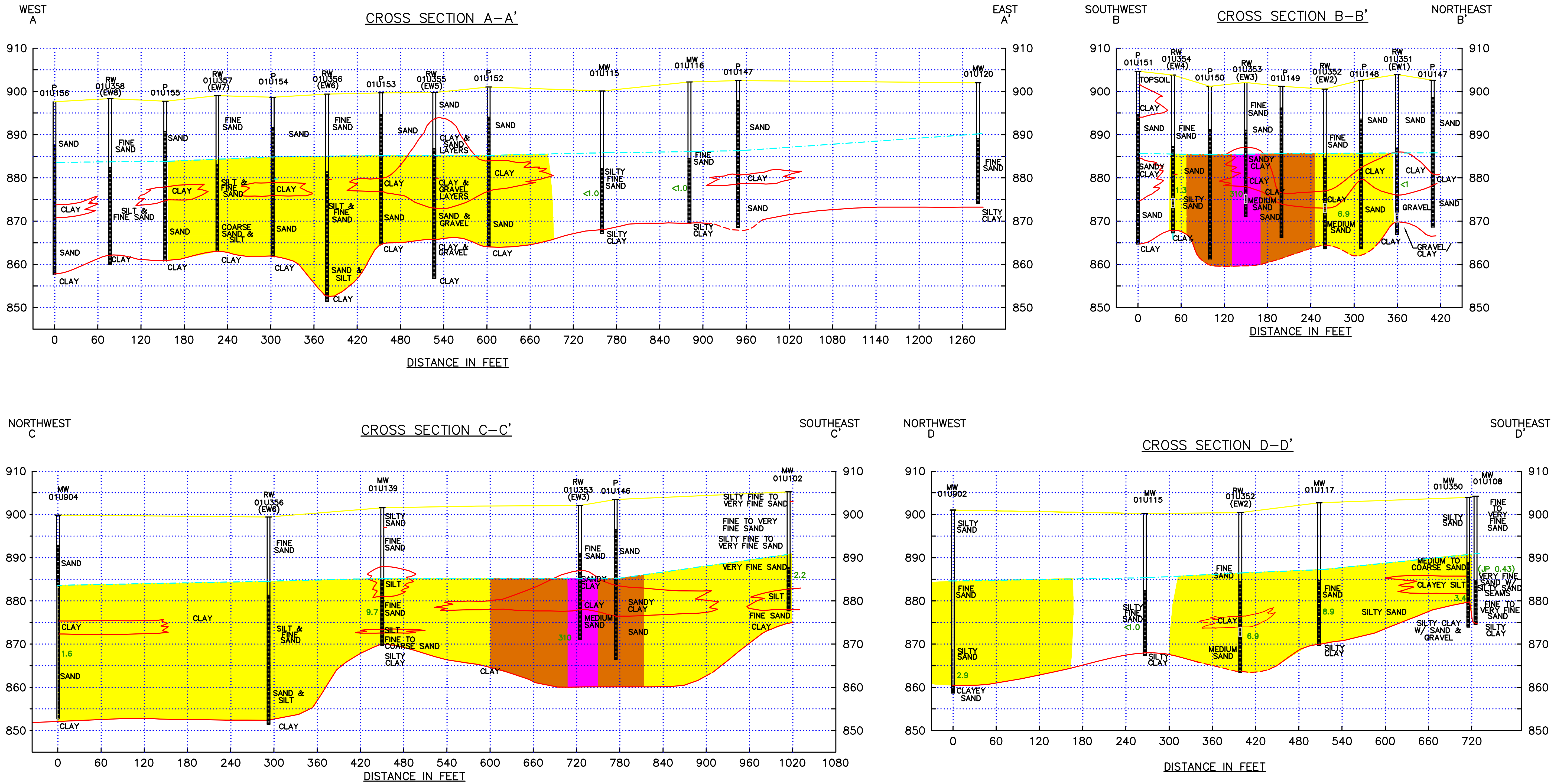
ANNUAL PERFORMANCE REPORT	Wenck Associates, Inc. Environmental Engineers 1800 Pioneer Creek Center Maple Plain, MN 55359-0429	FY 2010
Site A, Unit 1, Potentiometric Map - Summer 2010		Figure 6-2



ANNUAL PERFORMANCE REPORT	Wenck	FY 2010
Site A, Unit 1, Tetrachloroethene Isoconcentration Map, Summer 2010	Wenck Associates, Inc. Environmental Engineers 1800 Pioneer Creek Center Maple Plain, MN 55359-0429	Figure 6-3



ANNUAL PERFORMANCE REPORT	Wenck Associates, Inc. Environmental Engineers 1800 Pioneer Creek Center Maple Plain, MN 55359-0429	FY 2010
Site A, Unit 1, cis-1,2-Dichloroethene Isoconcentration Map, Summer 2010		Figure 6-4



NOTES:

1. RESULTS ARE FROM GROUNDWATER SAMPLES COLLECTED JUNE 22 AND 23, 2010.
2. CONSTRUCTION INFORMATION ON RECOVERY WELLS AND PIEZOMETERS WAS GENERATED BY DAHL AND ASSOCIATES, INC. AS PART OF THE SITE A REMOVAL ACTION SYSTEM CONSTRUCTION. CONSTRUCTION INFORMATION ON MONITORING WELLS WAS PROVIDED BY FEDERAL CARTRIDGE COMPANY.

SCALE

V.E. = 6X

LEGEND

- GEOLOGIC CONTACT
- INFERRED GEOLOGIC CONTACT
- SCREENED INTERVAL OF WELL
- PUMP LOCATION
- 885.0 WATER LEVEL SURFACE
- SLIGHT CHANGE IN GEOLOGIC UNIT (MARK LOCATED ALONG WELL STAFF)
- MW MONITORING WELL
- RW RECOVERY WELL
- P PIEZOMETER

MW 01U117 26 — cis–1,2–DICHLOROETHENE CONCENTRATION (µg/l) (VALUES IN PARENTHESES WERE NOT USED FOR CONTOURING PURPOSES)

cis–1,2–DICHLOROETHENE CONCENTRATIONS

- 1–10 µg/l
- 10–100 µg/l
- >100 µg/l

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ANNUAL PERFORMANCE REPORT

cis–1,2–Dichloroethene Cross Sections A–A', B–B', C–C' and D–D', Summer 2010

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1800 Pioneer Creek Center Maple Plain, Mn. 55359

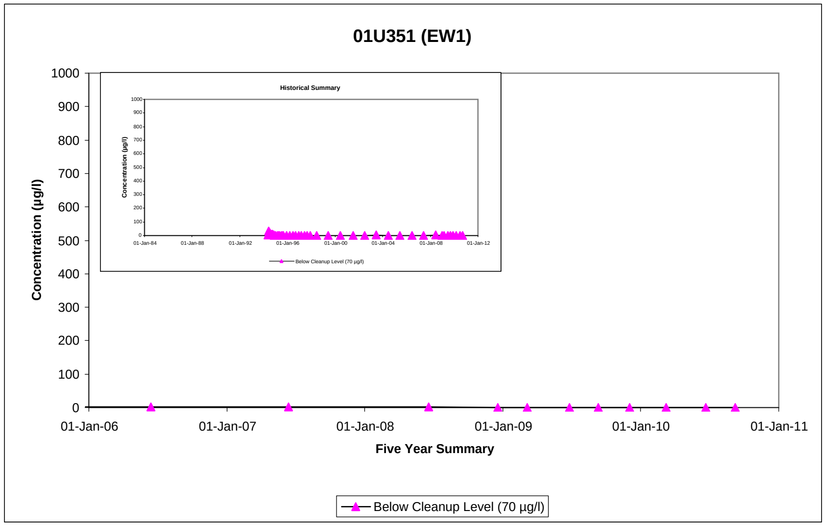
FY 2010

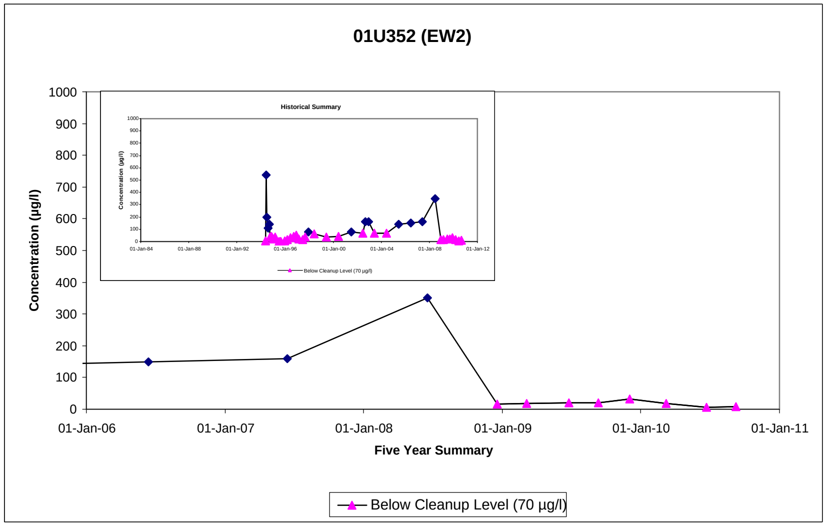
Figure 6–5

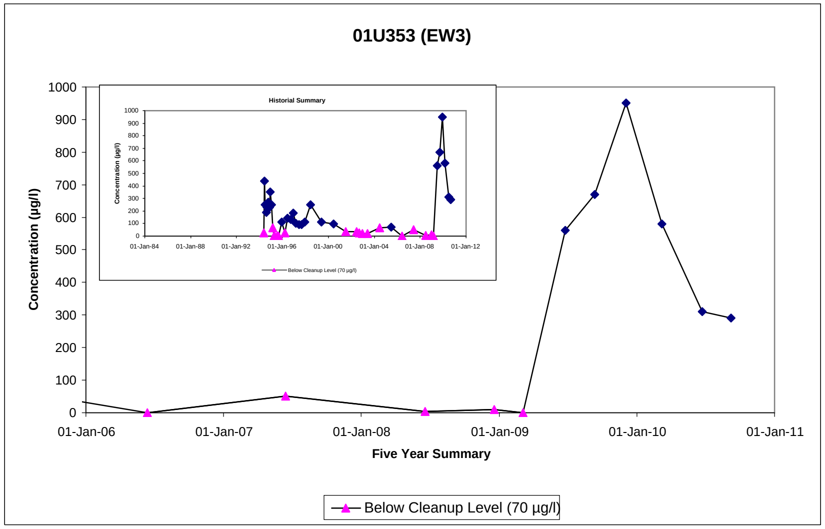
FIGURE 6-6

SITE A, cis-1,2-DICHLOROETHENE WATER QUALITY TRENDS: EXTRACTION WELLS

FY 2010 ANNUAL PERFORMANCE REPORT







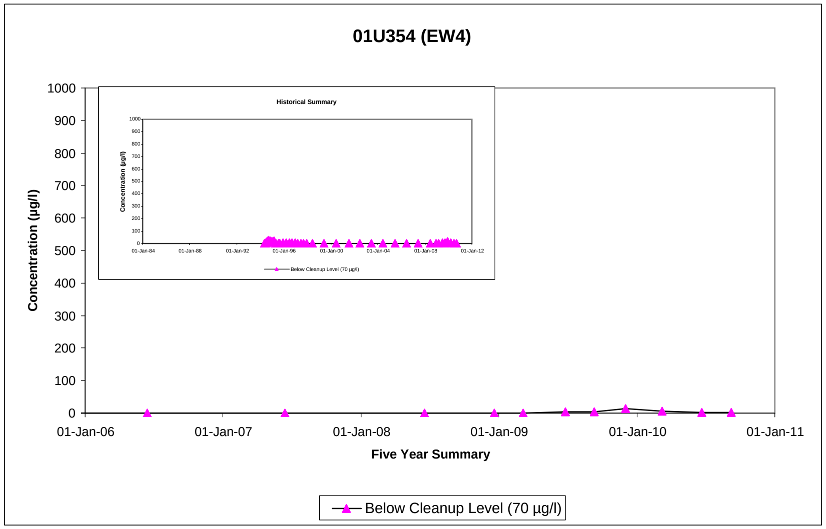
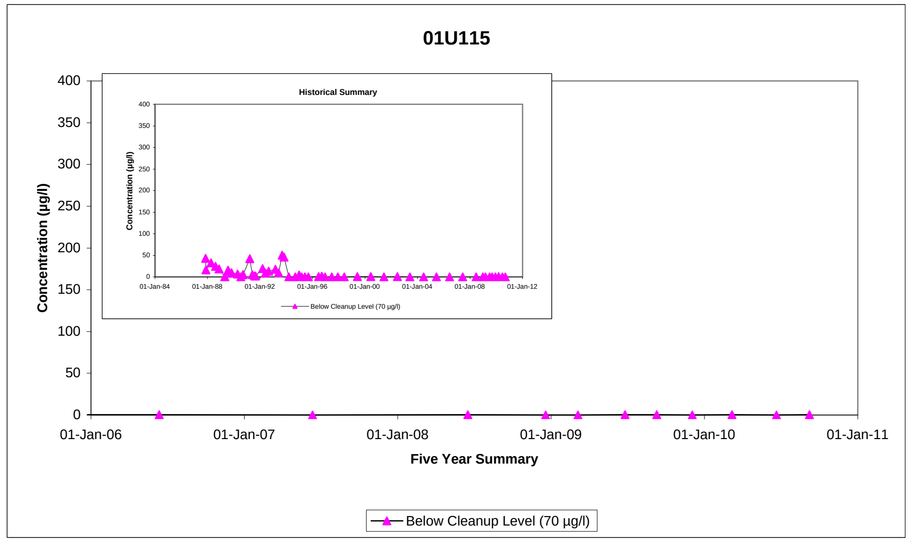
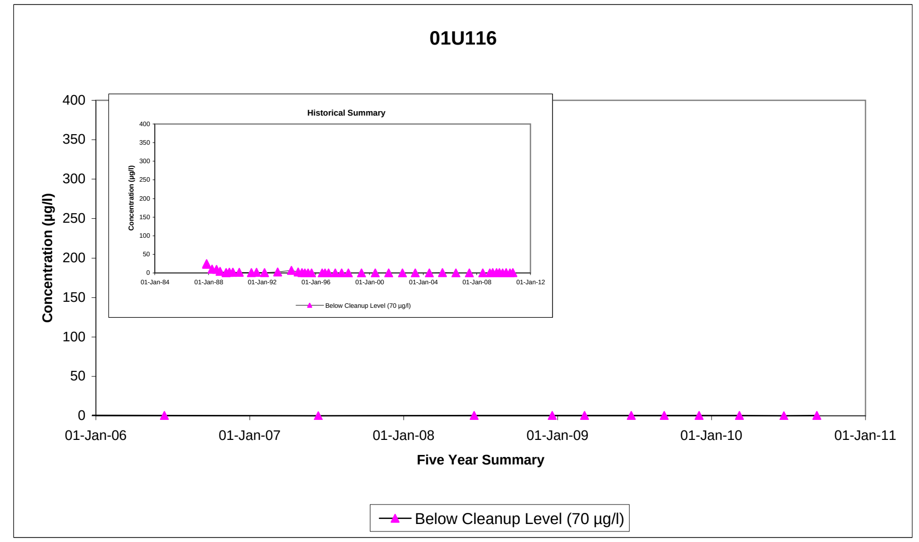
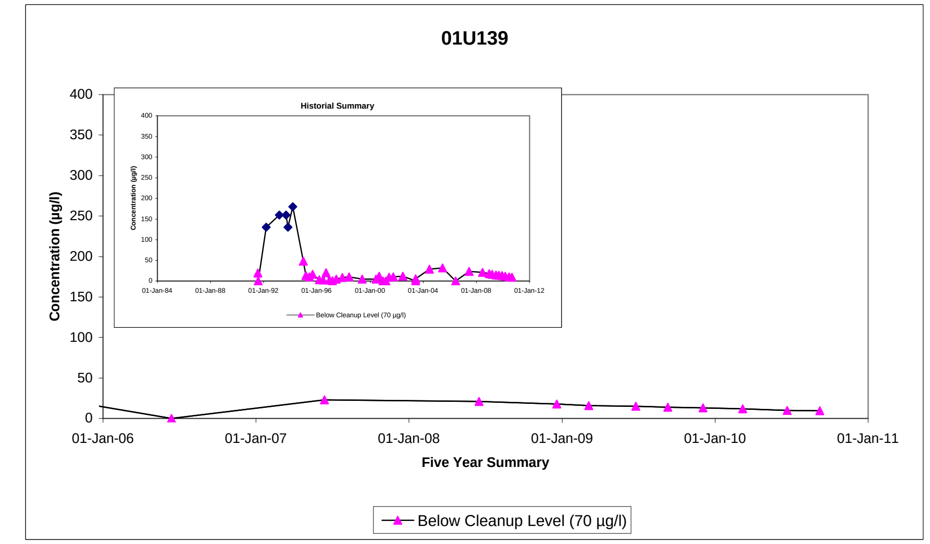
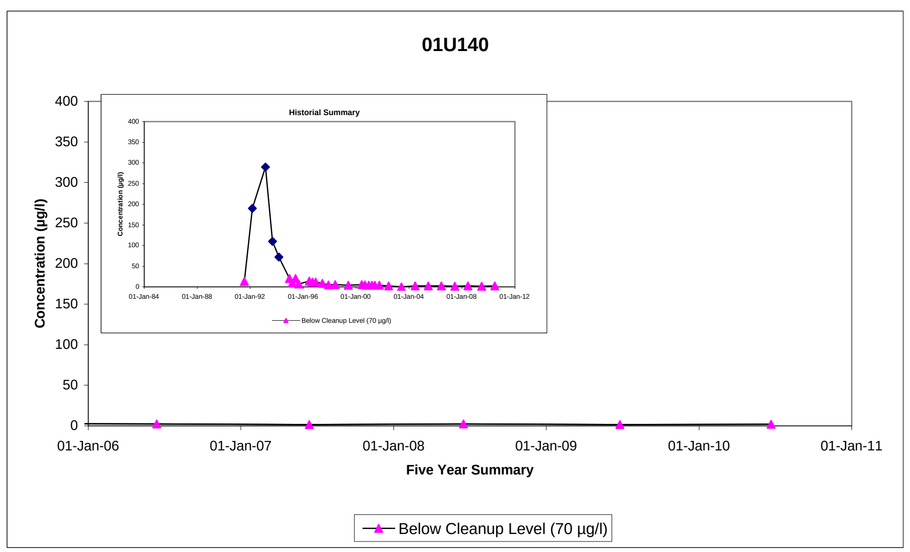


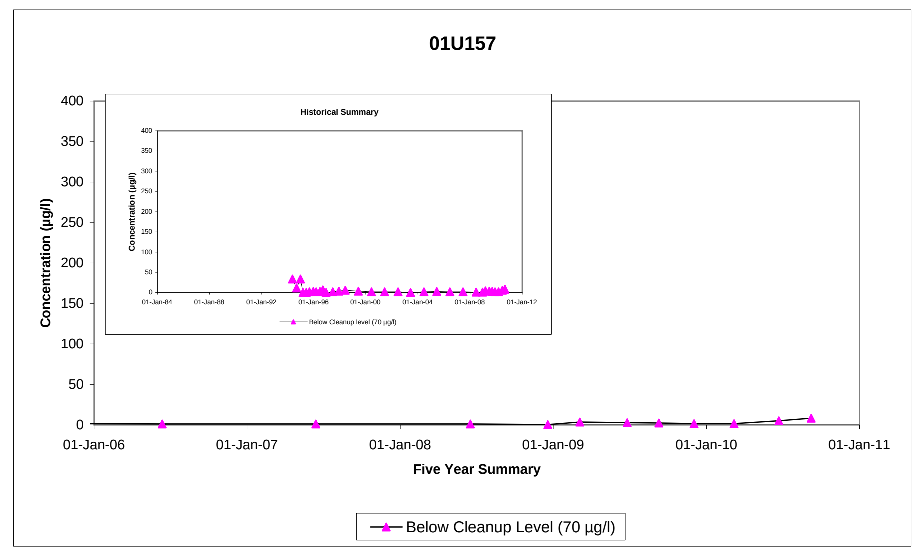
FIGURE 6-7
SITE A, cis-1,2-DICHLOROETHENE WATER QUALITY TRENDS: MONITORING WELLS
FY 2010 ANNUAL PERFORMANCE REPORT

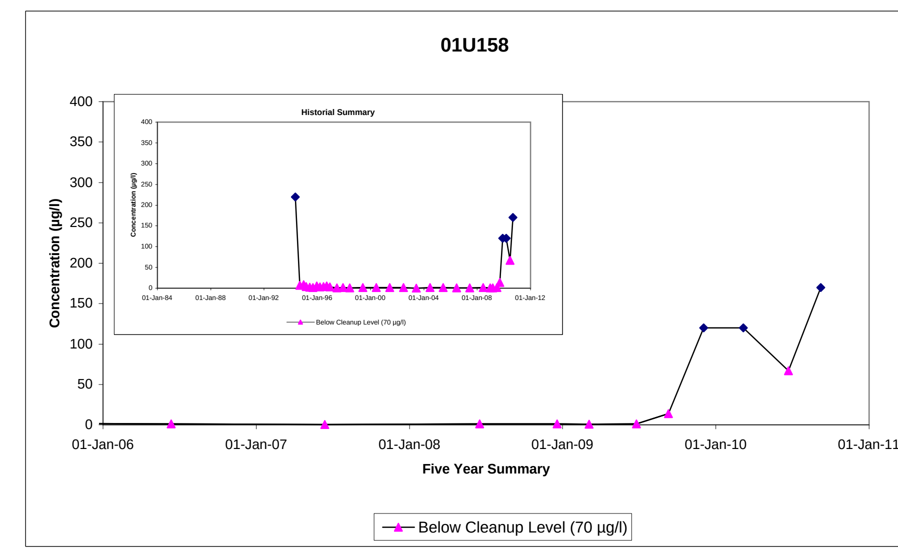












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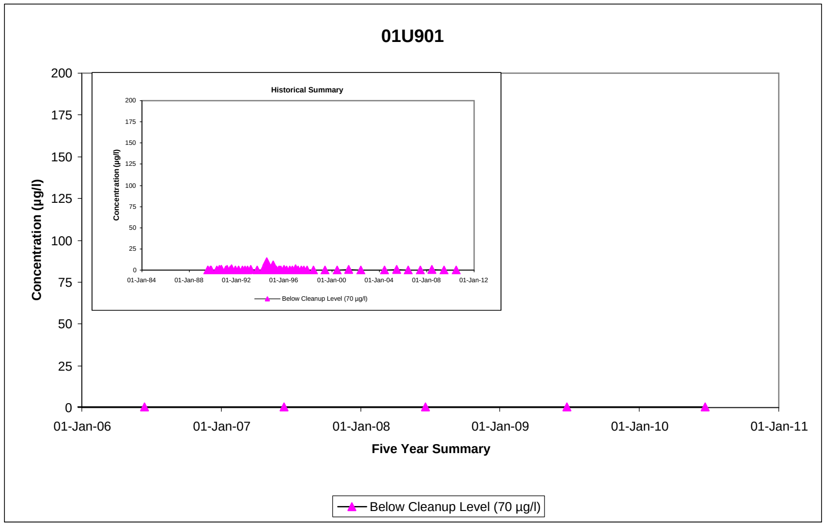
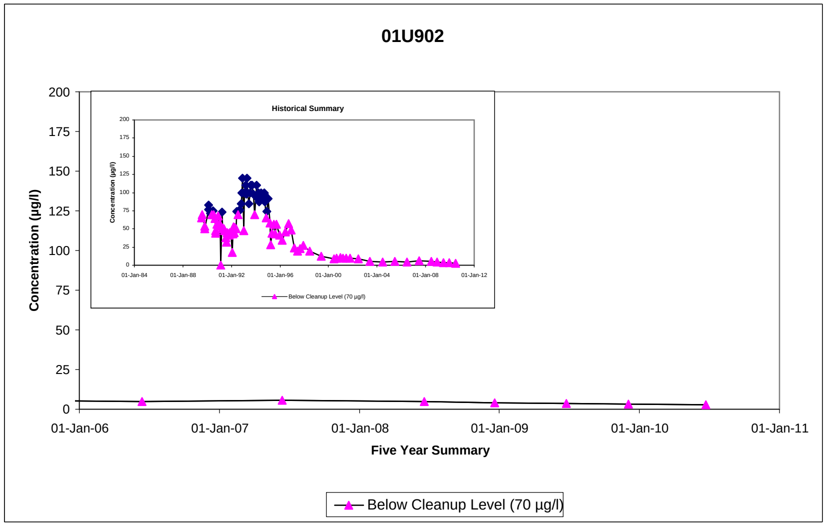
Wenck Associates, Inc.

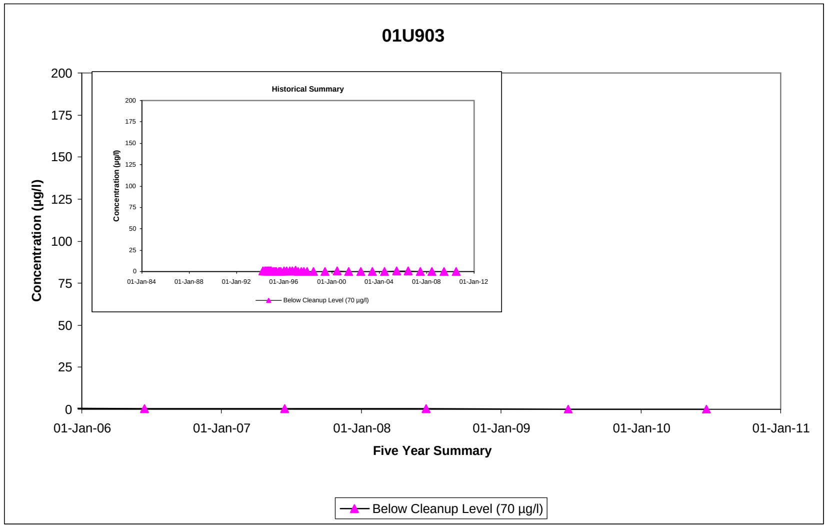
FIGURE 6-8

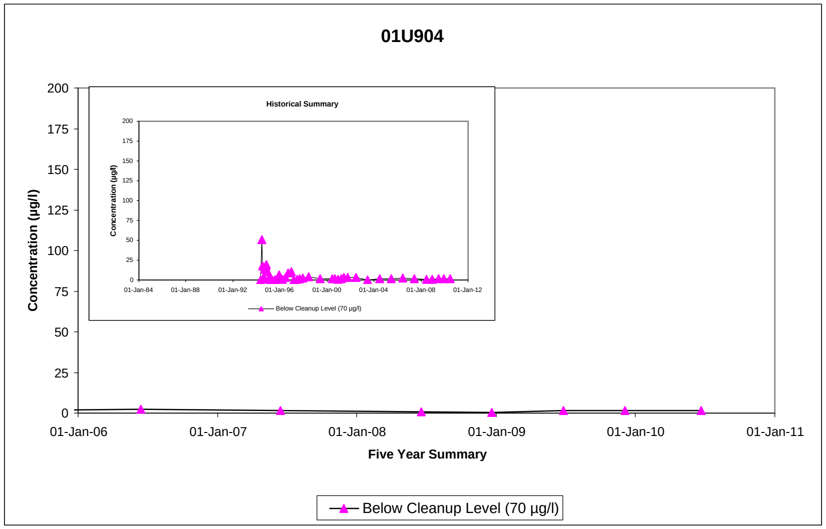
SITE A, cis-1,2-DICHLOROETHENE WATER QUALITY TRENDS: CONTINGENCY LOCATIONS

FY 2010 ANNUAL PERFORMANCE REPORT









ANNUAL PERFORMANCE REPORT

Site A, Proposed Groundwater Monitoring Plan (Beginning FY 2012)

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Maple Plain, MN 55359-0429

FY 2010

Figure 6-9

7.0 Operable Unit 2: Site C Shallow Groundwater

Impacts to Site C shallow groundwater had not occurred at the time of the OU2 ROD (1997). In FY 1997, the U.S. Army Environmental Command (USAEC) sponsored a technology demonstration project to phytoremediate lead-contaminated soil at Site C. During the growing seasons, ethylenediaminetetraacetic acid (EDTA) and acetic acid were applied to the soils to improve the metals uptake by the crops, and had the unintended consequence of causing migration of lead from the soils into the shallow groundwater at Site C, which is present within a few feet from the ground surface. In FY 2000, the MPCA took enforcement action, requiring that the Army implement corrective actions. Initially, the Army installed a groundwater recovery trench to contain the lead plume (operated between November 2000 and July 2001). On July 6, 2001, the Army began operating three extraction wells to contain the plume (replacing recovery trench operation), with discharge of extracted groundwater (treated as necessary) to a POTW. In FY 2004, a Stipulation Agreement was signed which resolved the enforcement action and directed that response actions be conducted under the authority of the FFA. The 2007 OU2 ROD Amendment #1 incorporated the existing groundwater extraction system as the final remedy.

On November 13, 2008, the groundwater system was shut off (with regulatory approval), since the lead concentrations in the three extraction wells had been below the groundwater cleanup level since March 2008 (i.e., the area of lead concentrations that exceeded the groundwater cleanup level was not even reaching the extraction wells, so operation of the extraction system was no longer required to contain the plume). The recommendation to shut the extraction system off was presented in the “Site C Groundwater Extraction System Evaluation Report,” which was approved by the USEPA and MPCA in November 2008. The groundwater system has not been removed and will be kept in place in the event that one or more extraction wells need to be restarted. The 2007 ROD Amendment #1 prescribes four major components of the remedy, and until a decision is made to formally change the remedy, the original components of ROD

Amendment #1 will be retained in this section (with discussion that is appropriate to the current remedy implementation status).

The Evaluation Report also presented the monitoring plan to be implemented at the point that the extraction wells were shut off, and presented the contingency actions that will be taken by the Army if groundwater and/or surface water monitoring indicates that any of the stated trigger points are exceeded. These monitoring and contingency actions have been incorporated into the APR and any changes to monitoring and contingency actions must be approved by the USEPA and MPCA through revisions to the APR.

If, after an initial trial period of extraction system shutdown, it is proven that extraction system operation is no longer necessary, the remedy could be formally changed. This change would presumably require an Explanation of Significant Difference (ESD), at a minimum, or possibly a ROD amendment. However, given that groundwater cleanup levels may be reached throughout Site C within a few years, it may not be necessary to go through the process of formally changing the remedy. Future APRs will ultimately determine when the USEPA, MPCA, and Army are comfortable that the extraction system can be dismantled, and will also monitor the progress towards reaching the groundwater cleanup levels throughout the Site.

7.1 REMEDY COMPONENT #1: GROUNDWATER AND SURFACE WATER MONITORING

Description: "The existing Site C groundwater monitoring program will be revised as needed."
"A new surface water monitoring plan will be prepared."
(OU2 ROD Amendment #1, page 39-40)

Performance Standard (how do you know when you're done):
When a performance groundwater and surface water monitoring program has been established and ongoing monitoring is in compliance with the program.

Is this remedy component being implemented?
Yes. Table 7-1 summarizes the performance monitoring requirements, the implementing parties, and the documents that contain the monitoring plans. The FY 2010 Monitoring Plan is included in Appendix A, and the water quality monitoring locations and frequencies are also summarized on Figure 7-1. Figure 7-2 presents groundwater elevation contours based on measurements in June 2010. The inferred groundwater flow direction confirms that the monitoring plan specifies the appropriate locations to track plume migration, though changes in sampling frequencies at some of the groundwater and surface water locations are proposed, beginning in FY 2012 (see discussion in Section 7.5).

Were the groundwater monitoring requirements for this remedy met? Yes.

Is any groundwater sampling proposed prior to the next report? Yes. Groundwater and surface water monitoring at Site C will be in accordance with the monitoring plan shown in Appendix A.1 and A.3, respectively.

Are any changes or additional actions required for this remedy component? Yes. Monitoring locations are to remain unchanged; however, changes in sampling frequencies at some of the groundwater and surface water locations are proposed to begin in FY 2012 (see discussion in Section 7.5).

7.2 REMEDY COMPONENT #2: GROUNDWATER CONTAINMENT

Description: "Three extraction wells, EW-1 through EW-3, will continue collecting contaminated groundwater." (OU2 ROD Amendment #1, page 38)

Is this remedy component being implemented?

No. As discussed previously, since the area of lead concentrations that exceed the groundwater cleanup level no longer extends to the extraction wells, the extraction system has been shut off and this remedy component is not currently being implemented.

7.3 REMEDY COMPONENT #3: DISCHARGE OF EXTRACTED WATER

Description: "Extracted groundwater will be pretreated onsite (as necessary) to meet the sanitary sewer discharge limit." (OU2 ROD Amendment #1, page 38)

Is this remedy component being implemented?

No. As discussed previously, since the area of lead concentrations that exceed the groundwater cleanup level no longer extends to the extraction wells, the extraction system has been shut off and this remedy component is not currently being implemented.

7.4 REMEDY COMPONENT #4: LAND USE CONTROLS

Description: "LUCs will be established to protect the groundwater extraction, treatment, and monitoring system and to prohibit the drilling of water supply wells within the contaminated portion of the Unit 1 aquifer." (OU2 ROD Amendment #1, page 39)

Performance Standard (how do you know when you're done):

For initial implementation, when the USEPA and MPCA have provided consistency approval for an OU2 Land Use Control Remedial Design (LUCRD) document. Implementation will continue until such time that the groundwater concentrations are below the cleanup levels.

Has a LUCRD document been approved to address land use control (LUC) issues for OU2, including Site C groundwater, and is it being implemented?

Yes. The USEPA and MPCA provided consistency approval for the OU2 LUCRD in September 2010 and it is being implemented by the Army.

Was an annual site inspection for land use controls conducted in FY 2010?

Yes. On July 14, 2010, the Army, National Guard, and Wenck conducted the annual inspection of OU2 sites. The checklist that was completed during the inspection is included as Appendix I.

Did the inspection identify any follow-up actions needed to maintain the protectiveness of the LUCs?

No.

7.5 OVERALL REMEDY FOR SITE C SHALLOW GROUNDWATER

Performance Standard (how do you know when you're done):

When the cleanup levels in Table 1 of OU2 ROD Amendment #1 have been attained throughout the areal and vertical extent of the Site C plume.

Has the Site C shallow groundwater remedy been completed (i.e., have the cleanup levels in Table 1 of the OU2 ROD Amendment #1 been attained throughout the areal and vertical extent of the Site C plume)?

No. Table 7-2 and 7-3 present the FY 2010 groundwater and surface water quality data, respectively, and highlight the values that exceed the cleanup level. Figure 7-3 shows the lead results. In FY 2010, lead exceeded the groundwater cleanup level of 15 µg/L in the four monitoring wells nearest the source area (MW-3, 13, 14 and 15), with concentrations ranging from 24 to 67 µg/L. Figure 7-4 and 7-5 show the lead concentrations plotted on geologic cross sections for Site C to illustrate the vertical extent of contamination (the cross section locations are illustrated on Figure 7-3).

The water quality trends for MW-3, 13, 14, and 15 are shown on Figure 7-6. MW-13, located closest to the source area, continued to show a steadily decreasing trend. The MW-3 result decreased from the FY 2009 result, showing a decreasing trend overall. MW-14 and 15, which had been below the cleanup level in the previous few events, had results that exceeded the cleanup level. These may prove to be isolated exceedances, as the trends for both these wells show occasional sporadic exceedances among data that is predominantly below the cleanup level. Given the decreasing trends at MW-3 and 13, which are just upgradient from MW-14 and 15, sustained increasing trends at MW-14 and 15 are not anticipated. Additional monitoring results will be needed at MW-14 and 15 to verify any change in the water quality trend at these wells.

Were any trigger levels exceeded at any of the contingency locations?

No. The Site C contingency locations and trigger levels are shown in Table 7-4. Depending on the location, the trigger level is either equal to the groundwater cleanup level or the surface water cleanup level. The groundwater results (Table 7-2) and surface water results (Table 7-3) show that none of the trigger levels were exceeded in FY 2010. If a trigger level were to be exceeded, the Army would implement the contingency action(s) specified in the footnotes to Table 7-4.

Can it be determined whether the extraction system should be dismantled? (If the extraction system should be dismantled and site closure is not yet possible, a recommendation to formally change the remedy should be made.)

No, the determination cannot be made yet. FY 2010 was the second year of evaluation following extraction system shutdown. The increased concentrations observed at MW-14 and 15 in FY 2010 suggest that additional monitoring is needed before this determination can be made. After the scheduled FY 2011 monitoring is completed, three years of quarterly monitoring will have been completed. Based on the results from the first two years, and assuming similar concentrations are observed in these quarterly locations in FY 2011, reduction of the monitoring frequency would be appropriate. Beginning in FY 2012, the following changes should be made:

- The wells that are currently being monitored quarterly (MW-4, 6, 7, 8, 11, and 12; 01U046; and EW-1, 2, and 3) should be changed to annual monitoring. In FY2010, the quarterly results for these wells (collectively) showed few detections of lead, and all of those detections were 1 µg/L or less. The scheduled quarterly sampling of these wells in FY 2011 is anticipated to show similar results.

- The three surface water monitoring locations that are currently being monitored quarterly (SW-5, SW-6, and the NE Wetland) should be changed to annual monitoring. In FY 2010, the quarterly results for these wells (collectively) showed few detections of lead, and all of those detections were 0.15 µg/L or less. The scheduled quarterly sampling of these wells in FY 2011 is anticipated to show similar results.

The above changes are shown on Figure 7-7, which indicates the monitoring plan that will be implemented beginning in FY 2012.

Do additional remedial measures need to be addressed?

No. The water quality monitoring plan that is shown on Figure 7-1 will be implemented in FY 2011; however, beginning in FY 2012, the monitoring plan shown on Figure 7-7 should be implemented (these monitoring plans are also documented in Appendix A). Continued monitoring will provide the additional data needed to determine if the extraction system can be dismantled.

Table 7-1

Summary of Site C Shallow Groundwater Monitoring Requirements
Fiscal Year 2010

Remedy Component	Monitoring Requirements	Implementing Party	Documents Containing the Monitoring Plan
#1: Groundwater and Surface Water Monitoring	Outlined below		
#2: Groundwater Containment	a. None. The groundwater extraction system was shut down in November 2008, since the area of groundwater that exceeded the groundwater cleanup level no longer extended to the extraction wells.		
#3: Discharge of Extracted Water	a. None (see #2 above).		
#4: LUCs to Restrict Well Installation and to Protect the Remedy Infrastructue	a. None.		
OR: Overall Remedy (Attainment of cleanup goals)	a. Groundwater quality data throughout the Site C plume to evaluate attainment and to verify that the groundwater extraction system can remain off. Also surface water data in the plume vicinity to verify that groundwater does not impact surface water above surface water standards.	Army	Site C Monitoring Plan in the Annual Report

Table 7-2
Water Quality Data for Site C Groundwater

Fiscal Year 2010

Sample Location		Date Collected	Lead (Dissolved) (µg/l)	L	D
Groundwater Cleanup Level[1]:			15		
Monitoring Wells:					
01U561 (MW1)		6/17/10	0.64	U	
01U562 (MW2)		6/17/10	0.64	U	
01U563 (MW3)		6/17/10	**42**		
01U564 (MW4)		12/1/09	0.051	U	
01U564 (MW4)		3/24/10	0.051	U	
01U564 (MW4)		6/17/10	0.64	U	
01U564 (MW4)		9/8/10	0.64	U	
01U566 (MW6)		12/2/09	0.051	U	
01U566 (MW6)		3/24/10	0.051	U	
01U566 (MW6)		6/17/10	0.64	U	
01U566 (MW6)		9/8/10	0.64	U	
01U567 (MW7)		12/2/09	0.051	U	
01U567 (MW7)		3/24/10	0.051	U	
01U567 (MW7)		6/16/10	0.64	U	
01U567 (MW7)		9/8/10	0.64	U	
01U568 (MW8)		12/2/09	0.051	U	
01U568 (MW8)		3/24/10	0.051	U	
01U568 (MW8)		6/16/10	0.64	U	
01U568 (MW8)	D	6/16/10	0.64	U	
01U568 (MW8)		9/8/10	0.64	U	
01U570 (MW10)		6/17/10	0.64	U	
01U571 (MW11)		12/2/09	0.094	J	UB0.1
01U571 (MW11)		3/24/10	0.051	U	
01U571 (MW11)		6/16/10	0.64	U	
01U571 (MW11)		9/8/10	0.64	U	
01U572 (MW12)		12/2/09	0.051	U	
01U572 (MW12)	D	12/2/09	0.051	U	
01U572 (MW12)		3/24/10	0.051	U	
01U572 (MW12)		6/17/10	0.64	U	
01U572 (MW12)	D	6/17/10	0.64	U	
01U572 (MW12)		9/8/10	0.64	U	
01U572 (MW12)	D	9/8/10	0.64	U	
01U573 (MW13)		6/17/10	**37**		
01U574 (MW14)		6/17/10	**67**		

Table 7-2
Water Quality Data for Site C Groundwater

Fiscal Year 2010

Sample Location		Date Collected	Lead (Dissolved) (µg/l)	L	D
Groundwater Cleanup Level(1):			15		
01U575 (MW15)		6/17/10	**24**		
01U576 (MW16)		6/17/10	0.64	U	
01U045		6/16/10	0.64	U	
01U046		12/1/09	0.051	U	
01U046		3/24/10	(Frozen)		
01U046		6/17/10	0.64	U	
01U046		9/8/10	0.64	U	
01U085		6/16/10	0.64	U	
Extraction Wells:					
01U551 (EW1)		12/2/09	0.10	J	UB0.1
01U551 (EW1)		3/24/10	0.11	J	UB6.4
01U551 (EW1)		6/17/10	0.64	U	
01U551 (EW1)		9/8/10	0.64	U	
01U552 (EW2)		12/2/09	0.11	J	UB0.1
01U552 (EW2)		3/24/10	0.051	U	
01U552 (EW2)		6/17/10	0.64	U	
01U552 (EW2)		9/8/10	0.64	U	
01U553 (EW3)		12/2/09	1.0	J	
01U553 (EW3)		3/24/10	0.95	J	UB6.4
01U553 (EW3)	D	3/24/10	0.93	J	UB6.4
01U553 (EW3)		6/17/10	0.95	J	
01U553 (EW3)		9/8/10	0.81	J	

Notes:

Laboratory Concentration Qualifiers (L):

U — Analyte was not detected above the Method Detection Limit (MDL).

J — Reported value is between the Method Detection Limit (MDL) and the Reporting Limit (RL).

Data Validation Qualifiers (D):

UB — The sample result was less than 5 times the level detected in a blank (the result for the blank is listed after "UB"). The sample result can be considered non detect at an elevated detection limit.

Other Notes:

D — Duplicate

(1) — The cleanup level for Site C Groundwater is from Table 1 of OU2 ROD Amendment #1. Bolding (in red color) indicates exceedance of the cleanup level.

Table 7-3
Water Quality Data for Site C Surface Water

Fiscal Year 2010

Sample Location		Date Collected	Lead (Dissolved) (µg/l)	L	D
Surface Water Cleanup Level[1]:			6.9		
SW 05		3/24/10	0.15	J	
SW 05		3/25/10	0.10	J	
SW 05		3/26/10	0.065	J	
SW 05		6/16/10	0.64	U	
SW 05		6/17/10	0.64	U	
SW 05		6/18/10	0.64	U	
SW 05		9/7/10	0.64	U	
SW 05		9/8/10	0.64	U	
SW 05		9/9/10	0.64	U	
SW 05	D	9/9/10	0.64	U	
SW 06		3/24/10	0.051	U	
SW 06		3/25/10	0.051	U	
SW 06		3/26/10	0.051	U	
SW 06		6/16/10	0.64	U	
SW 06	D	6/16/10	0.64	U	
SW 06		6/17/10	0.64	U	
SW 06		6/18/10	0.64	U	
SW 06		9/7/10	0.64	U	
SW 06		9/8/10	0.64	U	
SW 06		9/9/10	0.64	U	
NE Wetland		3/24/10	0.051	U	
NE Wetland		3/25/10	0.051	U	
NE Wetland		3/26/10	0.051	U	
NE Wetland	D	3/26/10	0.051	U	
NE Wetland		6/16/10	0.64	U	
NE Wetland		6/17/10	0.64	U	
NE Wetland		6/18/10	0.64	U	
NE Wetland		9/7/10	0.64	U	
NE Wetland		9/8/10	0.64	U	
NE Wetland		9/9/10	0.64	U	

Notes:

Laboratory Concentration Qualifiers (L):

U Analyte was not detected above the Method Detection Limit (MDL).

J Reported value is between the Method Detection Limit (MDL) and the Reporting Limit (RL).

Data Validation Qualifiers (D):

(None)

Other Notes:

D Duplicate

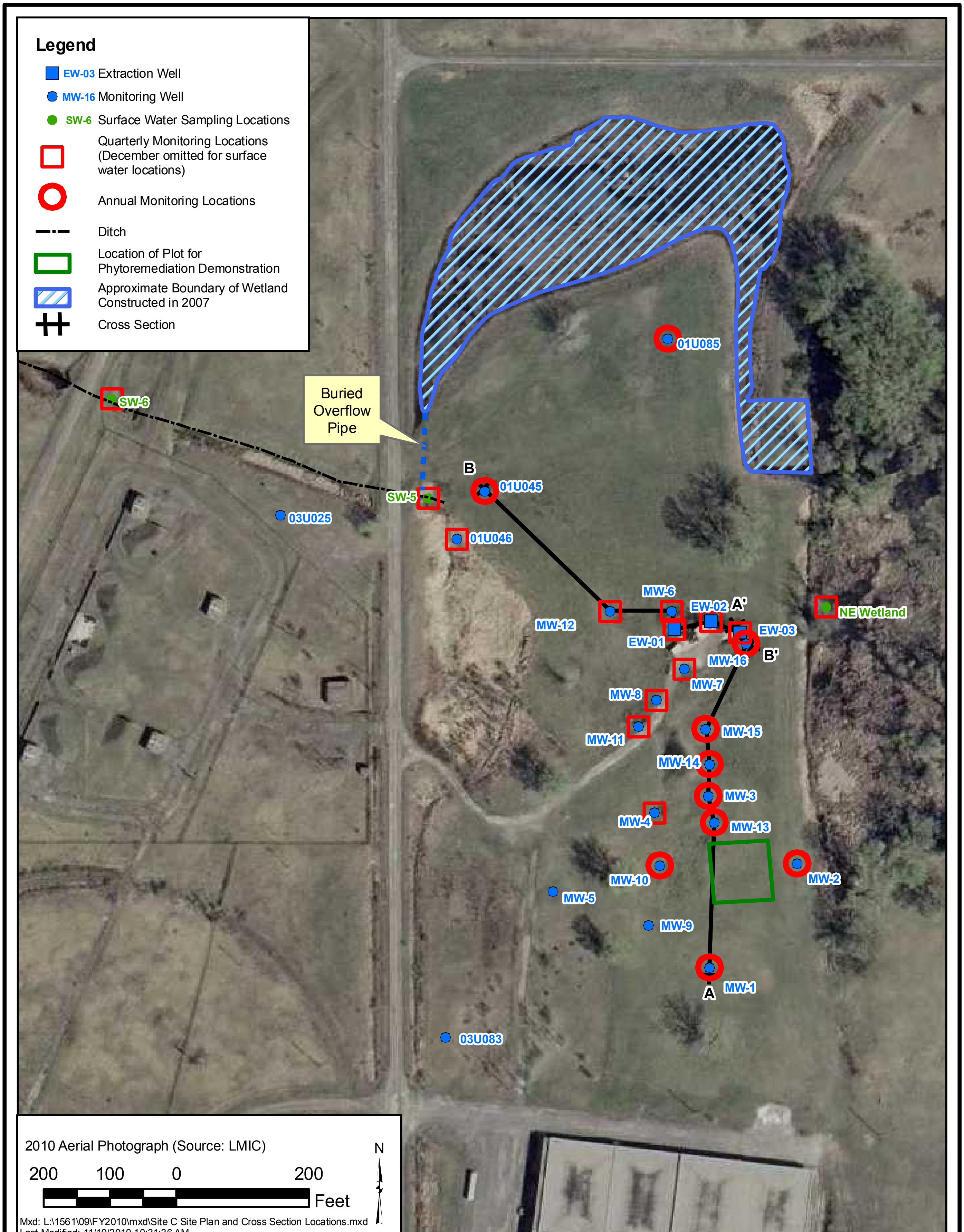
(1) The cleanup level for Site C Surface Water is from Table 1 of OU2 ROD Amendment #1.

Table 7-4
Contingency Locations for Site C Monitoring

	Contingency Role	
	Trigger for Contingency Action[1]	Contingency Action
MW-4	If 3-event moving average > 15 µg/l	Note 3
MW-6	If 3-event moving average > 6.9 µg/l	Note 3
MW-7	If 3-event moving average > 15 µg/l	Note 3
MW-8	If 3-event moving average > 15 µg/l	Note 3
MW-11	If 3-event moving average > 15 µg/l	Note 3
MW-12	If 3-event moving average > 6.9 µg/l	Note 3
01U046	If 3-event moving average > 6.9 µg/l	Note 4
EW-1	If 3-event moving average > 15 µg/l	Note 5
EW-2	If 3-event moving average > 15 µg/l	Note 5
EW-3	If 3-event moving average > 15 µg/l	Note 5
SW5 [2]	If one sampling event > 6.9 µg/l	Note 4
SW6 [2]	If one sampling event > 6.9 µg/l	Note 6
NE Wetland [2]	If one sampling event > 6.9 µg/l	Note 4

Notes:

1) Water quality monitoring is for dissolved lead in monitoring/extraction wells and surface water.
2) Surface water sampling is performed on three consecutive days and results are averaged for comparison to the trigger.
3) Army notify USEPA/MPCA within 1 week from receipt of data and submit an evaluation report within 30 days from notification.
4) Army notify USEPA/MPCA within 1 week from receipt of data; turn GW Extraction System back on; initiate monthly sampling of SW-5, SW-6, the NE Wetland, and the replacement wetland; and submit an evaluation report within 30 days from notification.
5) Army notify USEPA/MPCA within 1 week from receipt of data; turn GW Extraction System back on; and submit an evaluation report within 30 days from notification.
6) Army notify USEPA/MPCA within 1 week from receipt of data; turn GW Extraction System back on; initiate monthly sampling of SW-5, SW-6, the NE Wetland, and the replacement wetland; and submit an evaluation report within 30 days from notification. If SW-6 exceedance continues for 3 consecutive months, contain the surface water at SW-6, treat (if necessary) and discharge to sanitary sewer.



ANNUAL PERFORMANCE REPORT

Site C Monitoring Plan (Current)

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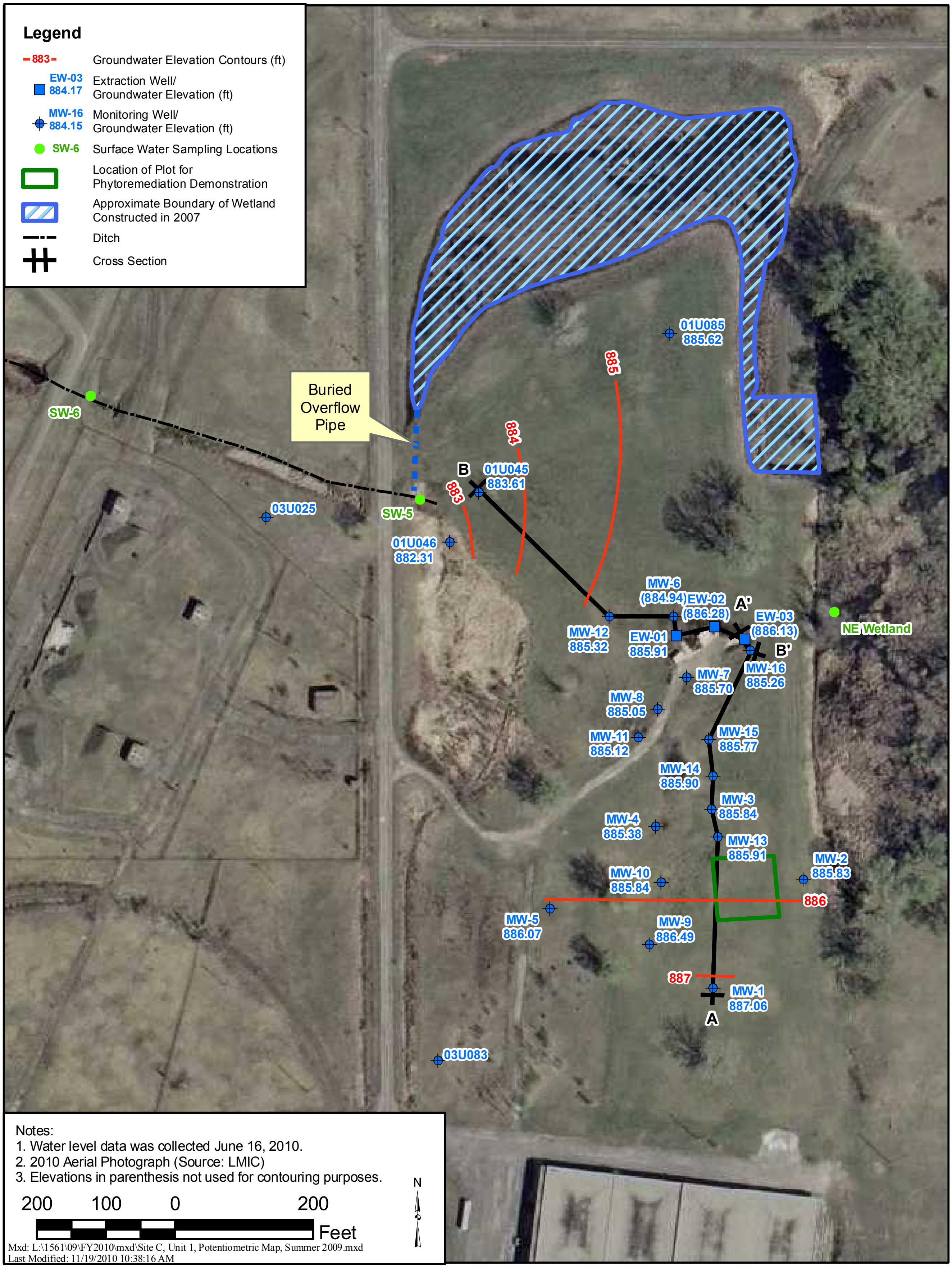
FY 2010

Figure 7-1



ANNUAL PERFORMANCE REPORT

Site C, Unit 1, Potentiometric Map, Summer 2010

Wenck

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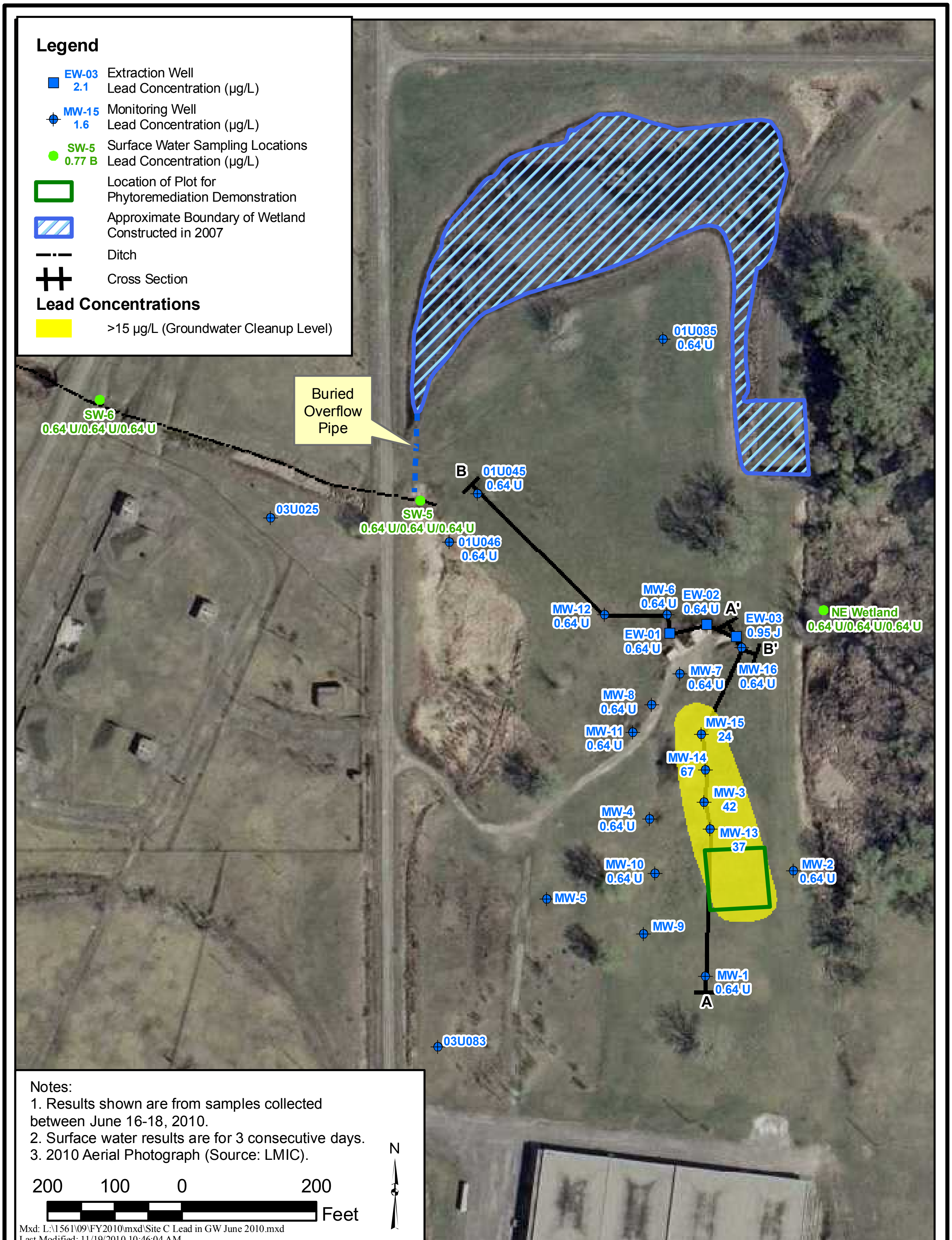
FY 2010

Figure 7-2



ANNUAL PERFORMANCE REPORT

Site C, Unit 1, Lead Results, Summer 2010

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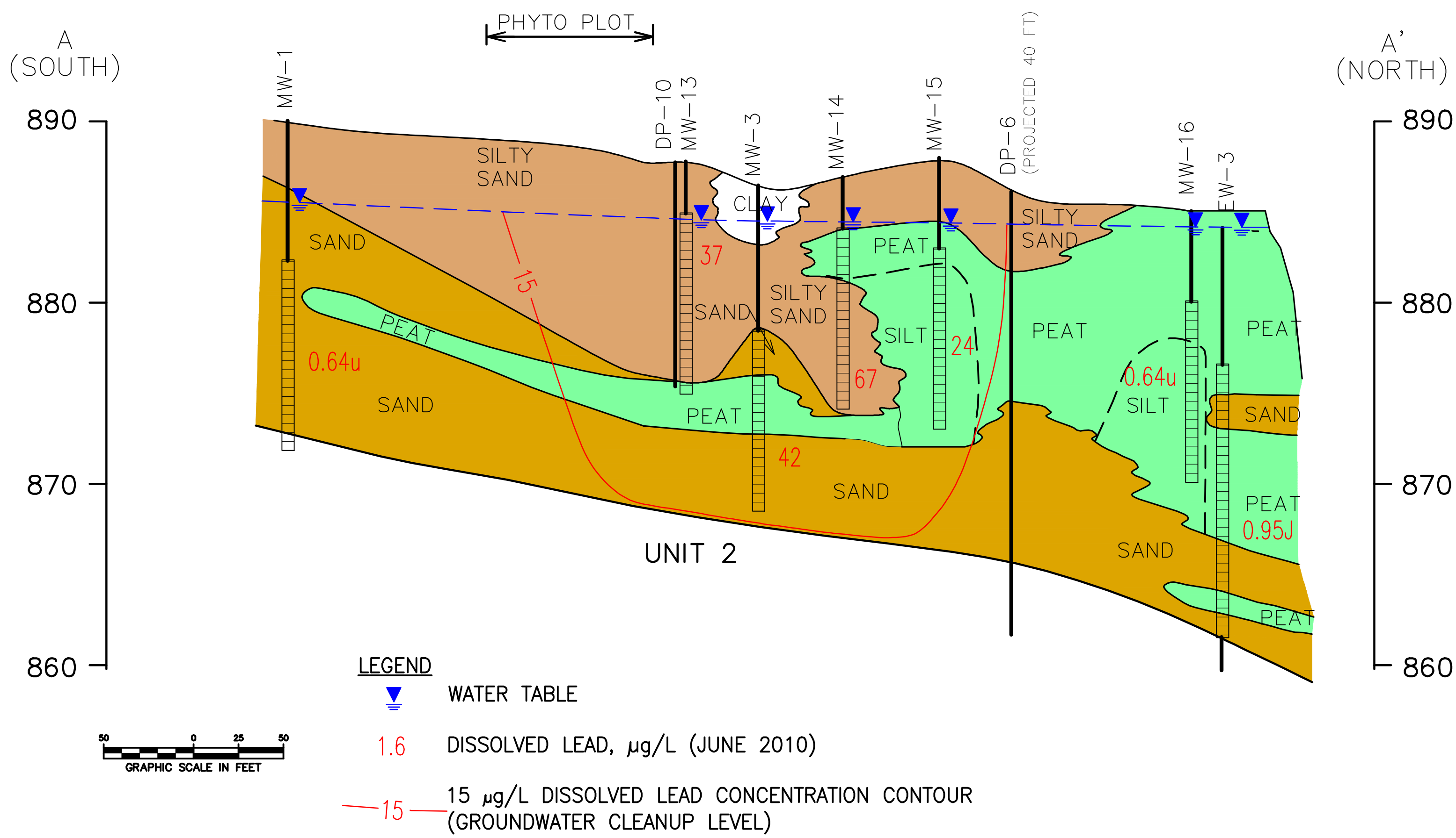
Environmental Engineers Maple Plain, MN 55359-0429

FY 2010

Figure 7-3



M:/1561/2010/no-so-xsec_rev1.dwg

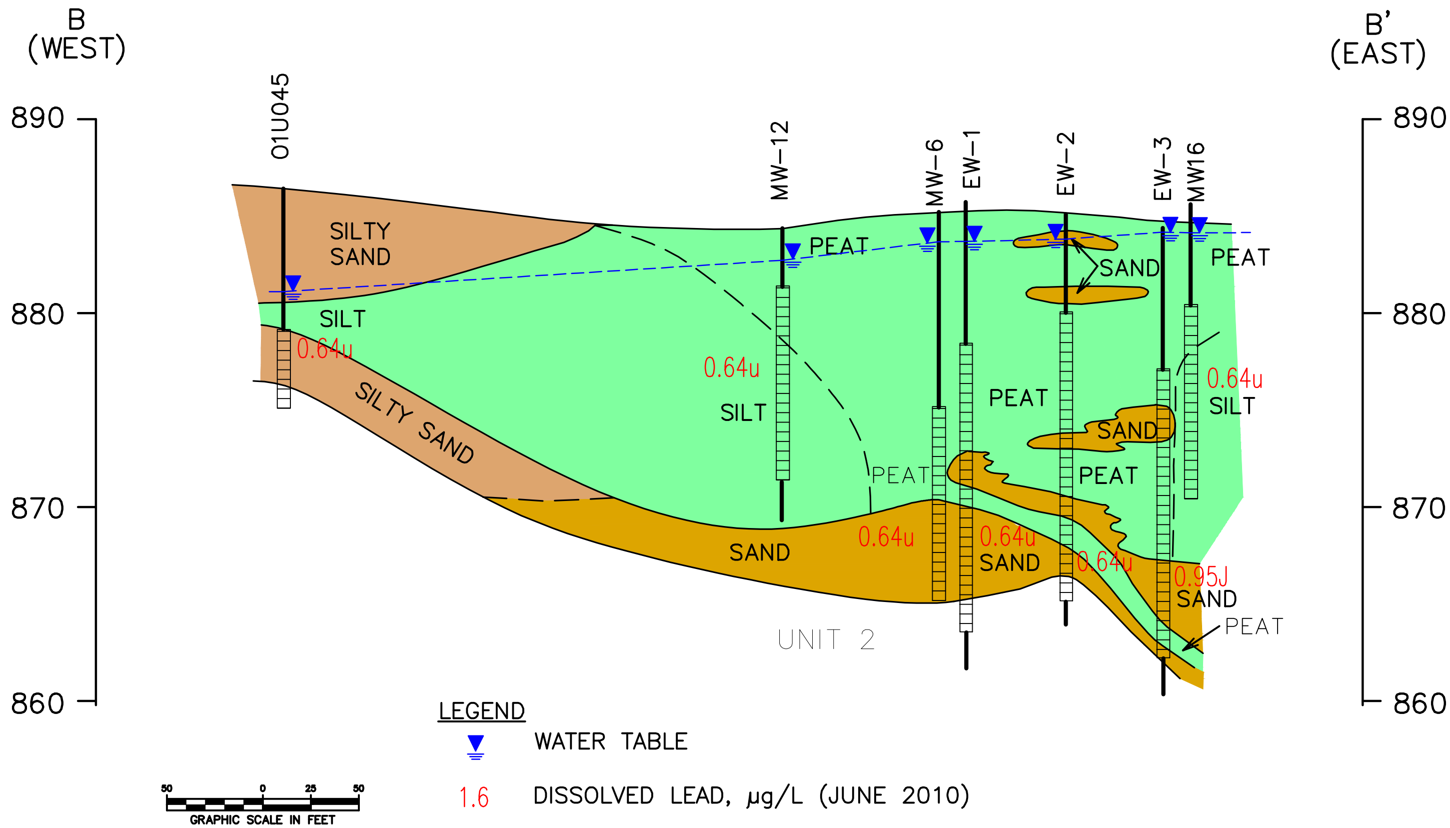
ANNUAL PERFORMANCE REPORT

Site C, Cross-Section A-A'

Wenck
Wenck Associates, Inc.
Environmental Engineers
1800 Pioneer Creek Ctr.
Maple Plain, MN 55359
P.O. Box 249
(763) 479-4200

FY 2010

Figure 7-4



M:/1561/2010/e-w-xsec_rev1.dwg

ANNUAL PERFORMANCE REPORT

Site C, Cross-Section B-B'

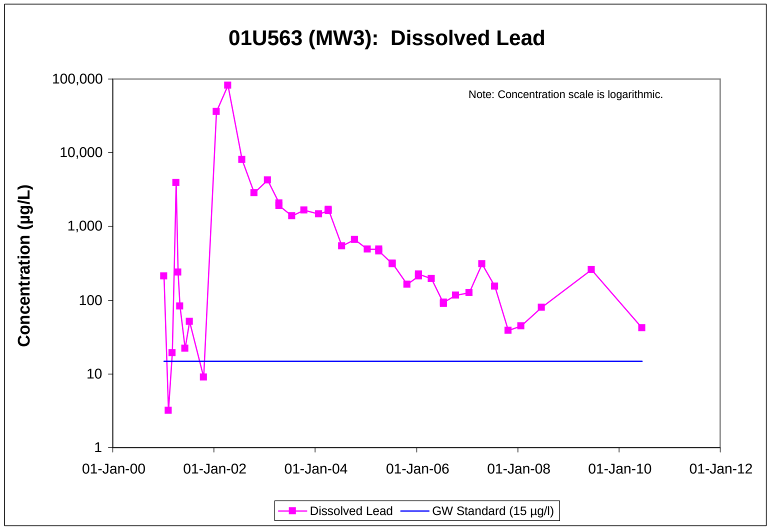
Wenck

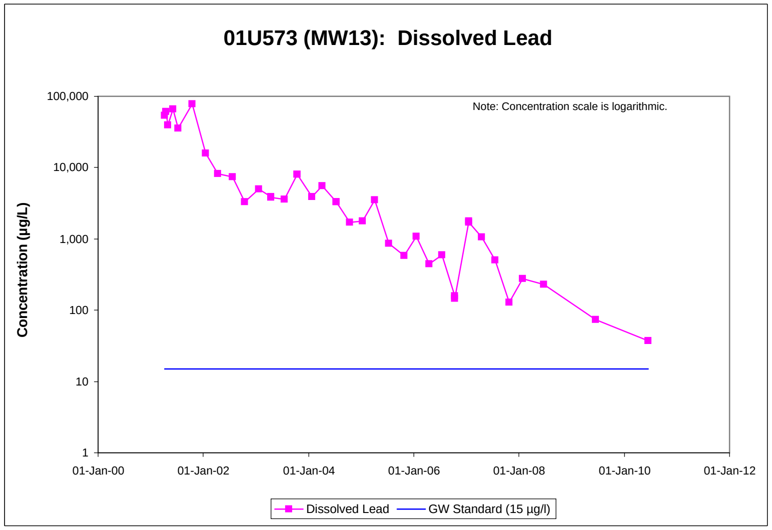
Wenck Associates, Inc. Environmental Engineers
1800 Pioneer Creek Ctr. Maple Plain, MN 55359
P.O. Box 249 (763) 479-4200

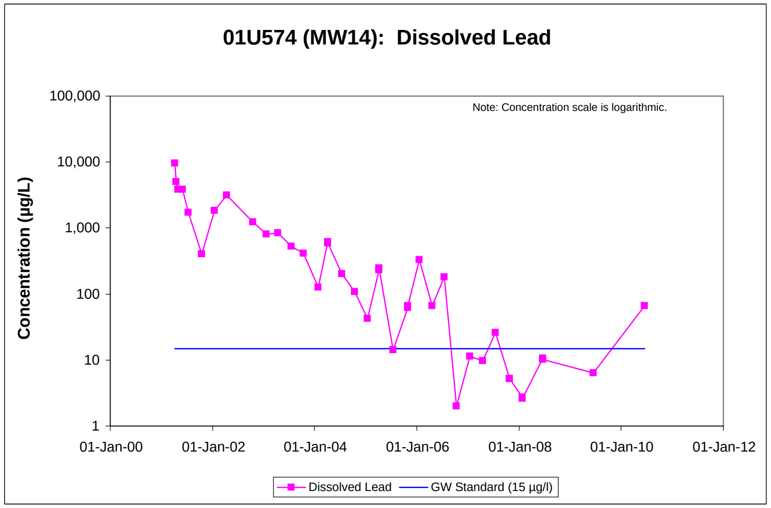
FY 2010

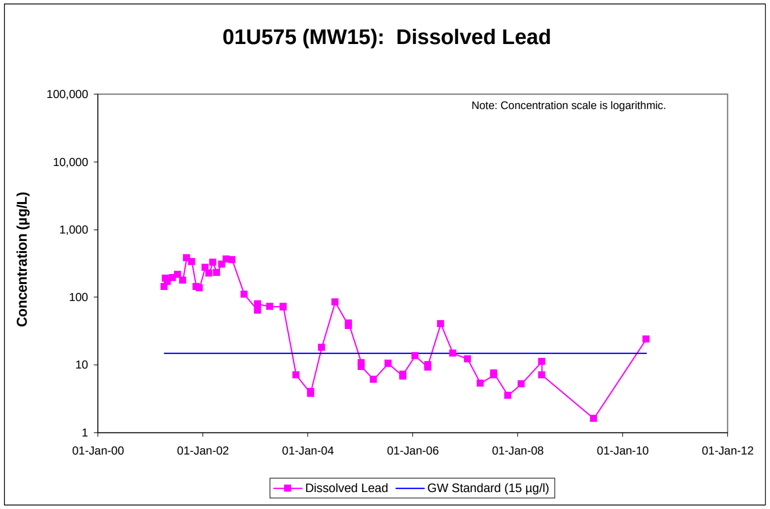
Figure 7-5

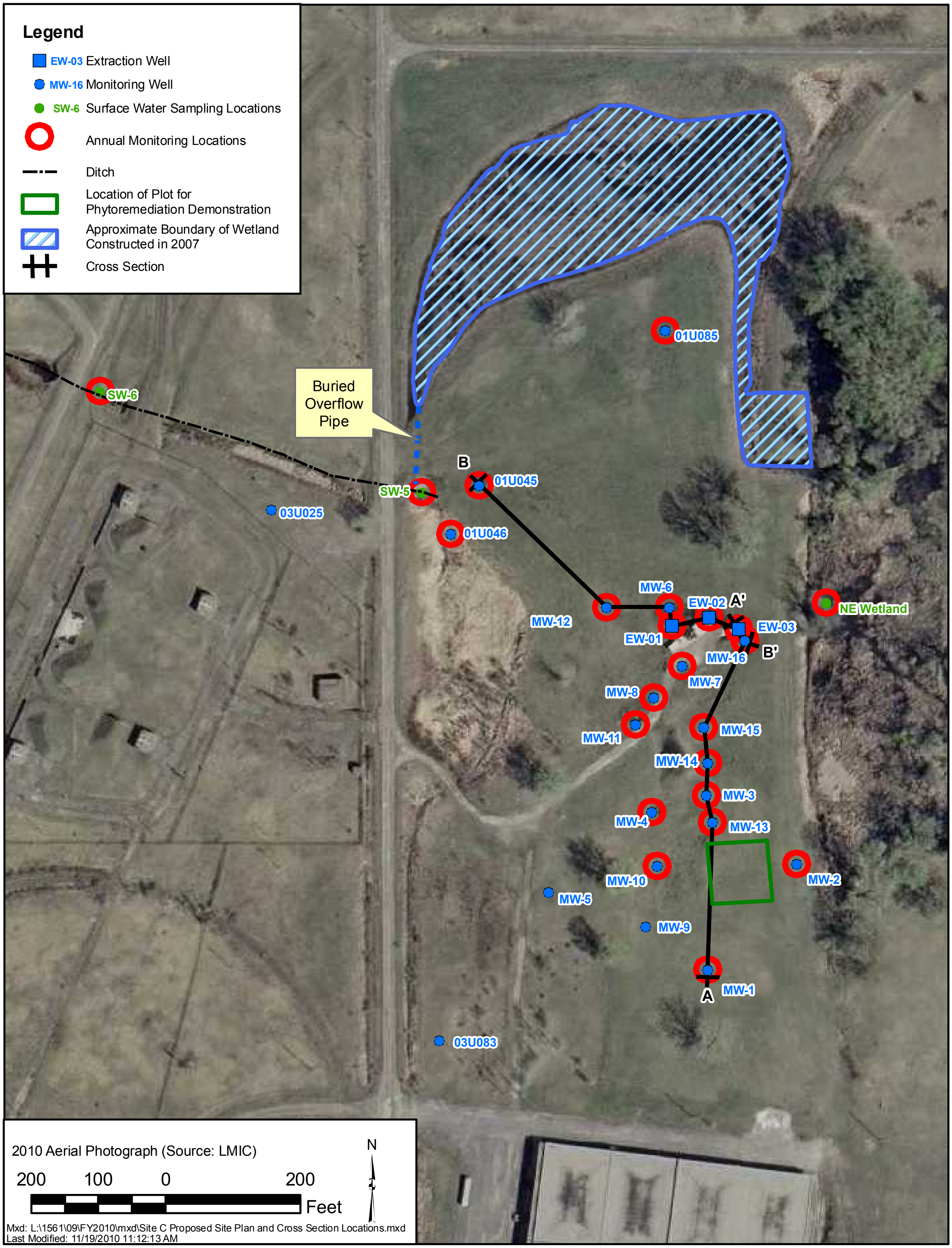
FIGURE 7-6
SITE C, LEAD WATER QUALITY TRENDS: MONITORING WELLS
FY 2010 ANNUAL PERFORMANCE REPORT











ANNUAL PERFORMANCE REPORT

Site C, Proposed Monitoring Plan (Beginning FY 2012)

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1800 Pioneer Creek Center Maple Plain, MN 55359-0429

FY 2010

Figure 7-7

8.0 Operable Unit 2: Site I Shallow Groundwater

VOCs have been identified in the Unit 1 (perched aquifer) at Site I. The selected remedy in the OU2 ROD (1997) consisted of four components:

- Groundwater monitoring
- Groundwater extraction
- POTW discharge
- Additional characterization

The additional investigation and Predesign Investigation Work Plan (Work Plan) were completed in FY 2000. Based on these documents, the remedy was proposed to consist of a dual-phase vacuum extraction system, which combined groundwater extraction with soil vapor extraction, to be installed beneath Building 502. A pilot test of dual-phase extraction subsequently determined that the technology was not feasible due to the low permeability of the Unit 1 aquifer beneath the building.

OU2 ROD Amendment #2 (2009) revised the requirements for shallow groundwater to the following:

- Groundwater monitoring
- Additional characterization
- Land use controls

These three major remedy components are evaluated in the following sections.

8.1 REMEDY COMPONENT #1: GROUNDWATER MONITORING

Description: "Groundwater monitoring to track remedy performance." (OU2 ROD, page 3)

Performance Standard (how do you know when you're done):
When a monitoring plan has been established and ongoing monitoring is in compliance with the plan.

Is the remedy component being implemented?
Yes. Table 8-1 summarizes the performance monitoring requirements, the implementing parties, and the documents that contain the monitoring plans. Appendix A summarizes the FY 2010 monitoring plan and any deviations are explained in Appendix C.2.

Nine Unit 1 monitoring wells were planned for sampling at Site I (Building 502) during FY 2010. These wells were 01U064, 01U632, 01U636, 01U639, 01U640, I01MW, I02MW, I04MW, and I05MW. Figure 8-1 shows these well locations. For FY 2010, both monitoring wells 01U639 and 482089 (I04MW) were included on the list of monitoring locations. Of the two wells, well 01U639 is the primary sampling location and 482089 (I04MW) is the alternate sampling location in the event monitoring well 01U639 is dry. If it is not possible to collect a groundwater sample from 01U639, then an attempt is made to collect a sample from 482089 (I04MW). Well 01U639 is selected as the primary location because there are more years of analytical data associated with this location.

Wells 01U639, I01MW, and I02MW were dry at the time of sampling and hydraulic monitoring (see Figure 8-2). Wells 01U632 and 01U640 had sufficient water to conduct hydraulic monitoring but had insufficient levels to conduct sampling with less than 1 inch and less than 3 inches of water in the wells, respectively. Groundwater samples were collected from wells 01U064, 01U636, I04MW, and I05MW. The groundwater samples were analyzed using EPA Method 8260 for VOCs.

The lack of water in Site I monitoring wells during previous years monitoring events is partially attributable to drier than normal precipitation in the months preceding the June sampling event. In addition, perched aquifers in general, and the Site I perched aquifer in particular (due to the presence of the impermeable Building 502 footprint), receive far fewer water inputs than a typical regionally connected groundwater aquifer. To accommodate this trend, future groundwater monitoring will occur in March or April to coincide with the typically higher groundwater elevation in early spring.

Is any groundwater sampling proposed prior to the next report? Yes. Groundwater monitoring at Site I will be in accordance with the monitoring plan shown in Appendix A.1.

Are any changes or additional actions required for this remedy component? No.

8.2 REMEDY COMPONENT #2: ADDITIONAL INVESTIGATION

Description: "Additional characterization of the Unit 1 and Unit 2 soil and groundwater." (OU2 ROD, page 3)

Performance Standard (how do you know when you're done):
When the work has been completed according to an Agency approved work plan.

Has the remedy component been implemented?
Yes. The results of the additional investigation were included in the Work Plan. The additional investigation resulted in a pilot study to evaluate the applicability of dual-phase vacuum extraction technology to the site. The report concluded that neither dual-phase extraction nor groundwater extraction is feasible at Site I. The May 2009 OU2 ROD Amendment removed the groundwater extraction and POTW discharge component of the remedy.

Are any changes or additional actions required for this remedy component? No.

8.3 REMEDY COMPONENT #3: LAND USE CONTROLS

Description: "LUCs will be established to protect the groundwater extraction, treatment, and monitoring system and to prohibit the drilling of water supply wells within the contaminated portion of the Unit 1 aquifer." (OU2 ROD Amendment #1, page 39)

Performance Standard (how do you know when you're done):
For initial implementation, when the USEPA and MPCA have provided consistency approval for an OU2 Land Use Control Remedial Design (LUCRD) document. Implementation will continue until such time that the groundwater concentrations are below the cleanup levels.

Has a LUCRD document been approved to address land use control (LUC) issues for OU2, including Site I groundwater, and is it being implemented?
Yes. The USEPA and MPCA provided consistency approval for the OU2 LUCRD in September 2010 and it is being implemented by the Army.

Was an annual site inspection for land use controls conducted in FY 2010?
Yes. On July 14, 2010, the Army, National Guard, and Wenck conducted the annual inspection of OU2 sites. The checklist that was completed during the inspection is included as Appendix I.

Did the inspection identify any follow-up actions needed to maintain the protectiveness of the LUCs?
No.

8.4 OVERALL REMEDY FOR SITE I SHALLOW GROUNDWATER

Performance Standard (how do you know when you're done):

When the cleanup levels in Table 1 of the OU2 ROD have been attained throughout the areal and vertical extent of the Site I plume (OU2 ROD, page 55).

Has the Site I shallow groundwater remedy been completed (i.e., have the cleanup levels in Table 1 of the OU2 ROD been attained throughout the areal and vertical extent of the Site I plume)?

No. Table 8-2 presents the FY 2010 groundwater quality data and highlights the values that exceed a cleanup level. Groundwater was present in sufficient volumes to collect groundwater monitoring samples from four Site I monitoring wells (01U064, 01U636, I04MW, and I05MW). The concentration of trichloroethene in I04MW was above the cleanup level in FY 2010. The concentration of vinyl chloride in 01U604 has decreased over time, but was still above the cleanup level in FY 2010.

Do additional remedial measures need to be addressed? No.

Table 8-1

Summary of Site I Groundwater Monitoring Requirements
Fiscal Year 2010

Remedy Component	Monitoring Requirements	Implementing Party	Documents Containing the Monitoring Plan
#1: Groundwater Monitoring	a. Groundwater quality and water levels to track remedy progress.	ATK	Site I Monitoring Plan in Annual Performance Report
#2: Additional Investigation	a. None (completed)		
#3: Land Use Controls	a. None		
OR: Overall Remedy	a. Water quality data to evaluate attainment.	ATK	Site I Monitoring Plan in Annual Performance Report

TABLE 8-2

GROUNDWATER QUALITY DATA
FISCAL YEAR 2010
SITE I, OU2
ARDEN HILLS, MINNESOTA

		Trichloroethene	*cis-1,2-Dichloroethene*	*trans-1,2-Dichloroethene*	*Vinyl chloride*
Site I Cleanup Level (1)		30	70 (total)		0.2
Location	Date	µg/l	µg/l	µg/l	µg/l
01U064	6/2/2010	0.71 (J)	31	1.9	**1.7**
01U064 D	6/2/2010	0.61 (J)	33	2.1	**1.9**
01U632	6/2/2010	NS	NS	NS	NS
01U636	6/2/2010	<1	<1	<1	<1
01U639	6/2/2010	Dry	Dry	Dry	Dry
01U640	6/2/2010	NS	NS	NS	NS
482086 (I01MW)	6/2/2010	Dry	Dry	Dry	Dry
482088 (I02MW)	6/2/2010	Dry	Dry	Dry	Dry
482089 (I04MW)	6/2/2010	**34**	0.87 (J)	<1	<1
482087 (I05MW)	6/2/2010	1.6	<1	<1	<1

Notes:

(1) Cleanup levels for Site I Shallow Groundwater are from the OU2 ROD
J Value is estimated, analyte is between the method detection limit and reporting limit.
D Duplicate Sample
NS Not sampled due to insufficient water in the wells.
Bolding indicates exceedances of cleanup levels

Legend

MONITORING WELL LOCATION

NOTE:

WELL NOMENCLATURE:
ERIS OR MN UNIQUE # NAME
(COMMON NAME)

0 175 350 700

Feet

N

Geographic Information Systems

Stantec

4444 Centerville Road, Suite 140, White Bear Lake, MN 55127 Phone 651.653.9112 www.stantec.com

PREPARED FOR:
ALLIANT TECHSYSTEMS
TWIN CITY ARMY AMMUNITION PLANT
ARDEN HILLS, MINNESOTA

SITE I, UNIT 1
GROUNDWATER QUALITY
MONITORING LOCATIONS

FIGURE: 8-1

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
182602182	TF	AG	AG	11/22/10

LEGEND:

- MONITORING WELLS
- 948.38 GROUNDWATER ELEVATION (FEET AMSL)
- NM NOT MEASURED

NOTE:

WELL NOMENCLATURE:
ERIS OR MN UNIQUE # NAME
(COMMON NAME)

0 125 250 500 750 1,000
Feet

N

Geographic Information Systems

Stantec
4444 Centerville Road, Suite 140, White Bear Lake, MN 55127 Phone 651.653.9112 www.stantec.com

PREPARED FOR:		SITE I, UNIT 1 GROUNDWATER ELEVATION MAP 06/01/10		FIGURE:
ALLIANT TECHSYSTEMS TWIN CITY ARMY AMMUNITION PLANT ARDEN HILLS, MINNESOTA				8-2
JOB NUMBER: 182602182	DRAWN BY: TF	CHECKED BY: AG	APPROVED BY: AG	DATE: 10/27/10

9.0 Operable Unit 2: Site K Shallow Groundwater

VOC contamination has been identified in the Unit 1 (perched aquifer) at former Building 103. The limits of the VOC plume in the perched groundwater have been defined to be beneath and immediately northwest of former Building 103.

The remedy selected in the OU2 ROD consisted of seven components that incorporated the existing groundwater extraction trench and air stripper, which began operation in August 1986. The remedy also included additional investigation of the unsaturated soils beneath the building slab. OU2 ESD #1 added land use controls as a remedy component in 2009.

9.1 REMEDY COMPONENT #1: GROUNDWATER MONITORING

Description: "Groundwater monitoring to track remedy performance." (OU2 ROD, page 3)

Performance Standard (how do you know when you're done):
When a monitoring plan is established and monitoring is in compliance with the plan.

Is the remedy component being implemented?
Yes. Table 9-1 summarizes the performance monitoring requirements, the implementing parties, and the documents that contain the monitoring plans. Appendix A summarizes the FY 2010 monitoring plan and any deviations are explained in Appendix C.2.

Water levels are collected annually from the monitoring wells and bundle piezometers in the vicinity of the groundwater collection and treatment system. The comprehensive monitoring well sampling round was conducted in June 2010. Figure 9-1 presents the sampling and water level monitoring locations. Figure 9-1 also shows the cross-section alignment.

Is any groundwater sampling proposed prior to the next report? Yes. Groundwater monitoring at Site K will be in accordance with the monitoring plan shown in Appendix A.1.

Are any changes or additional actions required for this remedy component? No.

9.2 REMEDY COMPONENT #2: SENTINEL WELLS

Description: "Installation of sentinel wells at the bottom of Unit 1 and top of Unit 3." (OU2 ROD, page 3)

Performance Standard (how do you know when you're done):
When the wells have been installed according to a regulator approved work plan.

Is the remedy component being implemented?
Yes. The upper Unit 3 sentinel well was installed in February 2000. The sentinel well was installed to monitor the potential for VOCs to migrate through the Unit 2 till and into the Unit 3 aquifer.

Existing piezometers were used to accomplish the deep Unit 1 sentry monitoring. Piezometers 01U625D, 01U626D, 01U627D, and 01U628D were used since they monitor the base of the Unit 1 aquifer near the trench. The issue is the potential for Dense Non-Aqueous Phase Liquids (DNAPLs) to migrate beneath the trench along the Unit 1/Unit 2 interface. These four piezometers are screened at that interface.

Figure 9-1 shows the location of the upper Unit 3 sentinel well (03U621) and the piezometers.

What are the results of the Unit 1 piezometer and Unit 3 sentinel well sampling?

The piezometers (Unit 1 sentinel wells) were sampled in March 2000 and the results were discussed in the FY 2000 APR. The results did not indicate the presence of DNAPLs at the Unit 2/Unit 3 interface. This was a one-time sampling event, as required by the MPCA/USEPA approved Predesign Investigation Work Plan, Site K, TCAAP, CRA, February 1999, and as documented in the Predesign Investigation Report, Site K, TCAAP, CRA, December 2001, for which concurrence was received.

The Unit 3 sentinel well (03U621) was sampled in March, July, and September 2000, of FY 2000, and in January 2001 for the quarterly sampling required by the Work Plan. After that, the well was incorporated into the regular TCAAP monitoring plan. The well was sampled in June 2010 for FY 2010. The results of the sample collected during FY 2010 are presented in Table 9-2. Trichloroethene was detected in the Unit 3 sentinel well at a concentration of 0.27 µg/L which is above the method detection limit but below the reporting limit.

Are any changes or additional actions required for this remedy component? No.

9.3 REMEDY COMPONENT #3: HYDRAULIC CONTAINMENT

Description: "Use of existing interceptor/recovery trench to contain the plume and remove impacted groundwater." (OU2 ROD, page 3)

Performance Standard (how do you know when you're done):
When the trench is operating as designed and capturing all groundwater exceeding the cleanup levels presented in Table 1 of the OU2 ROD, as described below.

Is the remedy component being implemented?
Yes. The groundwater collection system continues to provide capture (as described later) of the Unit 1 groundwater, upgradient of the trench and beneath the Building 103 slab, as designed.
Is the system providing hydraulic capture of the plume?

Yes. Water level data are presented in Table 9-3. Figure 9-2 presents a plan view of the groundwater contours from the June 2010 round of groundwater level measurements. At nested wells, the numerically lowest water elevation was used to create the plan view contours. Monitoring wells downgradient of the extraction trench show consistently higher water levels than those near and upgradient of the trench. This demonstrates that the horizontal hydraulic gradient has been reversed toward the extraction trench due to system operation.

Vertical capture was also effective as illustrated on Figure 9-3. As seen in the figure, groundwater both upgradient and downgradient of the trench is captured and collected. The upward gradient beneath the trench indicates that groundwater does not migrate below the trench. The monitoring coverage provided by the bundle piezometers, demonstrates complete vertical and horizontal hydraulic capture.

Figure 9-4 presents the trichloroethene concentrations from the June 2010 annual sampling event. The plume was originally defined based on data from all of the monitoring wells. The current monitoring well network is used to confirm the plume contours and measure the progress of remediation. Thus, the contours on Figure 9-4 were drawn with consideration of the extensive historical data. Comparison of Figure 9-4 to the groundwater elevation contour maps indicates that the VOC plume is hydraulically contained by the treatment system.

Are any changes or additional actions required for this remedy component? No.

9.4 REMEDY COMPONENT #4: GROUNDWATER TREATMENT

Description: "Treatment of contaminate d groundwater using air stripping." (OU2 ROD, page 3)

Performance Standard (how do you know when you're done):

When the air stripping facility is treating water to the cleanup standards.

Is the remedy component being implemented?

Yes. During FY 2010, the treatment system functioned and was operational 99.1% of the time. During FY 2010, a regular maintenance schedule was maintained. Appendix F.1 summarizes operational data and events at the groundwater extraction and treatment system.

Are any changes or additional actions required for this remedy component? No.

9.5 REMEDY COMPONENT #5: TREATED WATER DISCHARGE

Description: "Discharge of treated groundwater to Rice Creek." (OU2 ROD, page 3)

Performance Standard (how do you know when you're done):

When the system is operating as designed with treated water discharge to the storm sewer that, in turn, discharges to Rice Creek. The water is required to meet the substantive requirements of Document No. MNU000579 (MPCA), which contains the state-accepted discharge limits for surface water. Sampling and analysis are performed to monitor performance (see below).

Is the remedy component being implemented?

Yes. See discussion in Section 9.6.

Are any changes or additional actions required for this remedy component? No.

9.6 REMEDY COMPONENT #6: DISCHARGE MONITORING

Description: "Monitoring to track compliance with discharge requirements." (OU2 ROD, page 3)

Performance Standard (how do you know when you're done):
When a monitoring plan is established and is being implemented in accordance with the plan.

Is the remedy component being implemented?
Yes. Treatment system monitoring consisted of quarterly influent and effluent sampling. Influent and effluent analytical results are presented in Table 9-4 (organics) and Table 9-5 (inorganics). The discharge met all the treatment requirements with the exception of copper during the September 2010 sampling event. Copper concentrations were 24 mg/L in September 2010. The system effluent was resampled in October 2010 in accordance with the Performance Monitoring QAPP. The October 2010 sample exhibited a copper concentration of 25 mg/L. The maximum daily concentration for copper, as stated in the Substantive Requirement Document, is 21 mg/L. Because copper is not a contaminant of concern and the system does not treat copper, no further actions were proposed.

Are any changes or additional actions required for this remedy component? No.

9.7 REMEDY COMPONENT #7: ADDITIONAL INVESTIGATION

Description: "Additional characterization of the unsaturated Unit 1 soil." (OU2 ROD, page 3)

Performance Standard (how do you know when you're done):
When the additional investigation has been completed according to a regulator approved work plan.

Is the remedy component being implemented?

Yes. The Work Plan was approved in FY 1999. A report of the investigation results received a consistency determination from the Agencies on December 6, 2001. The report defined the extent of VOC contaminated soils beneath Building 103 and refined the location of the source area. The report and subsequent follow up sampling resolved anomalous dissolved zinc, lead, and nickel data at two monitoring wells. Zinc, lead, and nickel are no longer groundwater concerns.

Are any changes or additional actions required for this remedy component? No.

9.8 REMEDY COMPONENT #8: LAND USE CONTROLS

Description: "LUCs will be established to protect the groundwater extraction, treatment, and monitoring system and to prohibit the drilling of water supply wells within the contaminated portion of the Unit 1 aquifer." (OU2 ROD Amendment #1, page 39)

Performance Standard (how do you know when you're done):

For initial implementation, when the USEPA and MPCA have provided consistency approval for an OU2 Land Use Control Remedial Design (LUCRD) document. Implementation will continue until such time that the groundwater concentrations are below the cleanup levels.

Has a LUCRD document been approved to address land use control (LUC) issues for OU2, including Site K groundwater, and is it being implemented?

Yes. The USEPA and MPCA provided consistency approval for the OU2 LUCRD in September 2010 and it is being implemented by the Army.

Was an annual site inspection for land use controls conducted in FY 2010?

Yes. On July 14, 2010, the Army, National Guard, and Wenck conducted the annual inspection of OU2 sites. The checklist that was completed during the inspection is included as Appendix I.

Did the inspection identify any follow-up actions needed to maintain the protectiveness of the LUCs? No.

9.9 OVERALL REMEDY FOR SITE K

Performance Standard (how do you know when you're done):
When the cleanup levels in Table 1 of the OU2 ROD have been attained throughout the areal and vertical extent of the Site K plume (OU2 ROD, page 55).

Has the Site K shallow groundwater remedy been completed (i.e., have the cleanup levels in Table 1 of the OU2 ROD been attained throughout the areal and vertical extent of the Site K plume)?
No. Overall, the remedy for Site K continued to operate consistent with past years and in compliance with the required performance criteria.

Table 9-6 presents the VOC mass removal and monthly flow rates. The treatment system captured and treated 6,197,380 gallons of water resulting in the removal of 21.9 pounds of VOCs from the aquifer in FY 2010. The cumulative mass removal is 264.3 pounds of VOCs.

As shown on Figure 9-4, trichloroethene concentrations range from non-detect to 4,900 μg/L. The FY 2010 concentrations at wells 01U615 and 01U611, which monitor the core of the plume, showed a decrease from 4,600 μg/L to 3,700 μg/L in 01U615 and a decrease from 7,000 μg/L to 4,900 μg/L in 01U611 compared to the concentrations measured in FY 2009. The FY 2010 concentration of trichloroethene at 01U615 compares with historical concentrations from the last ten years of sampling, which have ranged from 1,800 μg/L to 7,300 μg/L. Trichloroethene concentrations at monitoring well 01U611 have been relatively stable over the last three years; however, over the last ten years concentrations have decreased an order of magnitude. With the exception of relatively stable trichloroethene concentrations in 01U615, the overall trend throughout Site K continues to show a gradual decrease in trichloroethene concentrations over the last fifteen years of sampling. Water levels measured during the FY 2010 monitoring were 0.84 feet higher at 01U615 and 0.80 feet higher at 01U611 compared to FY 2009 elevations. These wells have historically exhibited fluctuating groundwater elevations.

Three wells (01U128, 01U617, and 01U621) continue to exhibit low concentrations of 1,2-dichloroethene downgradient of the groundwater collection system's capture zone. Two of these wells (01U128 and 01U617) have exhibited relatively consistent concentrations of 1,2-dichloroethene since 1987. The third well, 01U621, has exhibited 1,2-dichloroethene since September 1996. The concentrations at these wells were consistent with those measured in FY 2009 and previous years and are below the cleanup levels for Site K.

Do additional remedial measures need to be addressed? No.

9.10 OTHER RELATED ACTIVITY IN FY 2010

Well 01U609 was sampled in June 2010 to monitor the effectiveness of the granular potassium permanganate placement during the 2009 Site K soils excavation. The TCE concentration was 16,000 µg/L. In comparison with 2 previous sampling events conducted at this well, one of which was collected prior to the placement of the potassium permanganate and one which was conducted 4 months after, the TCE concentration over time does not exhibit any apparent trend.

TABLE 9-1

SUMMARY OF GROUNDWATER MONITORING REQUIREMENTS
FISCAL YEAR 2010
SITE K, OU2
ARDEN HILLS, MINNESOTA

	Remedy Component		Monitoring Requirements	Responsible Party	Documents Containing the Monitoring Plan
#1:	Groundwater Monitoring		Outlined below		
#2:	Sentinel Wells	a.	Water quality to monitor potential migration.	ATK	Site K Monitoring Plan in Annual Performance Report
#3:	Hydraulic Containment	a.	Water levels for use in drawing contour maps showing capture.	ATK	Site K Monitoring Plan in Annual Performance Report
		b.	Pumping volumes and rates for reporting and mass removal calculation.	ATK	Site K Monitoring Plan in Annual Performance Report
#4:	Groundwater Treatment		None		
#5:	Treated Water Discharge		None		
#6:	Discharge Monitoring	a.	Treated effluent water quality for comparison to substantive requirements criteria for discharge maximum daily concentration.	ATK	Site K Monitoring Plan in Annual Performance Report
#7:	Additional Investigation	a.	None (completed).		

T:\1561 TCAAP\APR\FY10 APR\Final\Tables\T9-1 Site K Monitoring Requirements.xlsx-Sheet1

TABLE 9-2

GROUNDWATER QUALITY DATA
FISCAL YEAR 2010
SITE K, OU2
ARDEN HILLS, MINNESOTA

		Trichloroethene	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene
Site K Cleanup Level [1]		30	70 (total)	
Location	Date	µg/l	µg/l	µg/l
01U128	6/2/2010	<1.0	3.7	0.6 J
OW103 (01U603)	6/3/2010	<1.0	<1.0	<1.0
01U604	6/3/2010	<1.0	<1.0	<1.0
OW111 (01U611)	6/2/2010	**4900**	**1800**	**1700**
OW115 (01U615)	6/3/2010	**3700**	**730**	**73**
OW117 (01U617)	6/3/2010	<1.0	4.8	0.6 J
OW118 (01U618)	6/3/2010	1.9	12	2.1
OW119 (01U619)	6/2/2010	0.67 J	<1.0	<1.0
OW119 (01U619) D	6/2/2010	0.55 J	<1.0	<1.0
OW121 (01U621)	6/3/2010	<1.0	1.2	<1.0
03U621	6/3/2010	0.27 J	<1.0	<1.0
482083 (K04MW)	6/3/2010	1.5	<1.0	<1.0

Notes:
(1) Cleanup levels for Site K Shallow Groundwater are from the OU2 ROD. **Bolding** indicates exceedance of the cleanup level.
D - Duplicate analysis.
J - Value is estimated, analyte is between the method detection limit an

Table 9-3

GROUNDWATER ELEVATION MONITORING
Fiscal Year 2010
SITE K, OU2
ARDEN HILLS, MINNESOTA

Well ID	*TOC Elevation*	*Depth to Water (ft. BGS)*	*Groundwater Elevation 6/1/2010*
01U047	880.31	7.30	873.01
01U048	885.32	11.41	873.91
01U052	886.51	11.98	874.53
01U065	883.90	10.12	873.78
01U128	883.69	9.70	873.99
01U601	892.68	7.57	885.11
01U602	889.35	4.32	885.03
01U603	887.31	9.64	877.67
01U604	888.98	12.26	876.72
01U605	887.76	10.03	877.73
01U607	891.01	6.35	884.66
01U608	889.30	3.95	885.35
01U609	889.33	3.94	885.39
01U611	889.29	4.10	885.19
01U612	886.91	8.85	878.06
01U613	892.07	7.45	884.62
01U615	888.66	12.23	876.43
01U616	890.37	10.03	880.34
01U617	887.72	10.58	877.14
01U618	891.52	11.62	879.90
01U619	891.75	7.23	884.52
01U620	888.65	9.93	878.72
01U621	886.57	8.36	878.21
01U624A	889.88	11.55	878.33
01U624B	889.88	11.56	878.32
01U624C	889.91	11.58	878.33
01U624D	889.89	11.56	878.33
01U625A	886.92	9.77	877.15
01U625B	886.91	9.80	877.11
01U625C	886.91	9.80	877.11
01U625D	886.92	9.80	877.12
01U626A	886.87	9.91	876.96
01U626B	886.88	10.23	876.65
01U626C	886.88	10.16	876.72
01U626D	886.88	10.11	876.77
01U627A	886.46	8.54	877.92
01U627B	886.47	9.46	877.01
01U627C	886.47	9.56	876.91
01U627D	886.48	9.55	876.93
01U628A	887.82	9.91	877.91
01U628B	887.83	10.17	877.66
01U628C	887.82	10.56	877.26
01U628D	887.84	10.58	877.26
482085 (K01MW)	891.24	5.51	885.73
482084 (K02MW)	891.35	6.57	884.78
482083 (K04MW)	887.66	6.82	880.84
03U621	887.01	36.08	850.93

TABLE 9-4

TREATMENT SYSTEM CONCENTRATIONS (ORGANICS)
FISCAL YEAR 2010
SITE K, OU2
ARDEN HILLS, MINNESOTA

Location	***Sample Date***	1,1-Dichloroethane		1,1-Dichloroethene		1,2-Dichloroethane		cis-1,2-Dichloroethene		trans-1,2-Dichloroethene		Trichloroethene		Vinyl chloride	
Effluent	12/1/2009	<1		<1		<1		<1		<1		<1		<1	
Effluent	12/1/2009	<1	D	<1	D	<1	D	<1	D	<1	D	<1	D	<1	D
Effluent	3/8/2010	<1		<1		<1		<1		<1		<1		<1	
Effluent	6/3/2010	<1		<1		<1		<1		<1		0.42	J	<1	
Effluent	9/7/2010	<1		<1		<1		<1		<1		<1		<1	
Influent	12/1/2009	<1		<1		<1		130		19		300		0.82	J
Influent	3/8/2010	<1		<1		<1		100		14		250		0.82	J
Influent	3/8/2010	<1	D	<1	D	<1	D	100	D	14	D	270	D	0.8	D,J
Influent	6/3/2010	<1		<1		<1		130		11		210		0.72	J
Influent	6/3/2010	<1	D	<1	D	<1	D	140	D	12	D	210	D	0.91	J
Influent	9/7/2010	<1		<1		<1		110		13		390		<1	
Influent	9/7/2010	<1	D	<1	D	<1	D	110	D	12	D	390	D	0.52	D,J
MDL	12/1/2009	0.083		0.14		0.13		0.090		0.084		0.17		0.22	
MDL	3/8/2010	0.083		0.14		0.13		0.090		0.084		0.85		0.22	
MDL	6/3/2010	0.230		0.26		0.22		0.220		0.220		0.23		0.28	
MDL	9/7/2010	0.230		0.26		0.22		0.220		0.220		1.20		0.28	
RL		1		1		1		1		1		1		1	
REQ.		--		7.0		3.8		70		100		10		0.18	

Notes:
Results are reported in µg/L unless otherwise noted
RL - Reporting Limit
D - Duplicate Analysis
J - Value Estimated, analyte is between the MDL and RL
MDL - Method Detection Limit
REQ - Substantive Requirement Document Concentration Limit, Maximum Daily Concentration

TABLE 9-5

TREATMENT SYSTEM CONCENTRATIONS (INORGANICS)
FISCAL YEAR 2010
SITE K, OU2
ARDEN HILLS, MINNESOTA

Location	***Sample Date***	***Phosphorus Total***		***Copper***		***Cyanide***		***Lead***		***Mercury***		***Silver***		***Zinc***	
Effluent	12/1/09	430	J	1.70	UB.685	1.7	J	1.5	J	<0.02	JH1	0.120	UB.36	48	
Effluent	3/8/10	680		2.70	JE11	1.6	UB2.39	0.69	J	0.027	J,UCB0.0354	<0.028		88	
Effluent	6/3/10	1000[1]		5.30		<1.6		1.8	J	<0.049		<1.5		44	
Effluent	9/7/10	400	J, UMB0.096	**24**		<1.3		6.5		<0.032		<1.5		120	JE11
Effluent	10/6/10	NS		**25**[2]		NS		NS		NS		NS		NS	
MDL	12/1/09	77.0		0.083		1.60		0.051		0.02		0.028		0.26	
MDL	3/8/10	77.0		0.083		1.30		0.051		0.02		0.028		0.26	
MDL	6/3/10	77.0		0.830		1.60		0.640		0.049		1.500		2.40	
MDL	9/7/10	77.0		0.830		1.30		0.640		0.032		1.500		2.40	
RL		500		2		10		2		0.100		2		3	
REQ.		1000		21		17		106		0.2		3.4		134	

Notes:
Results are reported in ug/L unless otherwise noted
RL - Reporting Limit
MDL - Method Detection Limit
REQ - Substantive Requirement Document Concentration Limit, Maximum Daily Conc.
Bolding indicates exceedance of Max. Daily Concentration
UB# - Contamination present in method blank; # = concentration present in Blank
UCB# - Contamination present in calibration blank and initial calibration blank; # = concentration present in Blanks
UMB# - Contamination is reported in the method and the calibration blank, # = concentration present in Blanks
J - Estimated value, analyte is between the MDL and RL
JH#- Holding time exceeded; # = number of days holding time exceeded
JE#- Serial dilution percent difference out of control limits; # = %difference
(1) - Sample was collected on 6/15/10
(2) - Effluent was resampled for copper analysis only on 10/6/10
NS- Not Sampled

TABLE 9-6

SUMMARY OF MONTHLY VOC REMOVAL
FISCAL YEAR 2010
SITE K, OU2
ARDEN HILLS, MINNESOTA

Month	Total Monthly Flow (million gallons)	Total VOC Influent Concentration	Total VOC Effluent Concentration	Total VOCs in Treatment Center Discharge (g)	Total VOC Mass Removed (g)	Total VOC Mass Removed (lb)
Cumulative As Of September 2009 (FY09)						242.4
October[(1)]	0.55736	449.82	0	0.00	947.69	2.09
November[(1)]	0.60530	449.82	0	0.00	1029.20	2.27
December	0.47668	449.82	0	0.00	810.50	1.79
January[(1)]	0.41831	364.82	0	0.00	576.86	1.27
February[(1)]	0.34696	364.82	0	0.00	478.46	1.05
March	0.45031	364.82	0	0.00	620.99	1.37
April[(1)]	0.52583	351.72	0.42	0.83	698.26	1.54
May[(1)]	0.56594	351.72	0.42	0.90	751.51	1.66
June	0.57430	351.72	0.42	0.91	762.62	1.68
July[(1)]	0.63574	513	0	0.00	1232.78	2.72
August[(1)]	0.50873	513	0	0.00	986.50	2.17
September	0.53193	513	0	0.00	1031.49	2.27
Totals - FY10	6.19738			2.6	9926.9	21.9
Cumulative To Date						264.3

Notes:
[(1)] Influent and Effluent VOC concentrations from 12/01/09, 03/08/10, 06/03/10 and 09/07/10 quarterly samples, respectively.
Calculations based on compounds with concentrations above the CRDL only.
Analytical data has not received Level IV review and may be revised after completion of review.

Legend

- MONITORING WELL LOCATION
- ANNUAL MONITORING LOCATION
- UNIT 3 SENTINEL WELL
- TRENCH LOCATION
- CROSS SECTION LOCATION

NOTE:

1) WELL NOMENCLATURE: ERIS OR MN UNIQUE # NAME (COMMON NAME)
2) BUILDING 103 DEMOLISHED IN 2006; CONCRETE SLAB REMAINS

0 150 300 600 900 1,200
Feet

N

Geographic Information Systems

Stantec
4444 Centerville Road, Suite 140, White Bear Lake, MN 55127 Phone 651.653.9112 www.stantec.com

PREPARED FOR:
ALLIANT TECHSYSTEMS
TWIN CITY ARMY AMMUNITION PLANT
ARDEN HILLS, MINNESOTA

SITE K, UNIT 1 AND UNIT 3
GROUNDWATER MONITORING
LOCATIONS MAP

FIGURE:
9-1

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
182602182	TF	AG	AG	11/22/10

Legend

- ANNUAL WELLS
- MONITORING WELLS
- CLASS 3 SENTINAL WELL
- POTENTIOMETRIC SURFACE
- TRENCH LOCATION
- 874.10 GROUNDWATER ELEVATION (FEET AMSL)

NOTE:

1) WELL NOMENCLATURE: ERIS OR MN UNIQUE # NAME (COMMON NAME)
2) BUILDING 103 DEMOLISHED IN 2006; CONCRETE SLAB REMAINS

0 200 400 800 1,200 Feet

N

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PREPARED FOR:
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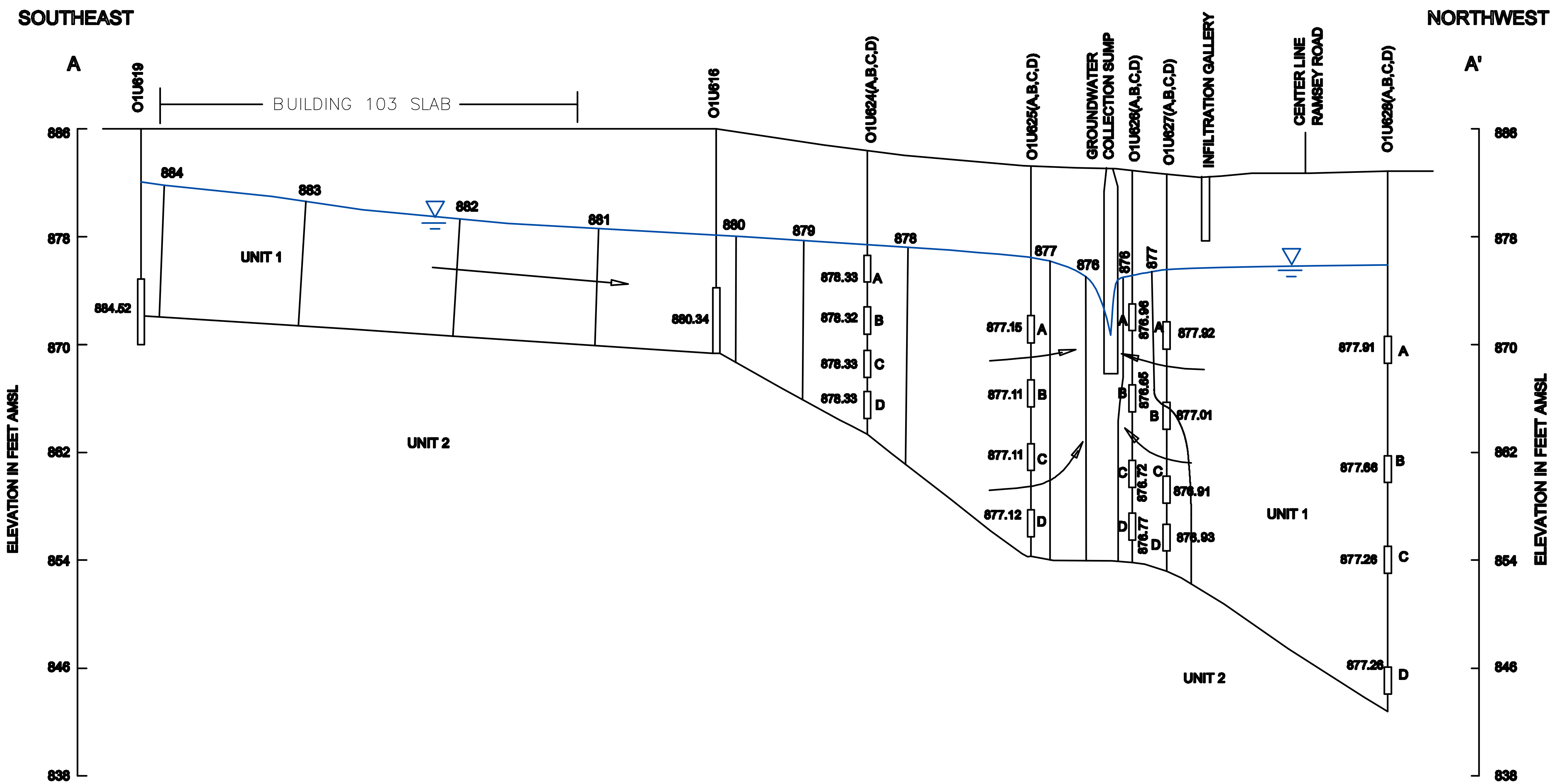
TWIN CITY ARMY AMMUNITION PLANT
ARDEN HILLS, MINNESOTA

SITE K, UNIT 1 AND UNIT 3
GROUNDWATER ELEVATION DATA
06/01/10

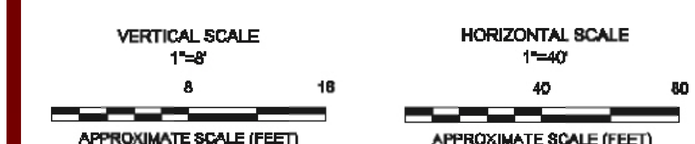
FIGURE: 9-2

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
182602182	TF	AG	AG	10/26/10



LEGEND:

WATER TABLE



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PREPARED FOR:		FIGURE:
ALLIANT TECHSYSTEMS TWIN CITY ARMY AMMUNITION PLANT ARDEN HILLS, MINNESOTA	SITE K HYDROGEOLOGIC CROSS SECTION A-A' 06/02/10 (Q107)	9-3

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
182602182	TF	AG	AG	11/22/10

Legend

- MONITORING WELL LOCATION
- ANNUAL MONITORING LOCATION
- UNIT 3 SENTINEL WELL
- TRENCH LOCATION
- TRICHLOROETHENE CONCENTRATION CONTOUR
- (4400) TRICHLOROETHENE CONCENTRATION (µg/L)
- (ND) NOT DETECTED
- J VALUE IS ESTIMATED

NOTE:

1) WELL NOMENCLATURE:
ERIS OR MN UNIQUE # NAME
(COMMON NAME)

2) BUILDING 103 DEMOLISHED IN 2006; CONCRETE SLAB REMAINS

0 150 300 600 900 1,200
Feet

N

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PREPARED FOR:			
ALLIANT TECHSYSTEMS TWIN CITY ARMY AMMUNITION PLANT ARDEN HILLS, MINNESOTA		SITE K, UNIT 1 AND UNIT 3 TCE CONCENTRATION MAP 06/02/10 (Q107)	FIGURE: 9-4
JOB NUMBER: 182602182	DRAWN BY: TF	CHECKED BY: AG	APPROVED BY: AG
DATE: 11/22/10			

10.0 Operable Unit 2: Deep Groundwater

The selected remedy for the Deep Groundwater in the OU2 ROD consists of five remedial components that include continued use of the TGRS, with modifications to improve VOC contaminant removal from the source area. It also includes an annual review of new and emerging technologies potentially applicable to the Deep Groundwater. This report documents all performance and monitoring data collected from October 2009 through September 2010.

Historical Design and Evaluation of TGRS Remedial Action

In September 1987, a Record of Decision (1987 ROD) was prepared by the USEPA in order to implement the Interim Response Action Plan (IRAP) for TCAAP. The 1987 ROD provided specific criteria for the Boundary Groundwater Recovery System (BGRS). Following extensive interagency negotiations on the FFA and the ROD, the BGRS was started on October 19, 1987.

The BGRS consisted of six Unit 3 extraction wells (B1 through B6), that were connected by forcemain to an air stripping treatment facility. The initial six BGRS extraction wells (B1 through B6) were installed and pumping tests were conducted prior to start up of the BGRS. These pumping tests were documented in the BGRS Extraction Well Pumping Test Report.

Following the initial 90-day operation of the BGRS, the IRA–BGRS Performance Assessment Report (PAR) was prepared. The PAR assessed the hydraulic and treatment performance of the BGRS. The PAR presented an extensive database collected during the initial 90-day period of BGRS operation and prior pertinent data. The PAR also included a summary of the geology, hydrogeology, and remediation history for TCAAP. The PAR was subsequently approved by the MPCA and USEPA.

A pumping test on well B9 was conducted in August 1988 and formed the basis of the final design of the TGRS. This test, and the previous pumping tests, were utilized to determine the pumping rate required to achieve the necessary zone of capture for the TGRS; based on the plume size at that time. The PAR stated that the overall pumping rate needed for the 17 extraction wells was 2,450 gpm. During the detailed design of the TGRS, the system was designed with the capacity to operate at a maximum theoretical rate of 2,900 gpm. The additional pumpage was included to provide a safety margin for the calculations and to allow for fluctuations in system operation.

The PAR made recommendations for expansion of the BGRS into the TGRS in order to meet the Phase II remediation criteria established in the 1987 ROD. These modifications were completed and the expanded system began operation on January 31, 1989.

The 1989 Annual Monitoring Report was the first report covering the fully configured TGRS. It concluded that the TGRS developed a continuous zone of capture that was approximately 4,500 feet wide at the TCAAP boundary. The zone of capture widened to approximately 8,300 feet upgradient of the boundary. This zone of capture was demonstrated at average system pumping rates of 2,400 to 2,700 gpm.

The 1989 Annual Monitoring Report was wider in scope than subsequent annual monitoring reports for the TGRS. The 1989 report was both a performance assessment report and a monitoring report. The 1989 report represented the first year of operation of the expanded TGRS. Thus, a more detailed and exhaustive performance assessment was appropriate and possible, as there were data available from non-pumping conditions for detailed comparison with pumping conditions. Between 1990 and 2002, the system continued to operate at an essentially steady state condition, so the TGRS was evaluated by comparing the pumping rates to those achieved for the 1989 evaluation.

In FY 2003, the Army received agency approval on the TGRS Operating Strategy (OS) document. The OS was based in part on findings from the 1989 Annual Monitoring Report and presented a Global Operation Strategy (GOS) for the entire TGRS extraction system and a Micro Operation Strategy (MOS) for selected well groups. Evaluations now consider and compare actual pumping rates to the GOS and MOS rates presented in the Final TGRS OS.

TGRS Modifications

Since 1990, a number of modifications have been made to the TGRS operation in response to changes in plume configuration or operational issues. A brief summary of the major changes is presented below:

1. Source control well SC4 was shut down in November 1996 in response to insignificant VOC mass removal by this well. SC4 operated at an average extraction rate of 29 gpm in 1989 and 45 gpm prior to shut down.
2. Boundary extraction well B12 was shut down in November 1996. The plume in the B12 area had dropped below cleanup standards for several years. Well B12 operated at an average extraction rate of 139 gpm in 1989 and 190 gpm prior to shut down.
3. As per the OS, boundary extraction well B2 was shutdown and replaced with well B13 that began production in December 2002. The well screen in B2 became fouled and flow rates decreased from an average of nearly 200 gpm in the early 1990s to 52 gpm in 2002. During FY 2003, well B13 operated at maximum pumping capacity of nearly 100 gpm. The original design capacity for B13 was 200 gpm.
4. As per the OS, boundary extraction wells B7 and B10, and source control well SC3 were officially shut down in December 2002 due to the low TRCLE concentrations.
5. As per the OS, a larger capacity pump was installed at well B9 in December 2002 to raise the pumping rate from 150 gpm to approximately 300 gpm.
6. In July 2004, the TGRS was modified (Modification #3) as approved by the Agencies in May 2004. Pumps in Wells B1 and B13 were replaced and the pump in Well B13 was lowered to allow pumping below the well screen.
7. Flow rates at individual wells have been modified from time to time due to plume configuration changes, operational issues, and to maintain the OS.

10.1 REMEDY COMPONENT #1: HYDRAULIC CONTAINMENT AND CONTAMINANT REMOVAL FROM THE SOURCE AREA

Description: "Groundwater extraction to hydraulically contain the contaminated source area to the 5-μg/L TRCLE concentration contour and optimize the removal of contaminants from the source area through pumping of select wells." (OU2 ROD, page 3)

Performance Standard (how do you know when you're done):
When the TGRS is containing the contaminated source area to the 5-μg/L TRCLE contour and the system is operated to maximize the contaminant removal from the source area.

Is the remedy component being implemented?
Yes. The TGRS was operated in FY 2010 consistent with the requirements of the OU2 ROD. Table 10-1 presents the cleanup requirements for the TGRS from the OU2 ROD.

During FY 2010, the average extraction well water pumped was approximately 1,777 gpm. The total extraction well water pumping rate was above the GOS Total System Operational Minimum (1,745 gpm) where the Army and the agencies agree that OU2 ROD requirements are met with an adequate safety factor. Additionally, all of the individual well groupings were above their respective MOS minimums for FY 2010. Pump upgrades and well cleanings conducted during FY 2010 to the southernmost well grouping (03U003, B11, B1, and B13) increased the extraction rate of this grouping to 425 gpm, above the MOS minimum flow rate of 415 gpm.

How is the system operated and what preventative maintenance measures were conducted during the year?

<u>Summary of Operations</u>
Beginning in FY 2003, the system operation changed to conform to the OS. Under the OS, groundwater is extracted from 8 wells along the southwest boundary of TCAAP (B1, B3 through

B6, B8, B9, B11 and B13) and three wells downgradient of interior source areas on TCAAP (SC1, SC2 and SC5). Prior to this, wells B2, B7, B10 and SC3 were also operating components of the system. Submersible pumps in the extraction wells discharge into a common pressurized forcemain that carries the water to the treatment system. The treatment system is located adjacent to Building 116. The TGRS layout is presented on Figure 10-1.

The TGRS was designed and constructed with three options for treated water discharge: recharge at the Arsenal Sand and Gravel Pit, discharge to Rice Creek, and discharge to the elevated water tank. Water stored in the elevated tank was "softened" and then "polished" with granular activated carbon (GAC) prior to distribution at the Facility. Due to the Army discontinuing all non-environmental services at the Facility in September 2007, the elevated water tank and the water softening and polishing equipment are no longer used. As such, the Arsenal Sand and Gravel Pit receives all of the extracted and treated water from the TGRS.

System Operation Specifications

In general, the influent and effluent water flow rates at the treatment plant are designed to be equal, thereby providing continuous operation of all processes and equipment. The following is a summary of the system design parameters:

- The groundwater extraction system, including the treatment center and 17 TGRS extraction wells, was originally designed to provide a theoretical hydraulic capacity of 2,900 gpm and a sustained daily average capacity of 2,730 gpm
- The influent to the treatment plant is divided between Towers 1 and 2, each receiving up to a maximum of 1,450 gpm.
- Wet Well Pumps 1 and 2 (WWP#1 and WWP#2 located in Wet Wells 1 and 2) transfer water to Towers 4 and 3, respectively. Each pump and tower handles up to a maximum of 1,450 gpm.
- Wet Well Pumps 3 and 4 (WWP#3 and WWP#4 located in Wet Well 3) discharge treated water to an end use at a combined rate of up to a maximum of 2,900 gpm.
- Air blowers provide air to the towers. The blowers for Towers 1 and 2 are designed to provide 6,000 – 7,000 standard cubic feet per minute (scfm) each. The blowers for Towers 3 and 4 are designed to provide 9,000 – 14,000 scfm each.

Water level sensors within the wet wells communicate with the programmed logic controller (PLC) according to changing water levels. A complete and balanced operation should provide continuing water levels above the low-level sensors and below the high-level sensors. However, given the probability of unbalanced flows for any number of reasons (e.g., changing hydraulic heads, maintenance, repairs, temporary malfunctions), the PLC has provisions within its program to cycle-off the extraction well(s) or wet well pumps according to high water levels occurring in the wet wells; and in turn, cycle-off the wet well pumps according to low levels occurring within these wet wells.

The system operates such that the wet well pumps cycle rather than the extraction well pumps. The rationale behind this is that there are a relatively small number of motors, starters and electrically controlled valves associated with the wet wells when compared with the extraction well field. This also provides for more continuous and complete hydraulic capture within the aquifer units. However, the extraction well field will cycle if necessary, starting with the least contaminated extraction well, B7 (if operating), and followed by the other extraction wells in a predetermined sequence.

In summary, the priority of operation is as follows:

- Maintain constant operation of all extraction wells and air stripping towers above the operating minimum;
- Maintain the desired flow rates at individual wells;
- Maintain treatment center WWP#1 and WWP#2 pumping rate equal to or slightly above the combined pumping rate of the extraction well field; and
- Maintain treatment center WWP#3 and WWP#4 pumping rate equal to or slightly above WWP#1 and #2.

<u>FY 2010 Maintenance and Inspection Activity</u>

During FY 2010, the following inspection and maintenance activities occurred:

Preventive Maintenance (PM): The extensive PM program allowed the operations staff to identify and repair or replace equipment to avoid a downtime failure. The program consists of monthly, quarterly and annual maintenance tasks. When required, further repair work was scheduled rather than waiting for the failure to occur. A broad range of system-specific information was collected during this year's PM. This information is used to direct future repair work.

Electrical Inspection and Temperature Survey: A system-wide electrical inspection and infrared temperature survey was performed to identify loose connections and overheating components. Component overheating often precedes equipment failure. Electrical components that were identified as failing were replaced.

Verification of Flow Meters: As part of the routine PM, flow meters in the pumphouses were compared to a factory-calibrated flow meter. Flow volume measurements before and after conducting maintenance on the meters were compared to verify the consistency of measurements. Meters found to be out of calibration were replaced or recalibrated.

Daily Tracking of Flow Rates: Pumphouse and treatment center meter readings were recorded in the course of the daily inspections. Daily meter readings were tabulated and the flow rates were calculated and reviewed by the operations staff. Early detection of changes in flow rate was critical in early identification of failing equipment. By early detection of flow rate changes, equipment repair was typically scheduled before a failure occurred.

Did the system operate at a rate sufficient for complete capture?

Yes. At 1,777 gpm, the total extraction well water pumped was above the GOS Total System Operational Minimum (1,745 gpm) where the Army and the agencies agree that capture is achieved with an adequate safety factor. Figure 10-2 plots the daily average flow rate since October 1, 2009, and shows that the TGRS operated above the OM for the majority of the time (318 days or 87.1 percent of the time) in FY 2010. On a monthly basis, total TGRS extraction rates were below 1,745 gpm during the following months:

- January 2010 (1,562 gpm, lower flow rate due to forcemain break and repair)
- June 2010 (1,689 gpm, lower flow rate due to forcemain replacement and power outages)

Appendix F.2 provides additional information on the various downtimes throughout FY 2010.

The monthly and annual volume of water pumped is presented in Table 10-2 and 10-3. Table 10-2 presents the pumphouse metered monthly flow volumes of each extraction well. The individual pumphouse flow meters are used to determine the amount of groundwater extracted from the various MOS well groups, individual extraction wells, and the total amount of groundwater extracted during the fiscal year. Table 10-3 presents the combined pumphouse-metered flow volume (extraction wells) and the flow volumes metered at various stages in the treatment center along with historical data. These flow meters are used to evaluate the flow of water through the treatment process to ensure proper system operation. In addition, treatment center meters #1 and #2, located after the first set of air stripping towers, are used as a check on the total extracted groundwater calculation.

As shown on Table 10-3, the TGRS successfully captured and treated approximately 933,789,205 gallons of contaminated water from October 2009 through September 2010 based on the sum of the individual pumphouse flow meters. This converts to an average flow rate of 1,777 gpm.

The TGRS as a whole was operational 97.0 percent of the time (i.e., 354.2 days out of 365 days in FY 2010).

Monthly Flow Reports

Each month a Monthly Flow Report is prepared. The report includes the month's meter totalizer readings, calculated flow volumes and operational notes. Flow volumes are presented on a daily basis and are totaled to provide a monthly flow volume. A compilation of FY 2010 operational notes is presented in Appendix F-2. During FY 2010, the sum of the individual pumphouse flow meters was used to measure total flow volumes in monthly reports for comparison with

Operating Strategy limits. Daily variation in readings at individual wells is primarily due to differences in the time of day when meter readings were taken.

How much down time occurred during the year?

The down time for each extraction well, over the last five years, is presented in Table 10-4. A summary of average down time for the pumphouses and the treatment center by the category of failure is presented in Table 10-5. A description of each down time event, organized chronologically, is presented in Appendix F-2. The same descriptions organized by affected pumphouse, treatment center, and forcemain is presented in Appendix F-3.

Treatment center and extraction well down times resulted primarily from failure and subsequent repair of components in the pumphouses, treatment center, and electrical service. The treatment center and extraction wells were shut down for repairs slightly less in FY 2010 than they were in FY 2009. The decreased downtime is primarily due to fewer interruptions to electrical service (down from 6.5 days in FY 2009 to 2.2 days in FY 2010).

Description of Down Time Categories

Pumphouse component failures accounted for an average of 2.6 days down time per pumphouse. There was less down time due to pumphouse maintenance in FY 2010 than there was in FY 2009. The major pumphouse repairs causing down time were:

- Installed new 3" ECV at Pumphouse B1
- Pump and/or motor failure and replacement at Pumphouses B1 and B5
- Well redevelopment at Pumphouses B6 and SC5

Treatment center component failures and repairs that caused pumphouse down time consisted of electric check valve maintenance, malfunctions and repairs, and electrical control equipment failures and subsequent repairs. Treatment center component failures, repairs, and adjustments accounted for an average of 0.6 days down time per pumphouse. The major treatment center repairs causing substantial down time were failure and replacement of the Pump 1 stop float in

November/December, Pump 4 electrical connection problems and ECV 4 issues in March, and Pump 1 pressure switch failure in August.

Electrical service system failures accounted for an average of 2.2 days down time per pumphouse. Electrical storm damage and power grid failures were the primary causes of down time.

Preventative maintenance procedures accounted for an average of 0.04 days of down time per pumphouse. Preventative maintenance procedures are described in the project Operation and Maintenance Manual.

System modifications accounted for an average of 0.0 days down time per pumphouse. There was no down time due to system modifications in FY 2010.

Forcemain issues accounted for an average of 5.3 days down time per pumphouse. Repairs to a forcemain break in January and replacement of a portion of the forcemain in June account for all of the down time due to forcemain issues in FY 2010. Approximately 900 feet of 16-inch diameter iron pipe leading up to Building 116 was replaced. This section of pipe was responsible for a number of leaks and emergency repairs since 2000. As expected, significant scaling and corrosion of the iron pipe was observed. The replacement pipe, made of high density polyethylene (HPDE), significantly improved the performance of the TGRS by decreasing the pressure loss through the forcemain. Hence, extraction well pumps have less pressure to overcome to maintain optimal extraction rates.

Were there any major operational changes during the year?

Yes. Following approval by the regulatory agencies, temporary continuous pumping of monitoring well 03U003 occurred in order to increase VOC mass removal from the area around the well. This well was pumped at an average rate of 13 gpm from October 1, 2009 until October 31, 2009 when pumping stopped and the pump was removed from the well. The pump was reinstalled in the well and pumping resumed from July 30, 2010 through the end of

FY 2010. Well 03U003 was pumped for a total of 93 days in FY 2010. Approximately 1.8 pounds of VOCs were removed by pumping well 03U003 in FY 2010.

The pumping of well 03U003 contributed approximately 3.4 gpm to the total annual average TGRS extraction rate of 1,777 gpm. As such, even without this short-term pumping measure the TGRS would have achieved an average extraction rate above the GOS Operational Minimum (1,745 gpm).

Did the system achieve hydraulic capture?

Yes. The total extraction well water pumped was above the GOS Operational Minimum where the Army and the agencies agree that capture is achieved with an adequate safety factor. A positive sign with respect to capture is the generally stable or decreasing TRCLE concentrations evident at many wells across the TGRS boundary since FY 2001.

Groundwater elevation measurements were collected in June 2010. Appendix D contains the water level database for the monitoring wells.

How much VOC mass was removed by the system and how is it changing with time?

As discussed above, the TGRS extracted and treated approximately 933,789,205 gallons of water from October 2009 through September 2010. Based on the monthly influent and effluent VOC concentrations and the monthly flow totals as measured by the extraction well flow meters, the TGRS removed a total of 2,096 pounds of VOCs from October 2009 through September 2010. The VOC mass removal in FY 2009 was 2,167 pounds. The decrease in FY 2010 reflects an overall decrease in plume concentration.

Average VOC influent concentrations decreased from 281 μg/L in FY 2009 to 269 μg/L in FY 2010 (4.3 percent lower). Table 10-6 summarizes the individual VOC mass contribution of each extraction well and the entire system. Overall, the TGRS has removed over 100 tons (203,545 lbs) of VOCs from the aquifers since 1987 and 11.7 tons of VOCs since the end of FY 2001 (the TGRS OS was based on data through 2001). If the annual VOC mass removal from the TGRS is less than 1,709 pounds (50 percent of the FY 2001 mass removal) then the Army and agencies have agreed that review of the OS operating minimum rates should be conducted and potentially reduced. At 2,096 pounds in FY 2010, the VOC mass removal from the TGRS is at 61 percent of the FY 2001 mass removal.

The total mass removed is based on the monthly TGRS influent and effluent sampling and flow through the treatment system. The monthly sampling of the treatment system provides the best estimate of overall mass removal, compared to the individual extraction well sampling, due to the larger number of samples and consistency in the month-to-month analytical results. The percent contributions for each well are based on the average flows from each well and the semi-annual VOC results from each well.

VOC samples were collected semi-annually from the operating extraction wells that comprise the TGRS. Well B2 is shut down, but was temporarily operated for June 2010 sampling. Wells B7, B10, B12, SC3, and SC4 are shut down, and were not sampled, as they are now sampled biennially (next event in June 2011). Table 10-7 presents a summary of the sampling results for the extraction wells. Variations in detection limits from round to round are the result of varying sample dilution performed by the laboratory. Dilutions are required due to the high concentrations of some analytes. The locations of the extraction wells are presented on Figure 10-1.

Appendix G-1 presents TRCLE versus time graphs for each extraction well. As shown, TRCLE concentrations have declined in each well and now many wells appear to be stable or still declining. Since FY 2001, the following extraction wells have shown the most improvement (greater than 50 percent reduction) in TRCLE concentrations:

- B10 (5.1 μg/L in FY 2001 to 0.47 μg/L in FY 2009 – 91% reduction)
- SC3 (5.5 μg/L in FY 2001 to 0.58 μg/L in FY 2009 – 89% reduction)
- B4 (500 μg/L in FY 2001 to 140 μg/L in FY 2010 – 72% reduction)
- B6 (230 μg/L in FY 2001 to 66 μg/L in FY 2010 – 71% reduction)
- B11 (4.8 μg/L in FY 2001 to 1.5 μg/L in FY 2010 – 69% reduction)

- B5 (410 μg/L in FY 2001 to 130 μg/L in FY 2010 – 68% reduction)
- SC2 (100 μg/L in FY 2001 to 32 μg/L in FY 2010 – 68% reduction)
- B1 (180 μg/L in FY 2001 to 67 μg/L in FY 2010 – 63% reduction)

These trends reflect the overall decline in OU2 deep groundwater contaminant concentrations. In addition, as discussed below, there has been a reduction in overall TGRS influent concentrations over the previous several years.

As Table 10-6 illustrates, eight wells, B1, B4, B5, B6, B9, B13, SC1 and SC5, that are located in the centers of the plume, achieve the largest rates of VOC removal. These eight wells together accounted for over 98 percent of the VOC mass removed. As predicted, the pumping of Well 03U003 tripled the mass removal in the well B11 area. However, the combined mass removal from these two wells amounts to 0.1% of the total TGRS mass removal.

The source control wells, SC1 through SC5, together accounted for nearly 68 percent of the VOC mass removed while accounting for only 8.1 percent of the water pumped by the system. SC5, in particular, removed nearly 65 percent of the total VOC mass at a rate of only approximately 96 gpm (5.4 percent of the total water pumped by the system). This illustrates the efficiency of extracting groundwater from near the source areas.

What do the long-term trends in the monitoring wells show?

A large majority of wells exhibit decreasing trends in TRCLE concentration, indicating an overall improvement in water quality both up gradient and down gradient of the TGRS. Due to the complexity of the flow system, changes in flow direction over time, and the variation in chemical transport properties across the study area, the trends may not reflect a uniform or easily predictable pattern.

Several wells were identified in previous APRs or when reviewing the FY 2010 database that have inconsistent or upward trends in TRCLE concentrations that warrant further observation and discussion:

Well	*Trend Observation*
03L806	Trend identified in FY 2001 APR. Dropped from 1000's of ppb in early 1990s. TRCLE decreased steadily from 410 ppb in 2001 to 140 ppb in 2005. Showed upward trend from 2006 (160 ppb) to 2008 (240 ppb). Back down to 140 ppb in 2009 and 120 ppb in 2010. Maintain annual sampling frequency.
04U806	Trend identified in FY 2001 APR. Dropped from 1000's of ppb in early to mid 1990s. TRCLE decreased steadily from 470 ppb in 2001 to 96 ppb in 2007. Spiked in 2008 to 380 ppb. Down to 180 ppb in 2009 and 130 ppb in 2010. Maintain annual sampling frequency.
03U094	Trend identified during FY 2004 data review. Increased from 170 ppb in 2003 to 470 ppb in 2005. Down to 119 ppb in 2008, 100 ppb in 2009, and 120 ppb in 2010. Appears to be stabilizing in low 100's of ppb. Maintain annual sampling frequency.
03M806	Trend identified during FY 2003 data review. Dropped from near 900 ppb in 1987, to below 100 ppb from 1993 through 1996. Increased to 1300 ppb, a historical high concentration, in 2003. Decreased to 910 ppb in 2006 and 520 ppb in 2007. Up slightly in 2008 to 680 ppb and back down to 490 ppb in 2009 and 480 ppb in 2010. Maintain annual sampling frequency.
03U711	Trend identified in FY 2001 APR. Dropped from near 1000 ppb in 1994 to 75 ppb in 1999. Increased to 250 ppb in 2004 and has been decreasing since, to 60 ppb in 2010. Maintain annual sampling frequency.
03L809	Trend identified in FY 2001 APR. Dropped from over 3,000 ppb to 67 ppb through 1998. At 220 ppb in 2007 and 120 ppb in 2009. Maintain biennial sampling frequency (next event 2011).
04U843	Trend identified in FY 2001 APR. Below 15 ppb from late 1980s through 1997, increased to between 22 ppb and 38 ppb from 1998 through 2001, dropped to below 1 ppb in 2003, and recently peaked at

Well	*Trend Observation*
	87 ppb in 2007 and 98 ppb in 2009. Maintain biennial sampling frequency (next event 2011).
04U841	Trend identified in FY 2001 APR. Below 10 ppb through 1995, increased to 25 ppb in 2001, decreased to 5 ppb in 2003, increased to 24 ppb by 2007, and down to 18 ppb in 2009. Maintain biennial sampling frequency (next event 2011).
03U822	Trend identified during FY 2003 data review. Below 25 ppb through 1998, peaked at 375 ppb in 1999, decreasing since 2003 (280 ppb) to 120 ppb in 2009. Maintain biennial sampling frequency (next event 2011).
03L822	Trend identified in FY 2001 APR. Increased from below 5 ppb during early 1990s to over 600 ppb from 1999 through 2003. Steady decrease since 620 ppb in 2003 to 230 ppb in 2009. Approximately 1 mile from TGRS. Well historically showed 1,1,1-trichloroethane as major contaminant. Maintain biennial sampling frequency (next event 2011).

10.2 REMEDY COMPONENT #2: GROUNDWATER TREATMENT

Description: "Groundwater treatment using air stripping." (OU2 ROD, page 3)

Performance Standard (how do you know when you're done):
When the air stripping treatment facility is treating water and meeting the clean up requirements in Table 1 of the OU2 ROD.

Is the remedy component being implemented?
Yes. The air stripping treatment facility has been operating since 1986.

Did the treatment system meet the treatment requirements in the OU2 ROD?

Yes. Influent and effluent water was sampled on a monthly basis during FY 2010. The influent/effluent database for FY 2010 is contained in Appendix G-2. Figure 10-3 presents a graph of influent TRCLE versus time. This graph is cumulative and includes data from before 1989, when the system consisted of only six extraction wells. The average FY 2010 influent TRCLE concentration was 209 μg/L, down from 217 μg/L in FY 2009. FY 2010 represents the eighth year since the TGRS was reconfigured to achieve greater pumping in the centers of the VOC plumes and less pumping on the edges of the plumes where VOC concentrations are much lower. The decreasing TRCLE concentration could be due in part to the overall decrease in plume concentration.

Figure 10-3 also presents a graph of the effluent TRCLE concentration versus time. As indicated, the effluent was below 5-μg/L TRCLE for all sampling events in FY 2010. A review of the FY 2010 database indicates that the effluent has also remained below the treatment requirements for all other VOC compounds specified in the OU2 ROD. Comparison of influent and effluent TRCLE concentrations indicates average removal efficiency of 99.8 percent.

What was the mass of VOCs emitted into the air?

The air stripping towers remove VOCs with an efficiency of approximately 99.8 percent. Thus, the air emissions are essentially equal to the VOC mass removal rates presented in Table 10-6. Air emissions therefore averaged 5.7 pounds/day based on the VOC mass removal rates. The total VOC emissions from October 2009 through September 2010 were 2,096 pounds.

10.3 REMEDY COMPONENT #3: TREATED WATER DISCHARGE

Description: "Discharge of treated water to the on-site gravel pit." (OU2 ROD, page 3)

Performance Standard (how do you know when you're done):
When the gravel pit is accommodating the discharge from the treatment system and allowing it to recharge to the aquifer.

Is the remedy component being implemented?
Yes. Based on visual observation during FY 2010, there were no noticeable changes in Gravel Pit performance. The Gravel Pit is accommodating the TGRS discharge as designed.

10.4 REMEDY COMPONENT #4: LAND USE CONTROLS

Description: "Institutional controls to restrict access to contaminated aquifers and prevent exposure to contaminated groundwater." (OU2 ROD, page 4) OU2 ESD #1 clarified the land use control component to include protection of the groundwater monitoring and extraction system infrastructure.

Performance Standard (how do you know when you're done):
For initial implementation, when the USEPA and MPCA have provided consistency approval for an OU2 Land Use Control Remedial Design (LUCRD) document. Implementation will continue until such time that the groundwater concentrations are below the cleanup levels.

Has a LUCRD document been approved to address land use control (LUC) issues for OU2, including the Deep Groundwater, and is it being implemented?
Yes. The USEPA and MPCA provided consistency approval for the OU2 LUCRD in September 2010 and it is being implemented by the Army.

Was an annual site inspection for land use controls conducted in FY 2010?

Yes. On July 14, 2010, the Army, National Guard, and Wenck conducted the annual inspection of OU2 sites. The checklist that was completed during the inspection is included as Appendix I.

Did the inspection identify any follow-up actions needed to maintain the protectiveness of the LUCs?

No.

10.5 REMEDY COMPONENT #5: REVIEW OF NEW TECHNOLOGIES

Description: "Reviews of new and emerging technologies that have the potential to cost-effectively accelerate the timeframe for aquifer restoration. Reviews shall be performed by the Army and reported annually in accordance with the consistency provisions of the TCAAP FFA." (OU2 ROD, page 4)

- The intent is to consider new technologies of merit, which is not on any set schedule. To have merit, a new technology must have promise in reducing cost and the time for cleanup. There may be years where no technologies are considered. It is envisioned that at any time, any interested party (Army, USEPA, and MPCA) can suggest new technologies for consideration. If a technology is agreed to have merit by the Army, USEPA, and MPCA, then the Army will evaluate the technology. The level of effort for evaluations can range from simple literature searches to extensive treatability studies. On an annual basis, the Army will report on:
  - Whether or not any new technologies were identified and considered to have merit that year
  - The progress or results of any evaluations during that year
  - Any planned evaluations for the following year

Performance Standard (how do you know when you're done):

When the Army reports on the status of any reviews of emerging technologies in the annual monitoring report.

Is the remedy component being implemented?

Yes. Beginning with the FY 1997 Annual Performance Report, the Army reports annually on the status of any reviews of emerging technologies.

- In September 2002, the MPCA and USEPA announced they would be conducting a natural attenuation microcosm study using carbon dating. In October 2002, Army drilled a boring at Site G to collect soil for the study. The study results were published in 2004.
- The MPCA identified a study involving the addition of vegetable oil to groundwater that is being monitored at the Navy site in Fridley, Minnesota, as a potential technology of interest.

Were any new technologies identified and considered to have merit during FY 2010?

No. The Army's review did not identify any new or emerging technologies that have the potential to cost-effectively accelerate the timeframe for aquifer restoration. Although not a new technology, the pumping of monitoring well 03U003 represented a modified approach to enhance VOC mass removal in the southern plume.

What is the status and/or findings of any previously initiated reviews of emerging technologies?

MPCA continued its research into natural attenuation processes at TCAAP. The MPCA and USEPA published the results of the microcosm study for deep groundwater sediments in 2004 showing that abiotic degradation of cis-DCE is an important factor contributing to the natural attenuation of this compound at the site. (*Non-biological Removal of cis-dichloroethylene and 1,1-dichloroethylene in aquifer sediment containing magnetite.* Environmental Science and Technology, 38: 1746-1752.)

Are any new reviews planned at this time for the coming year?

No. The Army will continue to look for emerging and new technologies, and attend relevant conferences that highlight emerging and new technologies. However, reviews of specific technologies are not planned in FY 2011.

10.6 REMEDY COMPONENT #6: GROUNDWATER MONITORING

Description: "Groundwater monitoring to track remedy performance." (OU2 ROD, page 4)

Performance Standard (how do you know when you're done):

When a regulator approved monitoring plan is in place and monitoring is conducted according to the plan.

Is the remedy component being implemented?

Yes. Monitoring in FY 2010 was consistent with the OU2 ROD. Water level measurements and water quality samples were collected as stated in Appendix A.1. Appendix A summarizes the FY 2010 monitoring plan and any deviations are explained in Appendix C-2. Monitoring was as follows:

Groundwater

TGRS groundwater level measurements were collected during December 2009 and June 2010 according to the monitoring plan. Appendix D contains the comprehensive groundwater quality and water level database for the TGRS monitoring wells. Water quality samples were collected from TGRS wells according to the monitoring plan. Groundwater samples were collected at wells stated in Appendix A.1. All wells were sampled for VOC (8260B) analysis. FY 2010 was a "small round" year in the biennial sample program, so samples were collected for only a select list of wells. Table 10-8 presents the groundwater quality data for FY 2010.

Results from the 2010 groundwater sampling showed that most of the wells sampled continued to have declining or stable TRCLE concentrations. The most notable decreases were at 03U708 (steady decrease from 270 μg/L in 2002 to 27 μg/L in 2010), 03M806 (decrease from 680 μg/L in 2008 to 480 μg/L in 2010), and 03U711 (steady decrease from 250 μg/L in 2004 to 60 μg/L in 2010). Several wells showed a slight increase in TRCLE concentration in 2010; however, the general trend at most wells since 1999 appears to be declining or stable. The increases were not significant, but were most notable at 03U094 (100 μg/L in 2009 to 120 μg/L in 2010) and 03U093 (93 μg/L in 2009 to 100 μg/L in 2010). Both wells are upgradient of the groundwater extraction system.

The TGRS OS estimated the width of the 5 μg/L TRCLE plume at the source area to be 3,600 feet based on FY 2001 analytical data. Since that time, 11.7 tons of VOCs have been removed from the groundwater. TRCLE concentrations are decreasing across the site, especially at the following wells that have been below 5 μg/L since 2001: B10, SC4, 03L021, 03L833, 03U099, 03U701, 04J702, 04U701, 04U702, and 04U833.

Treatment System

The TGRS treatment system influent and effluent was sampled monthly during FY 2010 in accordance with the FY 2010 monitoring plan. Groundwater samples from the extraction wells were collected in December 2009 and June 2010 in accordance with the FY 2010 monitoring plan.

Is additional monitoring proposed prior to the next report?

No additional monitoring for FY 2011 is proposed beyond that presented in the Monitoring Plan (Appendix A) of the FY 2009 APR. Table 10-9 and Appendix A of this report provide FY 2011 monitoring requirements.

10.7 OVERALL REMEDY FOR DEEP GROUNDWATER

Did the TGRS meet the requirements of the OU2 ROD? Yes.

- Hydraulic capture in Unit 3 extends beyond the 5-µg/L TRCLE contour. This meets the VOC capture criterion in the OU2 ROD. Hydraulic capture in Unit 4 extends beyond the 5-µg/L TRCLE contour. This meets the VOC capture criterion in the OU2 ROD.
- The total extraction well water pumped was above the Total System Operational Minimum (1,745 gpm). The FY 2010 annual average extraction rate was 1,777 gpm. Additional pumping was conducted at well 03U003 during October 2009 and from July 2010 to November 2010.
- The TGRS extracted and treated 933,789,205 gallons of water and removed 2,096 pounds of VOCs from October 2009 to September 2010. Average VOC influent concentrations decreased by 4.3% from FY 2009.
- Groundwater analytical data of the source area show a general decrease in TRCLE concentration. This demonstrates that the TGRS is effectively removing VOC mass from the aquifer.
- Effluent VOC concentrations were below contaminant-specific requirements for all sampling events.

Do any additional measures need to be addressed?
Not at this time.

TABLE 10-1

GROUNDWATER CLEANUP LEVELS
TGRS, OU2
ARDEN HILLS, MINNESOTA

Substance	***Expected Level in Discharge (ppb)***	***Operable Unit 2 Rod Requirements (ppb)***
Volatile Organic Compounds (VOCs)		
cis-1,2-Dichloroethene plus trans-1,2-Dichloroethene	<1	70
1,1-Dichloroethene	<1	6
1,1,1-Trichloroethane	<1	200
1,2-Dichloroethane	<1	4
Trichloroethene	<5	5
1,1-Dichloroethane	<1	70
Tetrachloroethene	<1	5

TABLE 10-2

EXTRACTION WELL WATER PUMPED
FISCAL YEAR 2010
TGRS, OU2
ARDEN HILLS, MINNESOTA

	Volume of Water Pumped (gallons)													
	B1	***B3***	***B4***	***B5***	***B6***	***B8***	***B9***	***B11***	***B13***	***03U003***	***SC1***	***SC2***	***SC5***	***TOTAL***
October 2009	9,504,200	7,387,900	9,463,400	6,766,100	9,744,200	6,292,500	12,351,300	4,989,900	4,249,300	629,200	784,700	2,439,700	3,751,200	78,353,600
(gpm)	213	165	212	152	218	141	277	112	95	15	18	55	84	1,755
November 2009	6,665,800	7,861,700	9,084,600	7,118,000	9,388,800	7,647,600	12,584,200	5,547,400	4,254,500		750,200	1,789,300	3,657,400	76,349,500
(gpm)	154	182	210	165	217	177	291	128	98	0	17	41	85	1,767
December 2009	8,655,800	7,333,500	9,248,400	8,896,400	9,598,400	6,510,400	11,773,400	5,324,000	4,054,000		712,900	2,192,000	3,929,200	78,228,400
(gpm)	194	164	207	199	215	146	264	119	91	0	16	49	88	1,752
January 2010	6,283,400	7,062,200	7,808,900	8,999,000	8,090,600	6,791,600	10,970,700	4,585,900	3,287,200		602,100	1,971,400	3,282,400	69,735,400
(gpm)	141	158	175	202	181	152	246	103	74	0	13	44	74	1,562
February 2010	10,027,400	6,995,200	8,121,600	8,431,500	8,558,400	5,692,700	11,875,600	4,438,000	3,542,700		621,800	1,663,700	3,483,500	73,452,100
(gpm)	249	173	201	209	212	141	295	110	88	0	15	41	86	1,822
March 2010	10,966,000	7,684,900	8,844,300	9,605,900	9,137,000	6,272,300	13,123,300	4,841,700	3,896,400		677,700	1,891,900	3,668,800	80,610,200
(gpm)	246	172	198	215	205	141	294	108	87	0	15	42	82	1,806
April 2010	10,397,400	7,443,300	8,235,900	9,893,000	8,662,100	6,312,300	12,458,700	4,631,400	3,847,500		641,700	1,165,500	4,441,600	78,130,400
(gpm)	241	172	191	229	201	146	288	107	89	0	15	27	103	1,809
May 2010	10,950,700	7,778,500	8,683,900	9,903,300	8,858,400	6,690,000	13,141,600	4,893,600	4,120,200		648,600	1,000,800	4,988,500	81,658,100
(gpm)	245	174	195	222	198	150	294	110	92	0	15	22	112	1,829
June 2010	9,978,300	6,871,000	8,148,100	8,685,600	7,963,400	6,060,700	11,327,400	4,332,600	3,818,200		386,405	1,018,800	4,381,000	72,971,505
(gpm)	231	159	189	201	184	140	262	100	88	0	9	24	101	1,689
July 2010	10,914,200	7,374,900	9,381,800	9,530,200	8,754,500	6,525,200	13,801,100	5,415,700	4,296,100	38,200	710,200	860,600	4,983,900	82,586,600
(gpm)	244	165	210	213	196	146	309	121	96	13	16	19	112	1,850
August 2010	10,071,400	7,014,400	8,594,500	11,814,000	6,854,800	6,585,800	12,636,400	5,524,700	4,212,700	582,800	677,700	690,400	4,898,700	80,158,300
(gpm)	226	157	193	265	154	148	283	124	94	13	15	15	110	1,796
September 2010	9,723,900	7,185,400	8,957,100	10,099,900	9,741,400	6,498,200	13,140,500	5,290,800	4,168,700	514,100	658,200	617,000	4,959,900	81,555,100
(gpm)	225	166	207	234	225	150	304	122	96	12	15	14	115	1,888
TOTAL FY 2010	**114,138,500**	**87,992,900**	**104,572,500**	**109,742,900**	**105,352,000**	**77,879,300**	**149,184,200**	**59,815,700**	**47,747,500**	**1,764,300**	**7,872,205**	**17,301,100**	**50,426,100**	**933,789,205**
Operational Minimum (gpm)	225	170	195	195	210	135	275	80	110	0	20	30	100	1,745

	B11, B1, B13,03U003	B4, B5, B6	B4, B5, B6, B8, B9	Total System
FY10 Average Flow Rate (gpm)	425	608	1040	1,777
MOS Operational Minimum (gpm)	415	600	1,010	1,745

TABLE 10-3

TREATMENT CENTER WATER METER TOTALS
FISCAL YEAR 2010
TGRS, OU2
ARDEN HILLS, MINNESOTA

	Volume of Water Pumped (gallons)									
	Extraction Wells	*Meter 1*	*Meter 2*	*Total Meters 1 & 2*	*Meter 3*	*Meter 4*	*Total Meters 3 & 4*	*Meter 5*	*Meter 6*	*Total Meters 5 & 6*
October 2009	78,353,600	33,350,000	43,070,000	76,420,000	12,975,000	66,879,000	79,854,000	0	0	0
November 2009	76,349,500	31,079,000	43,872,000	74,951,000	11,095,000	67,191,000	78,286,000	0	0	0
December 2009	78,228,400	28,209,000	48,887,000	77,096,000	8,641,000	71,606,000	80,247,000	0	0	0
January 2010	69,735,400	26,486,000	42,402,000	68,888,000	8,859,000	62,959,000	71,818,000	0	0	0
February 2010	73,452,100	27,434,000	45,520,000	72,954,000	8,415,000	67,180,000	75,595,000	0	0	0
March 2010	80,610,200	30,888,000	48,766,000	79,654,000	9,385,000	73,279,000	82,664,000	0	0	0
April 2010	78,130,400	30,230,000	47,535,000	77,765,000	544,000	79,781,000	80,325,000	0	0	0
May 2010	81,658,100	32,612,000	48,302,000	80,914,000	584,000	82,949,000	83,533,000	0	0	0
June 2010	72,971,505	30,329,000	41,988,000	72,317,000	456,000	73,848,000	74,304,000	0	0	0
July 2010	82,586,600	32,506,000	49,709,000	82,215,000	426,000	83,871,000	84,297,000	0	0	0
August 2010	80,158,300	32,938,000	47,233,000	80,171,000	399,000	81,651,000	82,050,000	0	0	0
September 2010	81,555,100	32,199,000	48,876,000	81,075,000	178,000	82,958,000	83,136,000	0	0	0
TOTAL FY 2010	933,789,205	368,260,000	556,160,000	924,420,000	61,957,000	894,152,000	956,109,000	0	0	0

TABLE 10-3

TREATMENT CENTER WATER METER TOTALS
FISCAL YEAR 2010
TGRS, OU2
ARDEN HILLS, MINNESOTA

	Volume of Water Pumped (gallons)									
	Extraction Wells	*Meter 1*	*Meter 2*	*Total Meters 1 & 2*	*Meter 3*	*Meter 4*	*Total Meters 3 & 4*	*Meter 5*	*Meter 6*	*Total Meters 5 & 6*
FY 1989	1,033,353,676	501,826,000	560,836,000	1,062,662,000	383,736,000	587,596,000	971,332,000	493,681,000	582,955,000	1,076,636,000
FY 1990	1,008,415,750	493,915,000	526,417,000	1,020,332,000	371,391,000	588,642,000	960,033,000	487,946,000	543,726,000	1,031,672,000
FY 1991	1,382,327,590	666,166,000	708,313,000	1,374,479,000	523,702,000	789,947,000	1,313,649,000	601,307,000	649,621,000	1,250,928,000
FY 1992	1,401,346,600	68,289,000	724,328,000	1,407,227,000	557,169,000	772,509,000	1,329,678,000	767,707,000	677,735,000	1,445,442,000
FY 1993	1,388,206,172	666,814,000	725,341,000	1,392,155,000	504,027,000	651,149,000	1,155,176,000	729,078,000	762,791,000	1,491,869,000
FY 1994	1,245,663,275	660,700,000	659,953,000	1,320,653,000	457,210,000	715,668,000	1,172,878,000	653,913,000	550,131,000	1,204,044,000
FY 1995	1,369,361,500	706,114,000	683,982,000	1,390,096,000	500,275,000	739,744,000	1,240,019,000	495,616,000	274,507,000	770,123,000
FY 1996	1,341,763,220	734,443,000	629,327,000	1,363,770,000	503,518,000	754,399,000	1,257,917,000	4,000	600,035,000	600,039,000
FY 1997	1,213,035,110	688,312,000	568,804,600	1,257,116,600	538,625,000	586,515,000	1,125,140,000	13,000	578,900,000	578,913,000
FY 1998	1,196,007,900	624,784,000	540,353,000	1,220,604,000	511,065,000	603,871,000	1,114,936,000	58,000	178,076,000	178,134,000
FY 1999	1,158,224,870	623,500,000	496,773,200	1,177,206,200	398,620,000	718,384,000	1,117,004,000	26,000	17,000	43,000
FY 2000	1,148,448,350	635,724,000	489,669,000	1,183,258,000	389,709,000	663,807,000	1,053,516,000	0	0	0
FY 2001	1,113,163,360	614,341,000	443,167,000	1,113,164,000	318,517,000	718,661,000	1,037,178,000	0	0	0
FY 2002	917,318,879	491,082,800	434,959,700	926,042,500	225,460,000	650,839,000	876,299,000	0	0	0
FY 2003	904,295,450	545,281,000	345,993,000	891,274,000	125,965,000	750,518,000	876,483,000	0	0	0
FY 2004	908,718,760	518,391,900	376,889,660	895,281,560	216,177,000	680,633,000	896,810,000	0	0	0
FY 2005	895,339,710	520,073,000	363,275,000	883,348,000	224,823,000	658,405,000	883,228,000	0	0	0
FY 2006	929,715,590	534,305,000	377,499,000	911,804,000	266,299,000	669,900,000	936,199,000	0	0	0
FY 2007	945,317,300	447,901,000	487,701,000	935,602,000	281,061,000	833,161,000	1,114,222,000	0	0	0
FY 2008	943,318,161	424,289,615	512,634,095	936,923,709	217,134,430	778,717,620	995,852,050	0	0	0
FY 2009	925,232,745	357,698,000	552,505,000	910,203,000	173,004,000	795,057,000	968,061,000	0	0	0
FY 2010	933,789,205	368,260,000	556,160,000	924,420,000	61,957,000	894,152,000	956,109,000	0	0	0

TABLE 10-4

PUMPHOUSE DOWN TIME (DAYS)
FISCAL YEAR 2010
TGRS, OU2
ARDEN HILLS, MINNESOTA

Well Name	*FY10 Down Time (Days)*	*FY09 Down Time (Days)*	*FY08 Down Time (Days)*	*FY07 Down Time (Days)*	*FY06 Down Time (Days)*
B1	18.0	9.5	4.4	10.6	6.9
B2	(1)	(1)	(1)	(1)	(1)
B3	7.4	12.1	9.5	6.4	23.5
B4	9.3	16.4	34.7	6.0	10.4
B5	7.7	8.6	3.4	1.3	27.1
B6	12.0	10.2	4.5	2.2	11.9
B7	(1)	(1)	(1)	(1)	(1)
B8	8.2	23.2	21.7	8.6	34.6
B9	7.9	9.4	5.4	10.2	20.8
B10	(1)	(1)	(1)	(1)	(1)
B11	8.7	8.7	6.0	12.4	24.9
B12	(1)	(1)	(1)	(1)	(1)
B13	7.4	16.1	15.2	6.2	14.1
03U003	4.8(2)	0.3(3)	(1)	(1)	(1)
SC1	17.2	10.8	5.8	8.9	13.4
SC2	7.5	14.2	11.9	21.8	17.5
SC3	(1)	(3)	(1)	(1)	(1)
SC4	(1)	(1)	(1)	(1)	(1)
SC5	13.8	21.0	3.9	18.5	37.1

Note:

(1) The extraction well was not in operation during the fiscal year.
(2) The extraction well was in operation from 10/1/09 to 10/30/09 and 7/29/10 to 9/30/10 during the fiscal year.
(3) The extraction well was in operation for only part of the fiscal year.

TABLE 10-5

DOWN TIME (DAYS) BY CATEGORY
FISCAL YEAR 2010
TGRS, OU2
ARDEN HILLS, MINNESOTA

Category	*Down Time (Days)*
Pumphouse Component	2.6
Treatment Center Component	0.6
Electrical Service	2.2
Miscellaneous	0.0
Preventive Maintenance	0.0
System Modification	0.0
Forcemain	5.3
Total System Equivalent	10.8
Anticipated Down Time for Fiscal Year 2011	
Pumphouse Component	3.5
Treatment Center Component	3.0
Electrical Service	1.0
Miscellaneous	0.1
Preventive Maintenance	3.5
System Modification	1.0
Forcemain	2.0

TABLE 10-6

VOC MASS LOADING SUMMARY
FISCAL YEAR 2010
TGRS, OU2
ARDEN HILLS, MINNESOTA

Well	*Percent Contribution to VOC Mass Removal*	*FY 2010 Total Pounds VOCs Mass Removed*
B1	3.9%	81.9
B2[1]	0.0%	0.0
B3	0.2%	4.5
B4	7.3%	153.8
B5	7.0%	147.5
B6	3.4%	71.4
B7[1]	0.0%	0.0
B8	0.9%	19.0
B9	5.4%	112.9
B10[1]	0.0%	0.0
B11	0.0%	0.8
B12[1]	0.0%	0.0
B13	4.2%	88.1
03U003[2]	0.1%	1.8
SC1	2.5%	52.0
SC2	0.4%	8.1
SC3[1]	0.0%	0.0
SC4[1]	0.0%	0.0
SC5	64.6%	1,354
Fiscal Year 2010 Total (lbs)		***2,096***
Daily Average (lbs/day)		***5.7***

Notes:

[1] Extraction well was not in operation during the fiscal year.

[2] The extraction well was in operation from 10/1/09 to 10/30/09 and 7/29/10 to 9/30/10 during the fiscal year.

TABLE 10-6

VOC MASS LOADING SUMMARY
FISCAL YEAR 2010
TGRS, OU2
ARDEN HILLS, MINNESOTA

HISTORICAL TOTAL

Fiscal Year		*Pounds VOC Mass Removed*
2010		2,096
2009		2,167
2008		2,292
2007		2,507
2006		2,552
2005		2,663
2004		3,291
2003	(First year of reconfigured system)	3,041
2002		2,852
2001		3,418
2000		4,499
1999		4,878
1998		6,132
1997		6,210
1996		10,655
1995		13,355
1994		15,070
1993		20,165
1992		24,527
1991		26,760
1990		18,005
1989	(First year of full scale system)	19,510
1988		4,800
1987		2,100
Total		***203,545***

TABLE 10-7

VOC CONCENTRATIONS IN TGRS EXTRACTION WELLS (µg/L)
FISCAL YEAR 2010
TGRS, OU2
ARDEN HILLS, MINNESOTA

Location	*Alias*	*Date*	*Dup*	*1,1,1-Trichloroethane* µg/L	*1,1-Dichloroethane* µg/L	*1,1-Dichloroethene* µg/L	*1,2-Dichloroethane* µg/L	*cis-1,2-Dichloroethene* µg/L	*Tetrachloroethene* µg/L	*Trichloroethene* µg/L
03F302	B1	12/8/09		3.5	0.77 JP	1.1	< 1	3.7	2.2	67
03F302	B1	6/1/10		4.1	0.86 JP	1.3	< 1	3.7	2.3	70
03F303	B2	6/1/10		0.26 JP	0.85 JP	2	0.3 JP	1.6	1.1	30
03F304	B3	12/8/09		< 1	0.58 JP	0.7 JP	< 1	< 1	< 1	3.9
03F304	B3	6/1/10		0.42 JP	0.63 JP	0.88 JP	< 1	0.26 JP	< 1	4.1
03F305	B4	12/8/09		8.3	6.3	6.1	< 1	3.5	< 1	140
03F305	B4	6/1/10		9.6	6.4	6.3	< 1	3.1	< 1	140
03F306	B5	12/8/09		3.9	4	3.9	< 1	1	7.6	130
03F306	B5	6/1/10		4.5	4.4	4.4	< 1	0.94 JP	6.5	130
03F307	B6	12/8/09		1	1.9	2.1	< 1	0.55 JP	< 1	75
03F307	B6	6/1/10		1.1	1.6	1.9	< 1	0.51 JP	< 1	66
03F312	B11	12/8/09		< 1	< 1	< 1	< 1	< 1	< 1	1.5
03F312	B11	6/1/10		< 1	< 1	< 1	< 1	< 1	< 1	1.6
03F319	B13	12/8/09		4.3	1.5	1.5	< 1	9.6	1	180
03F319	B13	6/1/10		3.8	1.4	1.3	< 1	7.8	0.93 JP	200
03U301	SC1	12/8/09		6.7	0.92 JP	1.7 JP	< 2	56	< 2	610
03U301	SC1	6/1/10		8.2	1.1 JP	1.9 JP	< 2	62	< 2	740
03U314	SC2	12/8/09		12	0.78 JP	1.2	< 1	0.47 JP	< 1	45
03U314	SC2	6/1/10		4.1	0.68 JP	0.69 JP	< 1	0.37 JP	< 1	32
03U317	SC5	12/8/09		780	21	38	< 10	3.3 JP	6.8 JP	2600
03U317	SC5	6/1/10		620	15	31	< 10	2.6 JP	5.6 JP	2000

TABLE 10-7

VOC CONCENTRATIONS IN TGRS EXTRACTION WELLS (µg/L)
FISCAL YEAR 2010
TGRS, OU2
ARDEN HILLS, MINNESOTA

Location	*Alias*	*Date*	*Dup*	*1,1,1-Trichloroethane* µg/L	*1,1-Dichloroethane* µg/L	*1,1-Dichloroethene* µg/L	*1,2-Dichloroethane* µg/L	*cis-1,2-Dichloroethene* µg/L	*Tetrachloroethene* µg/L	*Trichloroethene* µg/L
PJ#309	B8	12/8/09		1.5	0.93 JP	1.2	< 1	0.38 JP	< 1	24
PJ#309	B8	6/1/10		1.7	1	1.5	< 1	0.41 JP	< 1	22
PJ#309	B8	6/1/10	D	1.8	1	1.4	< 1	0.44 JP	< 1	22
PJ#310	B9	12/8/09		5.2	4.7	5.2	< 1	2.1	< 1	73
PJ#310	B9	12/8/09	D	4.6	4.3	4.8	< 1	1.7	< 1	69
PJ#310	B9	6/1/10		4.9	4.5	5.3	< 1	1.8	< 1	66

Notes:

D - Field Duplicate
JP - Result is qualified as estimated since the detection is below the laboratory quantitation limit.

TABLE 10-8

GROUNDWATER QUALITY DATA (µg/L)
FISCAL YEAR 2010
TGRS, OU2
ARDEN HILLS, MINNESOTA

			1,1,1-Trichloroethane	*1,1-Dichloroethane*	*1,1-Dichloroethene*	*1,2-Dichloroethane*	*cis-1,2-Dichloroethene*	*Tetrachloroethene*	*Trichloroethene*
TGRS Cleanup Level [1]			*200*	*70*	*6*	*4*	*70*	*5*	*5*
Location	*Date*	*Dup*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*
03L802	6/4/10		< 1	< 1	< 1	< 1	< 1	< 1	< 2.4 UB 1.3
03L806	6/2/10		0.93 JP	28	24	0.27 JP	2.4	0.54 JP	120
03M802	6/4/10		< 1	< 1	< 1	< 1	< 1	< 1	6.8
03M806	6/2/10		< 2	50	23	< 2	4.4	< 2	480
03M806	6/2/10	D	< 2	50	23	< 2	4.3	< 2	420
03U003	10/29/09		17	1.4	2.8	< 1	5.6	< 1	85
03U003	7/30/10		17	1.4	2.7	< 1	6.4	< 1	90
03U003	9/1/10		20	1.6	2.7	< 1	7.1	< 1	88
03U093	6/7/10		70	0.54 JP	5.5	< 1	2	< 1	100 JMS 69.9
03U094	6/7/10		40	6.8	5.1	< 1	5.9	< 1	120
03U099	6/4/10		2.2	< 1	< 1	< 1	< 1	< 1	4.5
03U708	6/3/10		5.4	1.5	2	< 1	0.72 JP	2.2	27
03U711	6/3/10		7.2	2.3	2.9	< 1	0.94 JP	1.2	60
03U801	6/3/10		< 1	< 1	< 1	< 1	0.6 JP	< 1	29
03U806	6/4/10		< 1	1.2	1	< 1	0.31 JP	1.5	56
04J077	6/3/10		9.7	12	12	< 1	4	0.56 JP	170
04U711	6/3/10		< 1	< 1	< 1	< 1	< 1	< 1	< 1.7 UB 1.3
04U802	6/4/10		< 1	< 1	< 1	< 1	< 1	< 1	< 1 UB 1.3
04U806	6/2/10		2	16	11	< 1	1.6	0.49 JP	130 JMS 62.4
04U833	6/3/10		< 1	< 1	< 1	< 1	< 1	< 1	< 1.6 UB 1.3
PJ#806	6/2/10		0.6 JP	2.6	2	< 1	0.33 JP	< 1	33

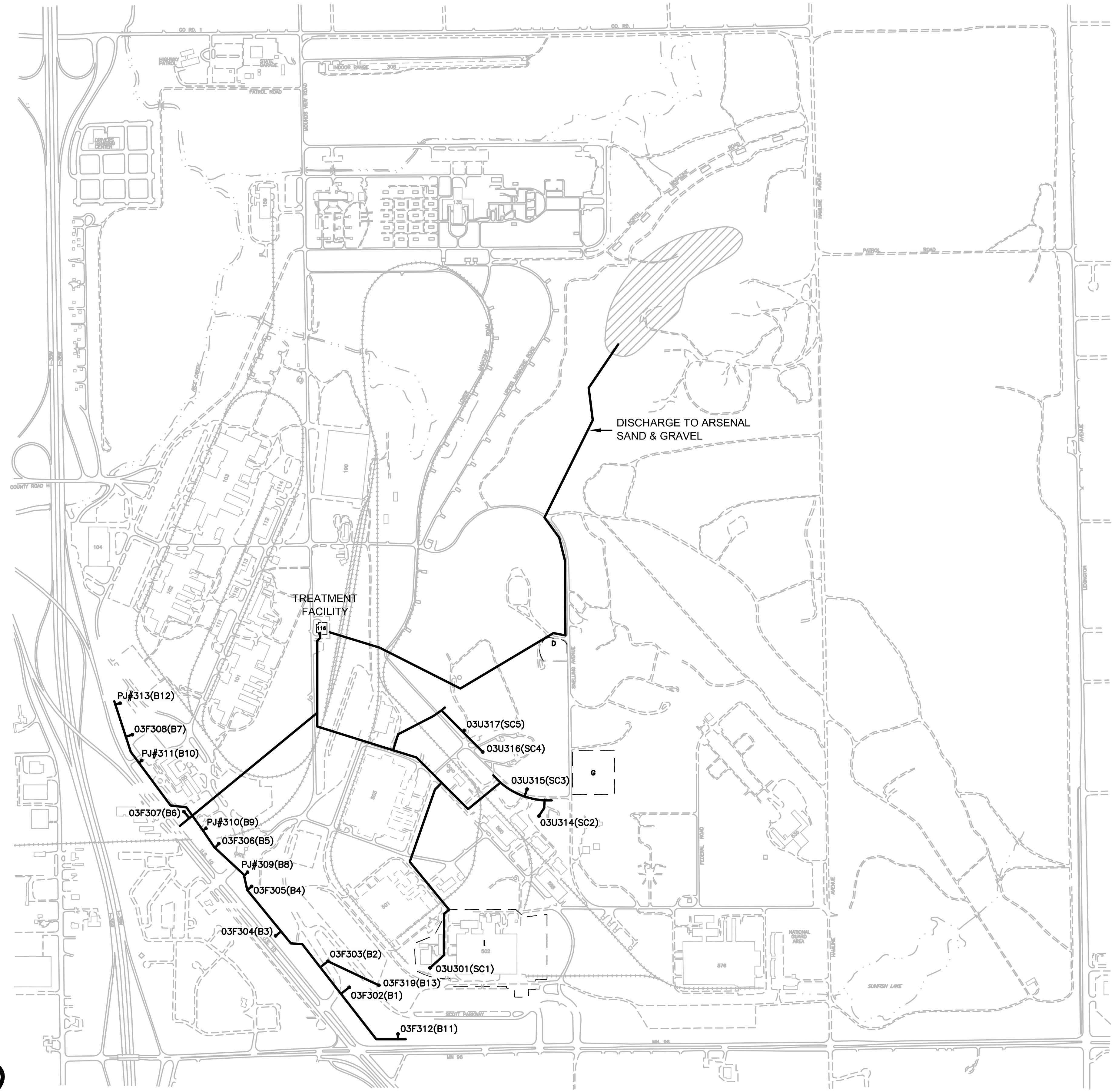
Notes:

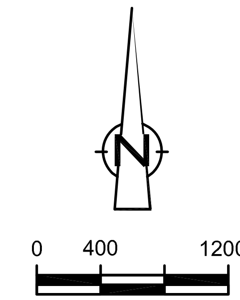
[1] Cleanup levels for TGRS are from the OU2 ROD. Shading indicates exceedence of the cleanup level.
D - Field Duplicate
JP - Result is qualified as estimated since the detection is below the laboratory quantitation limit.
JMS - Result is qualified as estimated since MS/MSD recovery control limit not met.
UB - Trip blank yielded a detection so the associated sample data should be qualified nondetect.

TABLE 10-9

SUMMARY OF OU2 DEEP GROUNDWATER MONITORING REQUIREMENTS
TGRS, OU2
ARDEN HILLS, MINNESOTA

Remedy Component	*Monitoring Requirements*	*Implementing Party*	*Documents Containing the Monitoring Plan*
#1 Hydraulic Containment and Mass Removal	a. Water levels to draw contour maps showing hydraulic zone of capture	ATK/Army	Deep groundwater monitoring plan in Annual Report
	b. Pumping volumes and rates for comparison to design rates	ATK/Army	Deep groundwater monitoring plan in Annual Report
	c. Influent and extraction well water quality for overall mass removal calculations	ATK/Army	Deep groundwater monitoring plan in Annual Report
#2 Groundwater Treatment	• Outlined below		
#3 Treated Water Discharge	• Effluent monitoring to verify attainment of treatment requirements	ATK/Army	Deep groundwater monitoring plan in Annual Report
#4 Land Use Controls	• None		
#5 Review of New Technologies	• None		
#6 Groundwater Monitoring	a. Water levels to draw contour maps showing hydraulic zone of capture	ATK/Army	Deep groundwater monitoring plan in Annual Report
	b. Groundwater quality to verify attainment of clean up goals	ATK/Army	Deep groundwater monitoring plan in Annual Report
Overall Remedy	a. Groundwater quality to verify attainment of clean up goals	ATK/Army	Deep groundwater monitoring plan in Annual Report





LEGEND

PRIMARY ROAD
SECONDARY ROAD
RAILROAD
DRAINAGE
BUILDING
BUILDING REMOVED
SOURCE AREA
WELL LOCATION

EXTRACTION WELL NAME CROSS REFERENCE

B1	03F302
B2	03F303
B3	03F304
B4	03F305
B5	03F306
B6	03F307
B7	03F308
B8	PJ#309
B9	PJ#310
B10	PJ#311
B11	03F312
B12	PJ#313
B13	03F319
SC1	03U301
SC2	03U314
SC3	03U315
SC4	03U316
SC5	03U317

figure 10-1

TGRS LAYOUT
OPERABLE UNIT 2
Arden Hills, Minnesota

057825-43(001)GN-SP001 Dec 15/2010

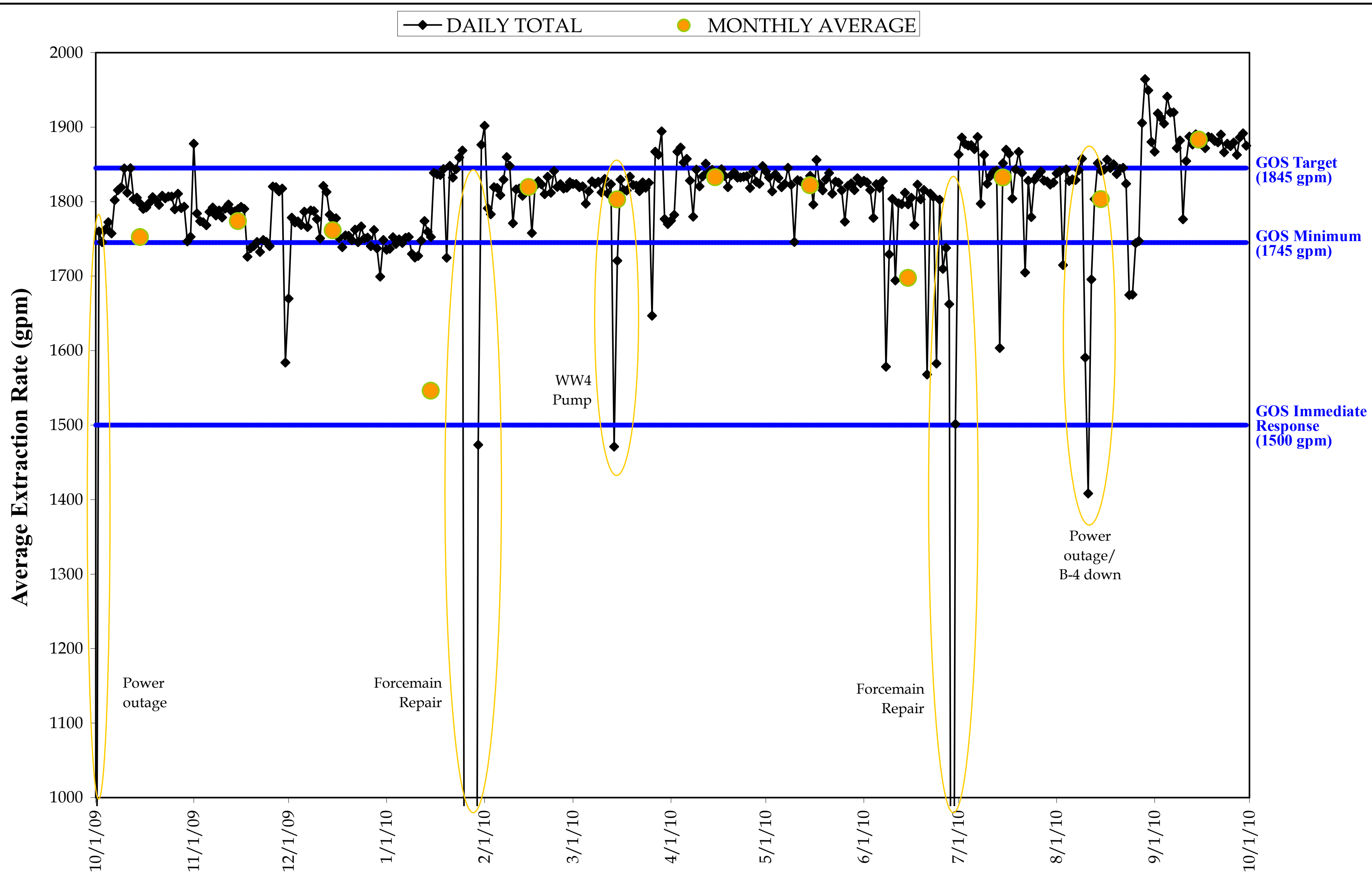
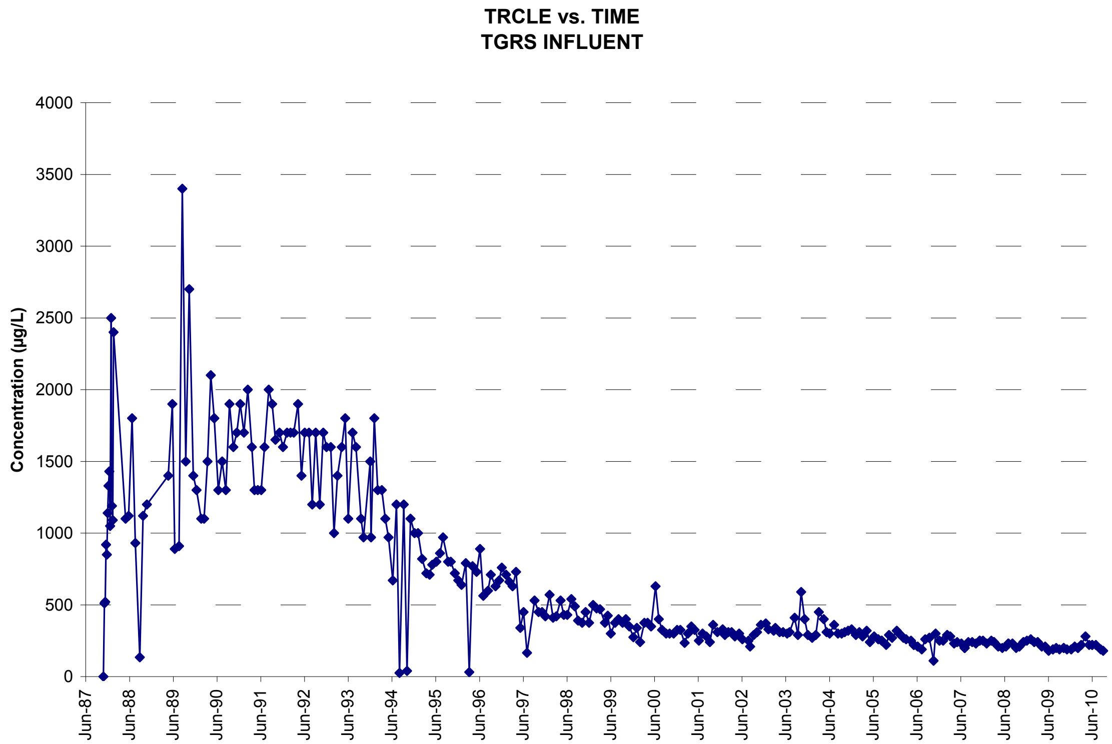
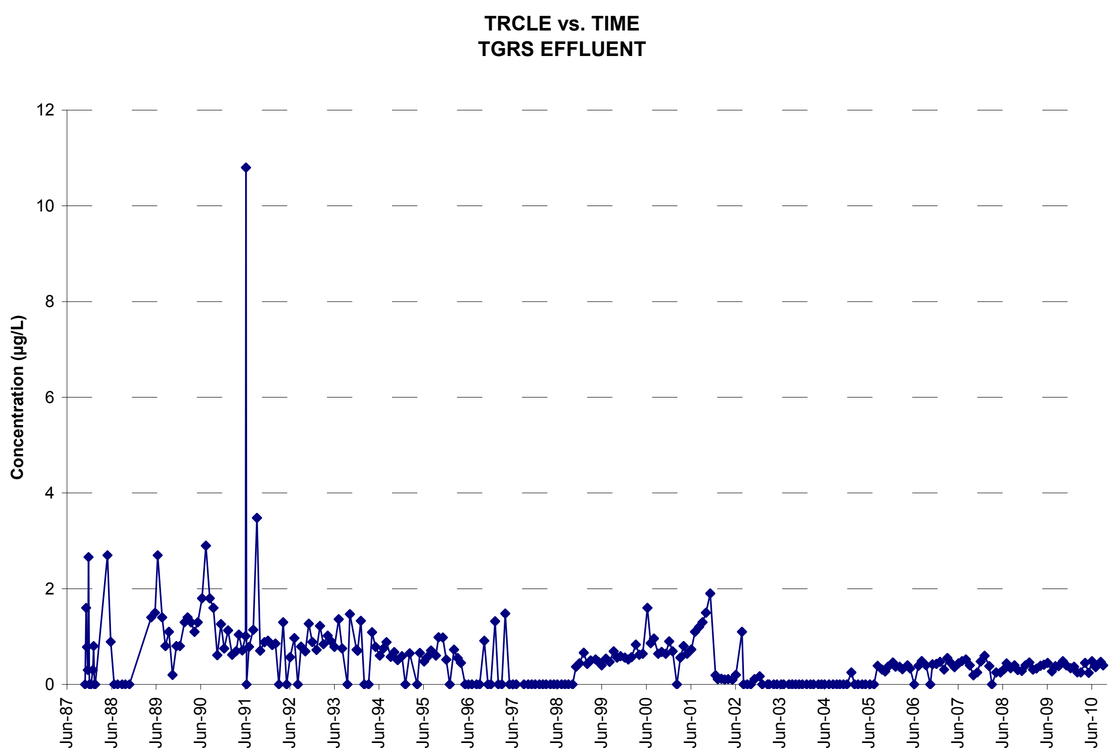


figure 10-2

TGRS FY2010 TOTAL DAILY FLOW RATES
OPERABLE UNIT 2
Arden Hills, Minnesota





NOTE: SAMPLES REPORTING CONCENTRATIONS OF NON-DETECT WERE PLOTTED AS ZERO. WHEN DUPLICATE SAMPLES WERE COLLECTED, THE HIGHER CONCENTRATION WAS REPORTED.

figure 10-3

TGRS TREATMENT SYSTEM PERFORMANCE
OPERABLE UNIT 2
Arden Hills, Minnesota

57825-43(001)GIS-SP002 DEC 14/2010

11.0 Operable Unit 3: Deep Groundwater

RECORD OF DECISION
Groundwater Remediation
Operable Unit 3
at New Brighton/Arden Hills Superfund Site
September 1992

RECORD OF DECISION AMENDMENT
For Operable Unit 3
New Brighton/Arden Hills Superfund Site
August 2006

A ROD Amendment was finalized in August 2006 that significantly changed the remedy for OU3. The basis for the OU3 ROD Amendment was the "Groundwater Statistical Evaluation, OU3" technical memorandum, which received consistency on May 2, 2005. This document presented a statistical evaluation showing that the South Plume has been receding since at least 1996, including the period after the Plume Groundwater Recovery System (PGRS) was shut off in 2001. The South Plume had receded well upstream of the PGRS and the PGRS was basically pumping clean water. The ROD Amendment removed the need for a pump and treat remedy, eliminating the PGRS extraction well and treatment train.

The PGRS was an off-post groundwater extraction and treatment system and municipal potable water supply. The PGRS consisted of New Brighton Municipal Well #13 (NBM #13) and a GAC treatment plant. New Brighton used the water for municipal supply. The PGRS was designed to contain the South Plume of VOC contamination emanating from the former TCAAP property and to prevent further downgradient migration. Recovered groundwater was treated and used by the City of New Brighton to fulfill its municipal water supply demand. Figure 11-1 presents an OU3 site plan.

The PGRS began operating on May 3, 1994. In 1997, the PGRS influent dropped below the ROD required limits for all VOCs. In December 1999, under an agreement with the Agencies, the PGRS pumping rate was reduced from a nominal rate of 1,000 gpm to 400 gpm to help determine if the VOC reductions in concentration were the result of actual plume decreases or the result of dilution from over pumping. In conjunction with the flow rate decrease, a quarterly monitoring program was undertaken to monitor for potential "rebound" in VOC concentrations. By the end of FY 2000, no rebound was observed and a review of the historical database for all of OU3 and the associated source area in OU2 revealed that the entire South Plume had dramatically decreased in size and concentration since the early 1990s. The VOC concentration decreases were such that the leading edge of the South Plume, at the PGRS, dropped below the ROD requirements.

The results of this evaluation were presented to the Agencies on September 6, 2000, and a report titled "Plume History Evaluation, Operable Unit 3", CRA, was submitted to the Agencies on October 10, 2000. The report documents the history of plume size and concentration reductions throughout OU3. Based on the dramatic reductions in plume size and concentration, the report recommended shutting down the PGRS. The Agencies subsequently accepted the recommendation. The City of New Brighton stopped significant pumping in August 2001 and the PGRS was maintained in standby status. During the period May 2003 through September 2003, the PGRS was operated solely to satisfy peak water supply demands and then was placed back into standby status. The PGRS remained in standby status throughout FY 2004, FY 2005, and FY 2006. The City conducted an evaluation of its municipal system to, in part, determine the future use of the PGRS extraction well and treatment system. The City decided the PGRS treatment system and well NBM #13 were not part of the City's long-term water supply plan. During FY 2007, the PGRS treatment system was dismantled and NBM #13 was abandoned.

11.1 REMEDY COMPONENT #1: MONITORED NATURAL ATTENUATION

Description: "Monitored natural attenuation."
(OU3 ROD Amendment, page 17)

Performance Standard (how do you know when you're done):
When a monitoring program is established and monitoring is in compliance with the regulator approved Annual Monitoring Plan.

Is the remedy component being implemented?
Yes. Appendix A summarizes the FY 2010 monitoring plan and any deviations are explained in Appendix C.2. Details of the groundwater monitoring program are discussed in Section 11.2.

11.2 REMEDY COMPONENT #2: GROUNDWATER MONITORING

Description: "Monitoring of the groundwater for VOCs to verify the effectiveness of the selected remedy and the natural attenuation of the South Plume."
(OU3 ROD Amendment, page 17)

Performance Standard (how do you know when you're done):
When a monitoring program is established and monitoring is in compliance with the regulator approved Annual Monitoring Plan.

Is the remedy component being implemented?
Yes. Appendix A summarizes the FY 2010 monitoring plan and any deviations are explained in Appendix C.2. Specifically, well 04U866 was added to the 2010 sampling event after it was inadvertently omitted from the 2009 sampling event.

Groundwater samples were collected from three OU3 wells in FY 2010 as part of the OU1, OU2, and OU3 annual sampling round. Samples were collected as specified in the monitoring plan and analyzed for VOCs by method SW846 8260. Well locations are shown on Figure 11-1. The specific purpose of monitoring each well is provided in Appendix A. Water elevations were also measured during the monitoring event and are presented in Appendix D.1.

Table 11-1 presents a summary of the analytical results. TRCLE concentrations in the downgradient sentry well, 04U863, remained less than 1.0 µg/L, as it has been since December 1999. TRCLE concentrations were also less than 1.0 µg/L at well 04U866. The other well sampled in FY 2010, 03M848, had a TRCLE concentration above the cleanup standard of 5 µg/L at 130 µg/L, which is the same concentration as in 2008 and 2009.

Previous sampling has shown 1,1,1-trichloroethane and its degradation products 1,1-dichloroethane and 1,1-dichloroethene present in wells at the boundary between OU1 and OU3, indicating a commingling of the North Plume and the South Plume at this location. No boundary wells were sampled in 2010, however, these parameters were detected at trace levels (below the detection limit) at 03M848, a center-of-plume well, in 2010.

What were the results of the Statistical Analyses?

The Mann-Kendall statistical analysis was updated for the center-of-plume well (03M848) sampled in 2010. A summary of the statistical analyses is presented in Table 11-2. A spreadsheet and graph presenting the Mann-Kendall test results for the well are provided in Appendix H.

The trend for 03M848, which has historically been the center of the South Plume, continued to be definitely decreasing. The TRCLE concentration decreased from 700 µg/L in FY 1999 to 130 µg/L in FY 2010. Well 03M848 had the highest TRCLE concentration in the South Plume in FY 2010, but at a concentration much lower than historic concentrations. The decrease in concentration at the core of the South Plume indicates that the South Plume continues to dissipate.

Are contingency actions warranted?

No. The OU3 ROD Amendment requires contingency actions to be considered when the Mann-Kendall statistical analysis shows that a well at the edge of the South Plume has an increasing trend. No edge-of-plume wells were analyzed in FY 2010.

What groundwater monitoring is proposed before the next report?

The OU3 monitoring requirements presented in Table 11-3 are proposed. Appendix A presents the FY 2010 – FY 2014 monitoring plan.

11.3 REMEDY COMPONENT #3: DRILLING ADVISORIES

Description: "Continued implementation of the drilling advisories that regulates the installation of new private wells within OU3 as a Special Well Construction Area." (OU3 ROD Amendment, page 17)

Performance Standard (how do you know when you're done):

When the Minnesota Department of Health (MDH) has issued a Special Well Construction Area Advisory.

Has the MDH issued a Special Well Construction Area Advisory?

Yes. It was issued in June 1996. The Special Well Construction Area encompasses OU1, OU3, and the OU2 Site A shallow groundwater plume. In June 1999, the MPCA requested that the MDH extend the boundary of the Special Well Construction Area further to the southwest to the Mississippi River and Marshall Avenue to ensure that the southern boundary fully encompassed the plume. The MDH revised the Special Well Construction Area in December 1999. The current boundary is shown on Figure E-1 (Appendix E).

Are any changes or additional actions required for this remedy component? No.

11.4 OVERALL REMEDY FOR OU3

Is the Remedy for OU3 Operating in Compliance with the OU3 ROD and OU3 ROD Amendment?

Yes. In FY 2010, groundwater monitoring took place as prescribed in the Annual Monitoring Plan. The limited annual sampling round of FY 2010 indicates that the South Plume footprint remains stable, with decreasing concentrations at the center of the plume.

Are any changes or additional actions required for OU3?

No. A comprehensive biennial groundwater sampling event will take place in FY 2011 as planned. No additional actions are necessary since no increasing trends were identified by the statistical analysis.

Monitoring well 04U861 was abandoned in February 2006 at the request of the City of New Brighton to allow for property redevelopment. The Army has committed to replacing 04U861 when the City completes property redevelopment. The schedule for redevelopment is uncertain; however, redevelopment is not expected to progress enough to allow for a replacement well to be installed in FY 2011.

TABLE 11-1

GROUNDWATER QUALITY DATA (µg/L)
OPERABLE UNIT 3
FISCAL YEAR 2010

			1,1,1-Trichloroethane	*1,1,2-Trichloroethane*	*1,1-Dichloroethane*	*1,1-Dichloroethene*	*cis-1,2-Dichloroethene*	*Trichloroethene*
OU3 Cleanup Level [(1)]			**200**	**3**	**70**	**6**	**70**	**5**
Location	***Date***	***Dup***	***µg/L***	***µg/L***	***µg/L***	***µg/L***	***µg/L***	***µg/L***
03M848	6/8/10		0.26 JP	< 1	0.75 JP	0.88 JP	6.4	130
04U863	6/8/10		< 1	< 1	< 1	< 1	< 1	0.42 JP
04U863	6/8/10	D	< 1	< 1	< 1	< 1	< 1	0.4 JP
04U866	6/8/10		< 1	< 1	< 1	< 1	< 1	0.53 JP

Notes:

[(1)] Cleanup levels for OU3 are from the OU3 ROD. Shading indicates exceedence of the cleanup level.
D - Duplicate analysis
JP - Results are less than the reporting limit, but greater than the instrument detection limit. Value is estimat

TABLE 11-2

MANN-KENDALL STATISTICAL SUMMARY
OPERABLE UNIT 3
FISCAL YEAR 2010

Well	*Kendall S*	*Number of Data Points*	*Raw Trend*	*Confidence*	*Coefficient of Varience*	*Raw Trend Decision*	*MAROS Conclusion*	*June 2010 TRCLE Conc.*
Center of Plume Well								
03M848	-12	6	Decreasing	99.52%	0.2592	Definite	Decreasing	130

TABLE 11-3

SUMMARY OF GROUNDWATER MONITORING REQUIREMENTS
OPERABLE UNIT 3
FISCAL YEAR 2010

	Remedy Component		***Monitoring Requirements***	***Implementing Party***	***Documents Containing the Monitoring Plan***
#1	Monitored Natural Attenuation		Outlined below.		
#2	Groundwater Monitoring	a.	Water levels for use in drawing contour maps.	ATK	OU3 Monitoring Plan in Annual Report
		b.	Groundwater sampling to track progress of clean-up and attenuation of plume.	ATK	OU3 Monitoring Plan in Annual Report
#3	Drilling Advisories	a.	Verification that drilling advisories are in place and functioning as intended.	Army/MDH	NA
OR:	Overall Remedy	a.	Water quality monitoring to verify attainment of clean-up goals.	ATK	OU3 Monitoring Plan in Annual Report

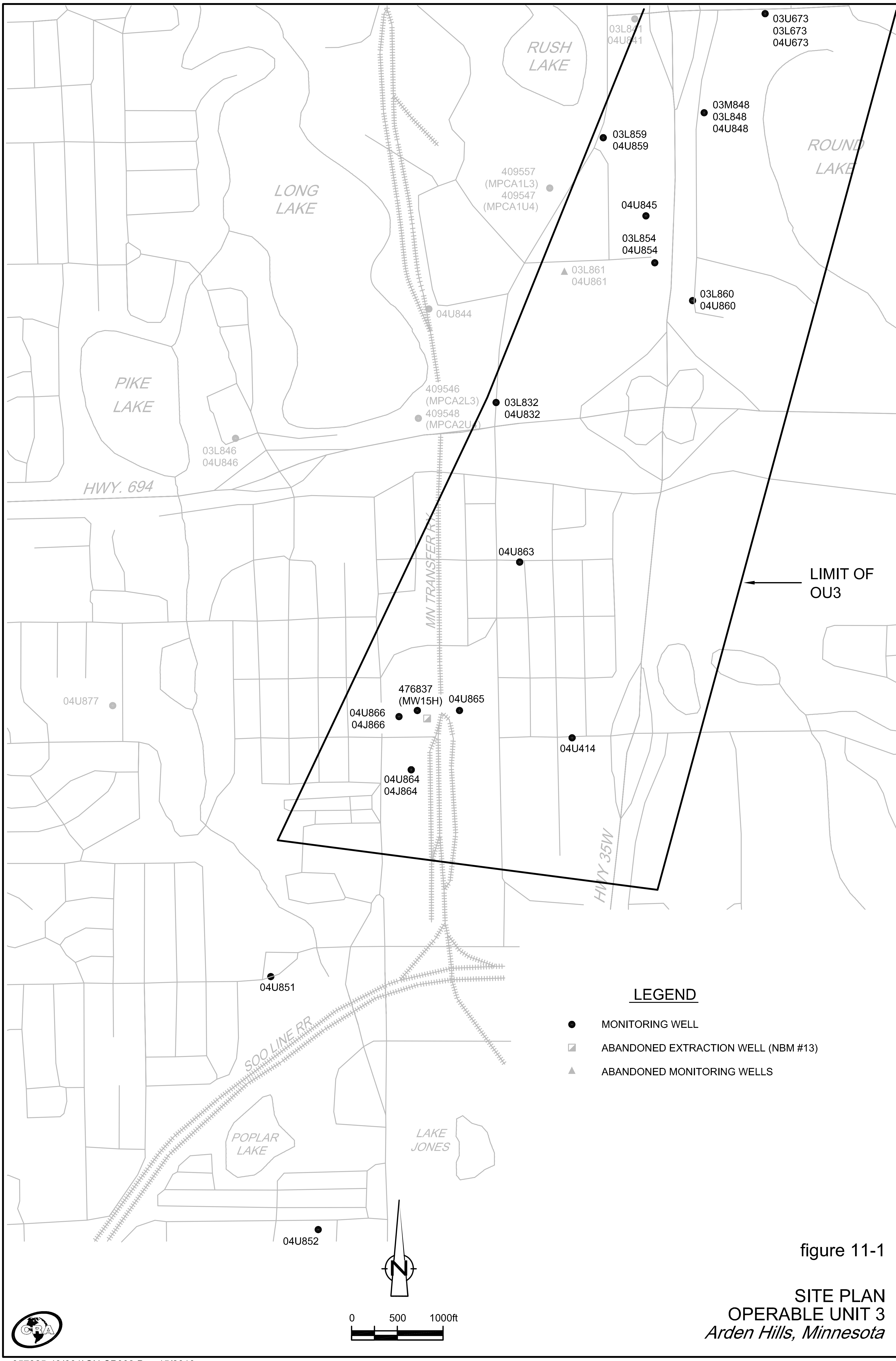


figure 11-1

SITE PLAN
OPERABLE UNIT 3
Arden Hills, Minnesota

057825-43(001)GN-SP002 Dec 15/2010

12.0 Other Installation Restoration Activities During FY 2010

This section summarizes the status of other activities that are related to the Installation Restoration Program, but are not required in the RODs for OU1 through OU3.

12.1 BUILDING 102 SHALLOW GROUNDWATER

Building 102, located as shown on Figure 12-1, was constructed in 1942 and used periodically until the 1980s for the production of small caliber ammunition and various other munitions components. Between March 2002 and February 2004, shallow (Unit 1) groundwater contamination was discovered emanating from beneath Building 102 (discovered during the Phase I and Phase II Environmental Site Assessment in support of the future transfer of the remaining TCAAP property).

Additional groundwater investigation was conducted and is documented in a Groundwater Investigation Report approved by the USEPA and MPCA in FY 2006. The Army then proceeded to address the remedy for Building 102 shallow groundwater as a non-time critical removal action under CERCLA. To support the EE/CA, additional groundwater investigation was conducted in FY 2007 and FY 2008 to further define the extent and magnitude of groundwater contamination. Delineation was completed and COCs were identified, including trichloroethene and related chlorinated VOCs (trichloroethene was found to be degrading to cis-1,2-dichloroethene and vinyl chloride through abiotic degradation). The EE/CA documenting the additional investigation work and recommending a remedy for the Building 102 shallow groundwater was approved by the USEPA and MPCA in FY 2008. The Army Action Memorandum documenting the final remedy selection for Building 102 groundwater (monitored natural attenuation) was signed early in FY 2009. The remedy also includes a LUC to prohibit installation of water supply wells into the contaminated portion of the Unit 1 aquifer. Ongoing groundwater sampling is being conducted for performance monitoring, and this monitoring is conducted in accordance with the Quality Assurance Project Plan for MNA that is updated and approved annually.

Building 102 groundwater level data collected in June 2010 is shown as groundwater elevation contours on Figure 12-2 (Site K water levels are also contoured on this figure to provide a more complete water level map in the site vicinity). Groundwater quality data collected in FY 2010 is shown in Table 12-1. Groundwater quality data for June 2010 is also shown on plume maps for three of the chemicals of concern: trichloroethene (Figure 12-3), cis-1,2-dichlororethene (Figure 12-4), and vinyl chloride (Figure 12-5). The June 2010 results for vinyl chloride (chemical that has historically had the largest areal extent) are shown on geologic cross-sections A-A' (Figure 12-6) and B-B' (Figure 12-7).

As shown in Table 12-1, cleanup levels have not been reached throughout the areal extent of the plume and the site cannot be closed. Concentrations of trichloroethene, cis-1,2-dichlororethene, and/or vinyl chloride exceed their respective cleanup levels in four of the monitoring wells at this site.

The FY 2010 groundwater quality results were generally comparable to the FY 2009 results, suggesting that the plume remains stable due to the natural attenuation that is occurring at this site. There were no significant increases in the wells downgradient from 01L581 (the 582 nest and 01U048). Some changes that were noted include:

- 01U580 (source area): Trichloroethene decreased from 2,600 to 150 µg/L and cis-1,2-dichloroethene decreased from 1,100 to 20 µg/L.
- 01L581 (centerline of plume just downgradient of the source area): Trichloroethene decreased from 32 to 9.9 µg/L and cis-1,2-dichloroethene decreased from 15 to 9.4 µg/L. The FY 2009 concentrations were an increase from the typical results observed in

previous events; however, the decreased FY 2010 concentrations show a return to levels that are similar to the typical results observed in events prior to FY 2009.

- 01U048 (adjacent to Rice Creek): Vinyl chloride was not detected (< 0.05 µg/L). Previous events had always shown low detections (approximately 0.02 to 0.04 µg/L).

The monitoring plan shown in Appendix A.1 is adequate to monitor the shallow groundwater at this site. No changes to the monitoring plan or to the natural attenuation remedy are needed.

Regarding the LUC for Building 102 groundwater, the USEPA and MPCA provided consistency approval for the OU2 LUCRD in September 2010 and it is being implemented by the Army. On July 14, 2010, the Army, National Guard, and Wenck conducted the annual inspection of LUCs. The checklist that was completed during the inspection is included as Appendix I. The inspection did not identify any follow-up actions that were needed to maintain the protectiveness of the LUC for Building 102 groundwater. Eventually, it will be necessary to amend the OU2 ROD to formally adopt the LUC as the final remedy for Building 102 groundwater.

12.2 DEEP GROUNDWATER BACKGROUND MONITORING

The Army voluntarily conducts monitoring at locations near the upgradient side of OU2 (the northeast corner and east side) to assess the quality of groundwater entering the operable unit. The five wells that are sampled for this purpose include 03U007, 03U009, 03L007, 04U007, and 04U510. Locations of these wells are shown on Figure B-3 in Appendix B. However, since this was a minor sampling year with respect to OU2 deep groundwater, none of these wells were sampled in FY 2010. These locations will be sampled in FY 2011 as shown in Appendix A.1 (the wells are listed under TCAAP Groundwater Recovery System in the appendix).

12.3 AQUATIC STUDIES

The Tier II Ecological Risk Assessment Report for aquatic sites, prepared by the U.S. Army Center for Health Promotion and Preventative Medicine (USACHPPM), was approved by the MPCA and USEPA in December 2004. In June 2005, the Army submitted a draft feasibility study (FS) to support the risk management decisions with respect to "No Further Action" or "Implement a Remedy" for each aquatic site. As a result of comments on the draft FS, it was agreed to conduct additional sampling of Marsden Lake and Pond G, which was completed in 2008. A revised FS was submitted in January 2009. Based on comments received and resolution thereof, the Army then submitted a revised (redlined) FS in April 2010. After review of this report, USEPA and MPCA requested that the Army prepare a work plan for collection of additional Round Lake sediment data. Given the time that will be required to collect the additional data, the Army, USEPA, and MPCA agreed to separate the FS into two documents: one for Round Lake and one for Rice Creek, Sunfish Lake, Marsden Lake, and Pond G. At the end of FY 2010, the Army was preparing a QAPP for Round Lake sediment investigation, and the Army, USEPA, and MPCA were in the process of resolving comments on the FS for Rice Creek, Sunfish Lake, Marsden Lake, and Pond G.

12.4 135 PRIMER/TRACER AREA

The Preliminary Assessment report received regulatory approval in FY 2002. It was recommended that a Site Inspection be conducted. The Site Inspection (SI) investigation report received MPCA and USEPA approval in FY 2005. The SI report recommended that an Engineering Evaluation/Cost Analysis (EE/CA) be conducted to determine what, if any, remediation is required to address contamination observed in the soil. The 135 Primer/Tracer Area is on property that is proposed to be transferred out of federal ownership. It is the Army's current intention to have the purchaser conduct further work at this area as part of the transfer negotiations.

12.5 535 PRIMER/TRACER AREA

The Preliminary Assessment received regulatory approval in FY 2002 and the Site Inspection investigation report received approval in FY 2005. The Army conducted additional soil sampling during FY 2008, which delineated the approximate extent of two areas of shallow soil contamination: one with lead contaminated soil and one with PAH-contaminated soil. The EE/CA was approved by the USEPA and MPCA on January 28, 2009, which was followed by Army selection of the recommended remedy (soil removal) in an Action Memorandum signed on March 20, 2009. The soil removal action field work was completed at the end of FY 2009. In FY 2010, the soil removal action closeout report was completed (consistency was received on January 13, 2010). Since LUCs were part of the selected remedy for the 535 PTA, ongoing maintenance of LUCs will be performed by the Army in accordance with the OU2 LUCRD.

The USEPA and MPCA provided consistency approval for the OU2 LUCRD in September 2010 and it is being implemented by the Army. On July 14, 2010, the Army, National Guard, and Wenck conducted the annual inspection of LUCs. The checklist that was completed during the inspection is included as Appendix I. The inspection did not identify any follow-up actions that were needed to maintain the protectiveness of the LUC for the 535 PTA. Eventually, it will be necessary to amend the OU2 ROD to formally adopt the removal action as the final remedy for the 535 PTA.

12.6 PROPERTY TRANSFER-RELATED ENVIRONMENTAL ACTIVITIES

In 2002, the remaining 774 acres that were still under the control of TCAAP were declared excess to the needs of the Department of Defense. The Army Base Realignment and Closure Office funded environmental site assessment (ESA) work to collect information regarding the environmental condition of the property in order to facilitate property transfer. The work included document reviews and field sampling of various media. The findings were published in "Environmental Site Assessment for 774-Acre Excess Parcel, Phase I and Phase II Report, Twin

Cities Army Ammunition Plant" (Plexus Scientific Corporation, February 20, 2004, final report). Based on comments from the MPCA and USEPA, additional samples were collected and analyzed in FY 2005. The Army prepared an "ESA Addendum Report" that was approved in FY 2006. Originally, it was proposed to transfer approximately 585 acres through a negotiated sale with the City of Arden Hills, who in turn had an agreement with a developer. In FY 2007, the developer collected additional samples of various media on the property proposed for transfer to Arden Hills. Some, but not all of the data from this work was made available to the regulators and Army. In FY 2009, the developer withdrew from its agreement with Arden Hills, who in turn withdrew its offer to purchase with the federal government. No property transfer-related environmental investigation or cleanup work was performed in FY 2010.

TABLE 12-1
BUILDING 102 GROUNDWATER QUALITY DATA

Fiscal Year 2010

			Trichloroethene (µg/l)	cis-1,2-Dichloroethene (µg/l)	1,1-Dichloroethene (µg/l)	Vinyl Chloride (µg/l)	Vinyl Chloride(2) (µg/l)
Building 102 Cleanup Level (1)			5	70	6	0.18	0.18
01U048		6/16/10	<1	<1	<1	<1	<0.05
01U578		6/16/10	<1	<1	<1	<1	---
01U579		6/16/10	**43**	6.2	<1	<1	---
01U580		6/16/10	**150**	20	<10	<10	---
01U581		6/16/10	JP 0.47	1.4	<1	<1	---
01L581		6/16/10	**9.9**	9.4	<1	**JP 0.3**	---
01U582		6/16/10	<1	<1	<1	<1	<0.05
01U582	D	6/16/10	---	---	---	---	<0.05
01L582		6/16/10	<1	19	<1	<1	**0.19**
01U583		6/16/10	JP 0.45	<1	<1	<1	---
01L583		6/16/10	<1	<1	<1	<1	---
01L583	D	6/16/10	<1	<1	<1	<1	---
01U584		6/16/10	<1	<1	<1	<1	---
01L584		6/16/10	<1	JP 0.72	<1	<1	---
01L584	D	6/16/10	<1	JP 0.69	<1	<1	---

Notes:

(1) Cleanup levels for Building 102 Groundwater are from Table 3-5 of the Building 102 Groundwater EE/CA. Bolding (in red color) indicates exceedance of the cleanup level.

(2) This analysis of vinyl chloride is by Method 8260C-SIM to obtain a lower reporting limit for vinyl chloride.

--- Not sampled.

D Duplicate sample.

JP The value is below the reporting level, but above the method detection limit. Results should be considered estimated.

ANNUAL PERFORMANCE REPORT

Location of Building 102

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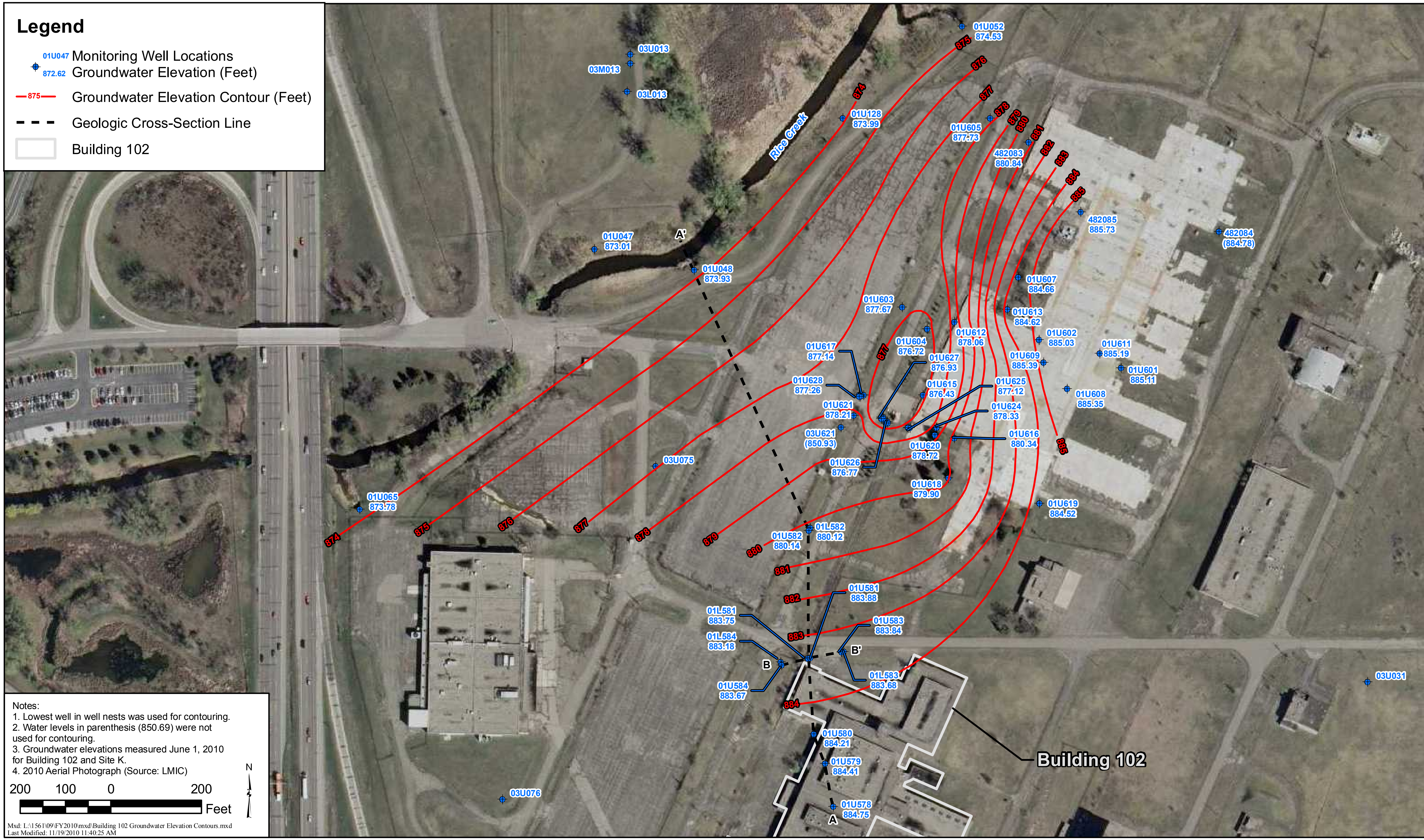
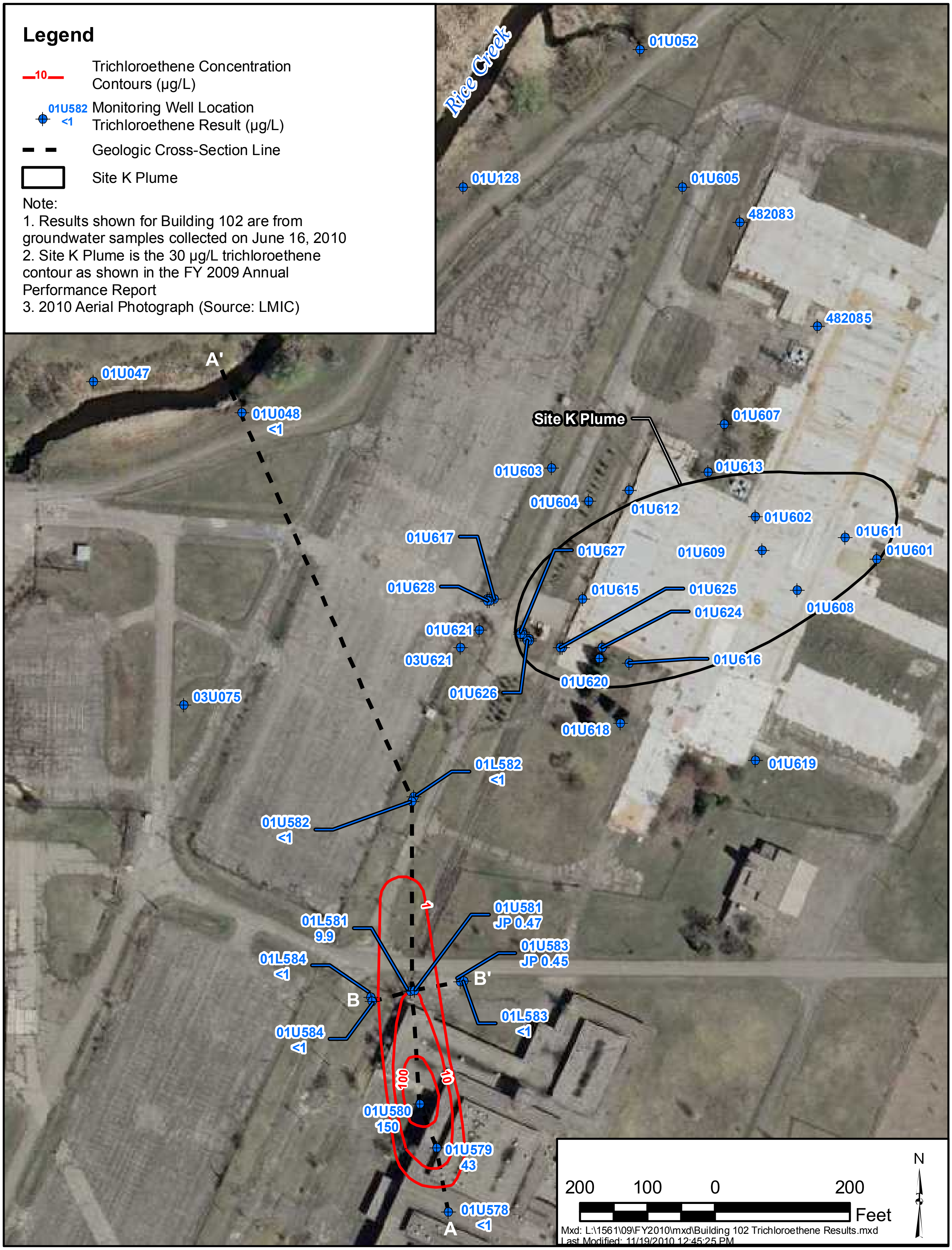
Wenck
Wenck Associates, Inc. 1800 Pioneer Creek Center
Environmental Engineers Maple Plain, MN 55359-0429

FY 2010

Figure 12-1



ANNUAL PERFORMANCE REPORT	Wenck Associates, Inc. Environmental Engineers 1800 Pioneer Creek Center Maple Plain, MN 55359-0429	FY 2010
Building 102 , Unit 1, Potentiometric Map - Summer 2010		Figure 12-2



ANNUAL PERFORMANCE REPORT

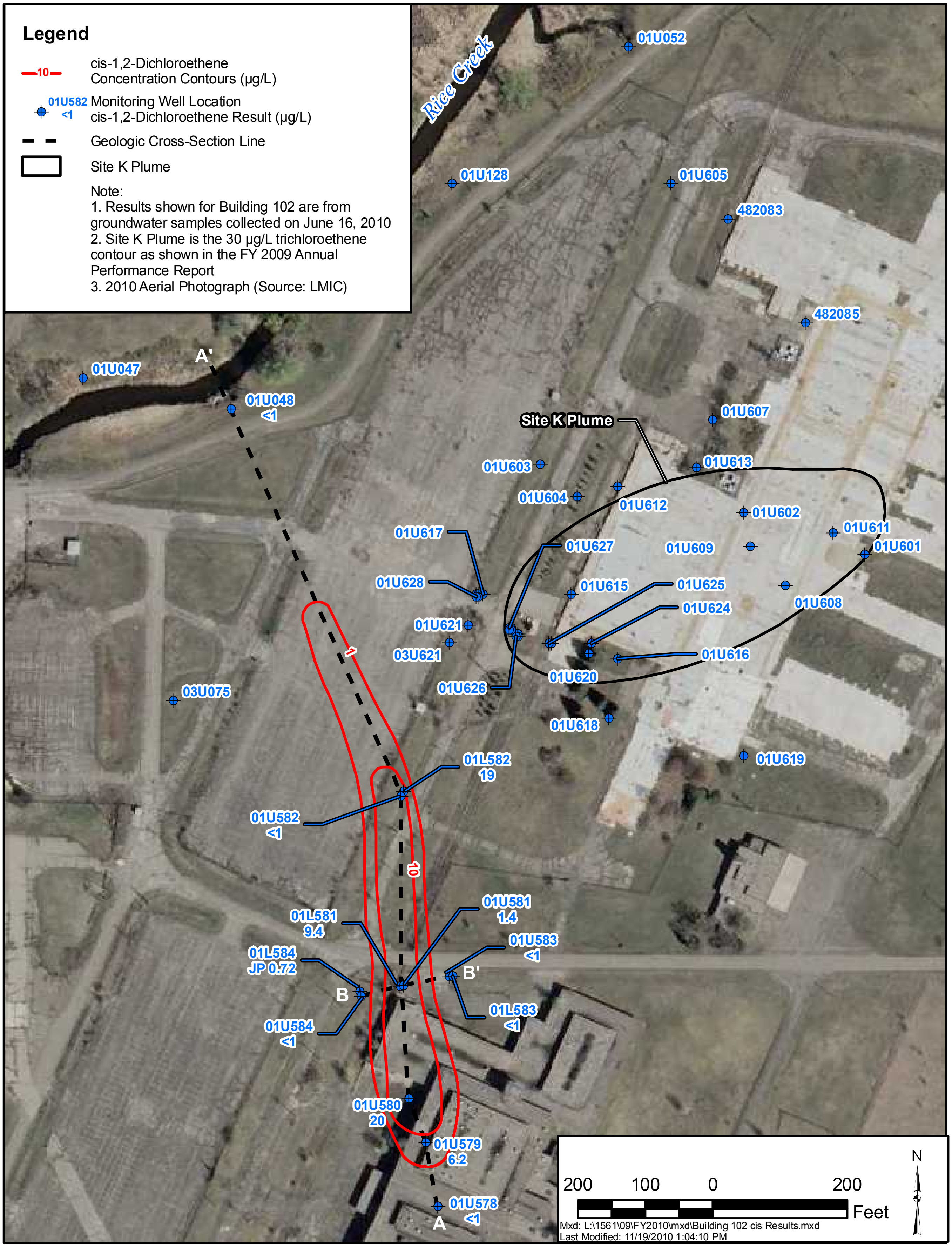
Trichloroethene Results - Summer 2010

Wenck

Wenck Associates, Inc. Environmental Engineers
1800 Pioneer Creek Center Maple Plain, MN 55359-0429

FY 2010

Figure 12-3



ANNUAL PERFORMANCE REPORT

cis-1,2-Dichloroethene Results - Summer 2010

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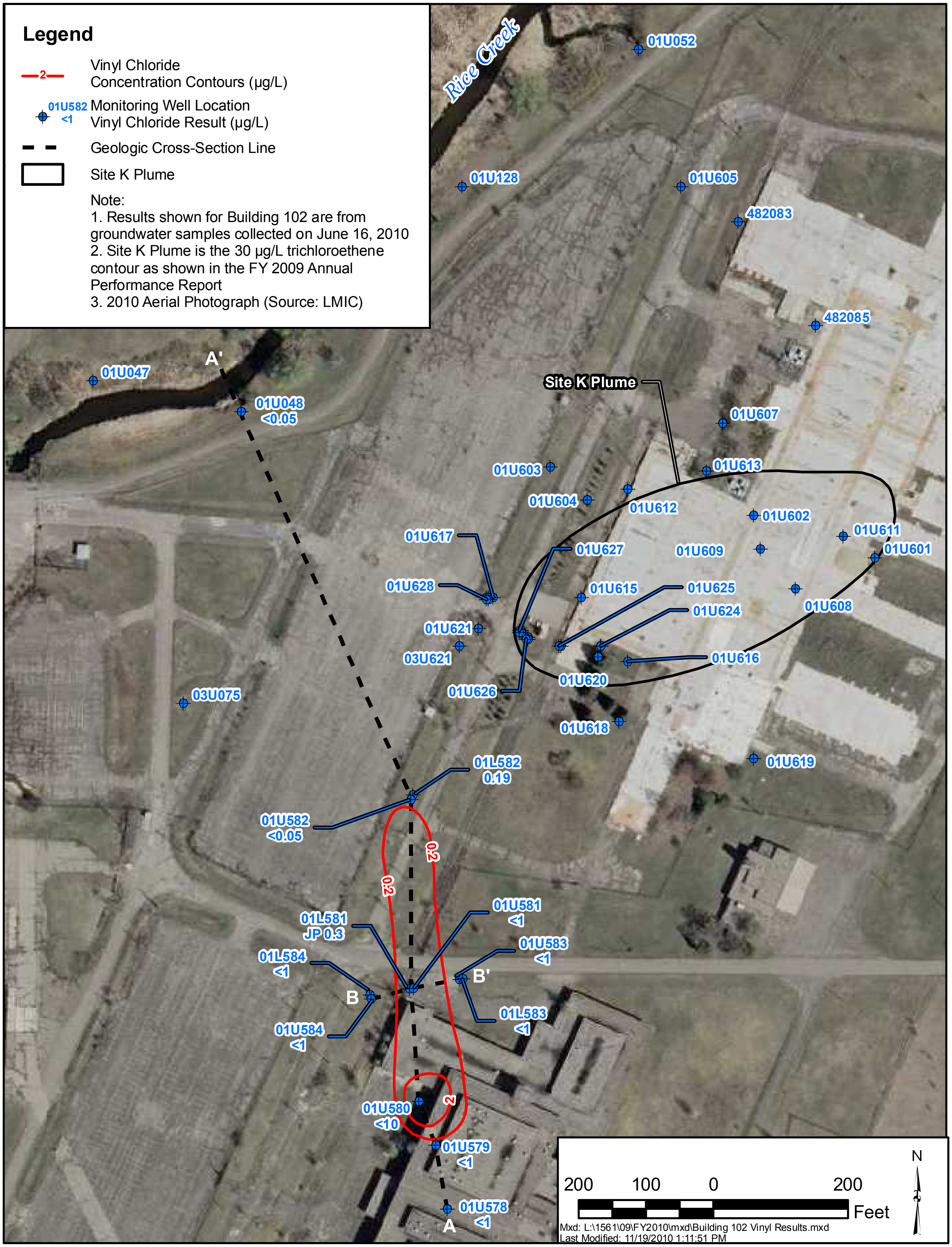
FY 2010

Figure 12-4



ANNUAL PERFORMANCE REPORT

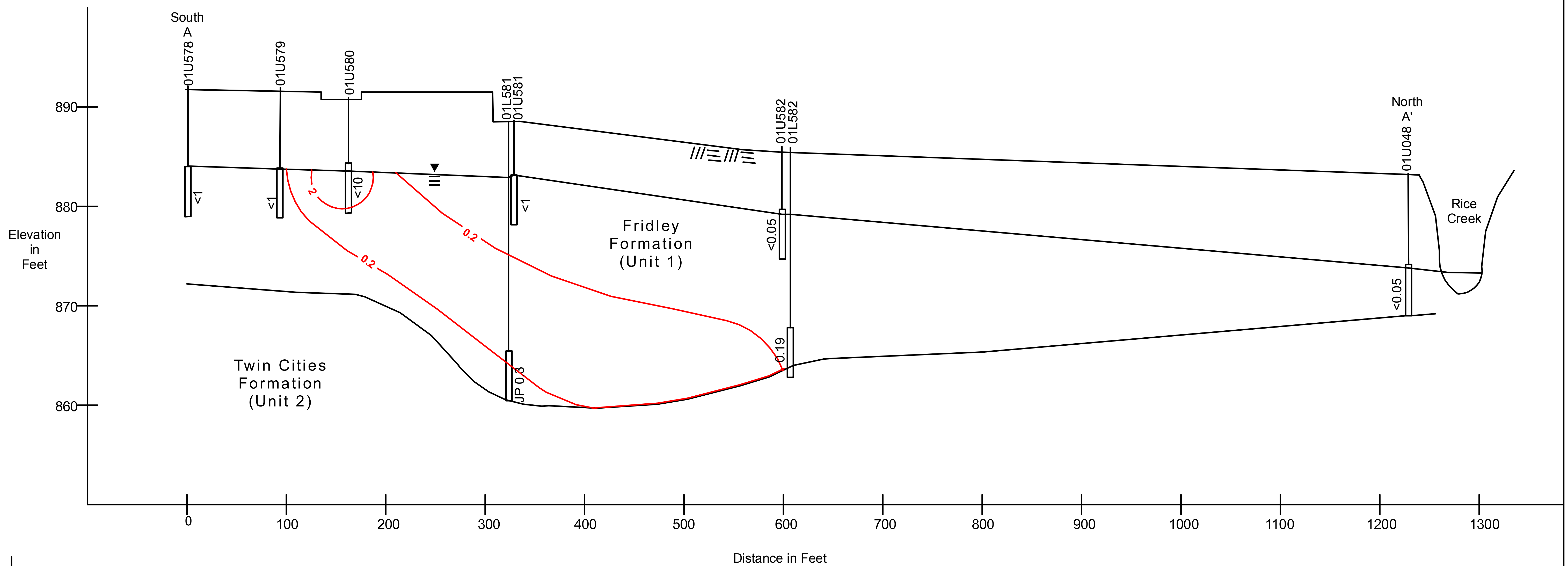
Vinyl Chloride Results - Summer 2010

Wenck

Wenck Associates, Inc. Environmental Engineers
1800 Pioneer Creek Center Maple Plain, MN 55359-0429

FY 2010

Figure 12-5



Screened interval of well

Groundwater Level

Vinyl Chloride Concentration Contour (µg/L)
(from samples collected on June 16, 2010)

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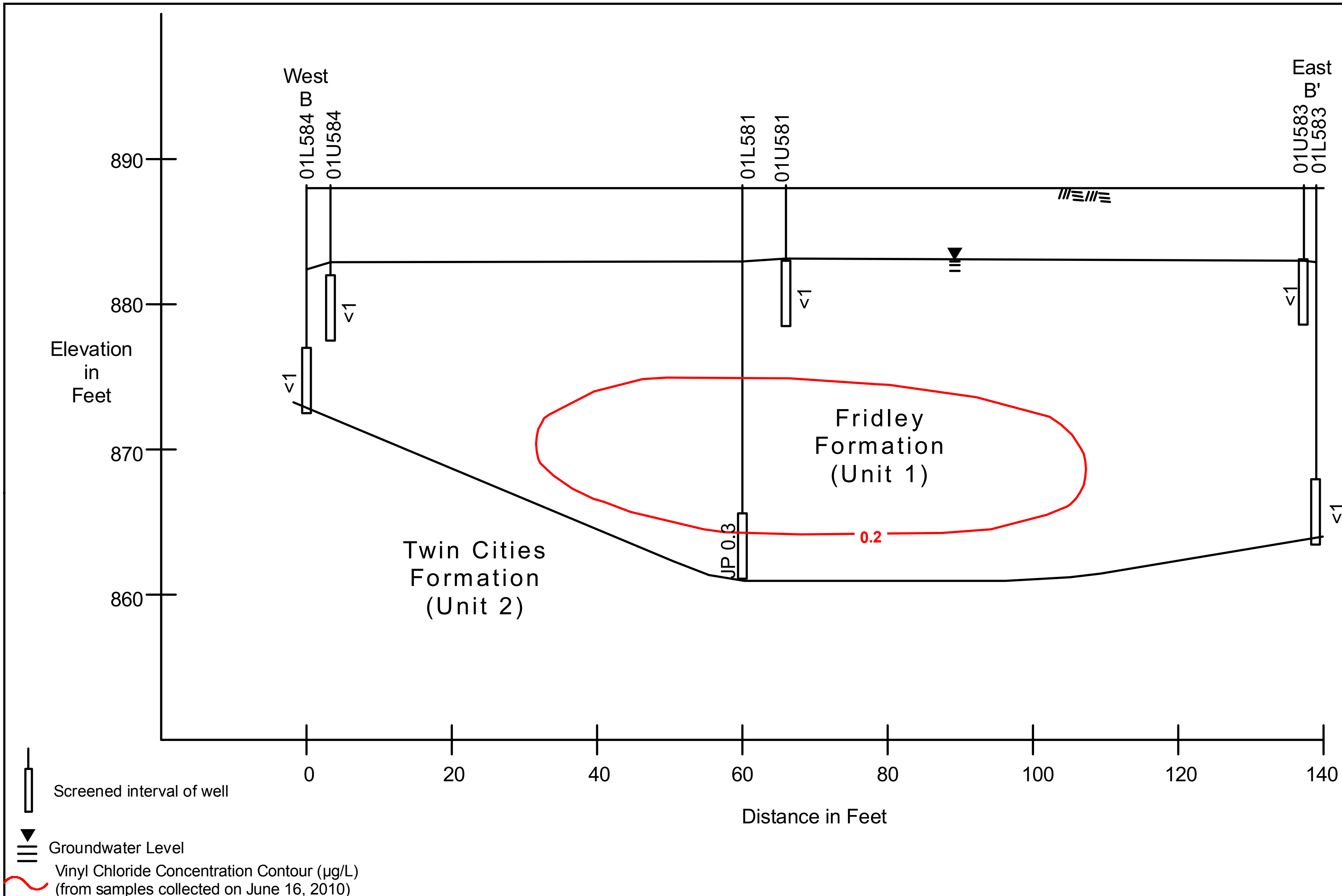
ANNUAL PERFORMANCE REPORT

Geologic Cross Section A-A'

FY 2010

Figure 12-6



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ANNUAL PERFORMANCE REPORT

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Environmental Engineers

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Maple Plain, MN 55359-0429

FY 2010

Figure 12-7

13.0 References

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Appendix A

FY 2010 – FY 2014 Monitoring Plans

A.1 Groundwater Monitoring Wells

APPENDIX A.1

FY 2010 - FY 2014 MONITORING PLAN FOR GROUNDWATER MONITORING WELLS

Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 10	June 11	June 12	June 13	June 14	Water Quality	Water Level	Comments
Operable Unit 1			Note: Changes from the monitoring plan presented in the previous Annual Performance Report are highlighted in this appendix.								
03U	03U811			---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
03U	03U821			---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
03U	03U822			---	Q,L(B)	---	Q,L(B)	---	1.a, OR	None	
03U	03U831			---	---	---	---	---	---	---	abandoned 2006
03U	409550	PCA 6U3		---	Q,L(B)	---	Q,L(B)	---	OR	None	
03U	409596	BS118U3		---	---	---	---	---	---	---	aband.2007, may need replacement
03M	03M843			---	Q,L(B)	---	Q,L(B)	---	1.a, OR	None	
03L	03L811			---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
03L	03L822			---	Q,L(B)	---	Q,L(B)	---	OR	None	
03L	03L832			---	Q,L(B)	---	Q,L(B)	---	OR	None	
03L	03L841			---	Q,L(B)	---	Q,L(B)	---	1.a, OR	None	
03L	03L846			---	Q,L(B)	---	Q,L(B)	---	1.a, OR	None	
03L	03L853			---	---	---	---	---	---	---	
03L	409556	PCA4L3		---	Q,L(B)	---	Q,L(B)	---	1.a, OR	None	
03L	409557	PCA1L3		---	Q,L(B)	---	Q,L(B)	---	1.a, OR	None	
03L	409597	BS118L3		---	---	---	---	---	---	---	aband. 2007, may need replacement
PC	04U821			---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	04U834			---	Q,L(B)	---	Q,L(B)	---	OR	None	
PC	04U836	MW-1		---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	04U837	MW-3		---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	04U838	MW-5		---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	04U839	MW-7		---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	04U841			---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	04U843			---	Q,L(B)	---	Q,L(B)	---	1.a, OR	3.b	
PC	04U844			---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	04U846			---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	04U847			---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	04U849			---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	04U850			---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	04U855			---	Q,L(B)	---	Q,L(B)	---	1.a, OR	3.b	
PC	04U871			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	3.b	
PC	04U872			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	3.b	
PC	04U875			---	Q,L(B)	---	Q,L(B)	---	1.a, OR	3.b	
PC	04U877			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	3.b	
PC	04U879			---	Q,L(B)	---	Q,L(B)	---	1.a, OR	3.b	
PC	04U880			---	Q,L(B)	---	Q,L(B)	---	1.a, OR	3.b	

APPENDIX A.1

FY 2010 - FY 2014 MONITORING PLAN FOR GROUNDWATER MONITORING WELLS

Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 10	June 11	June 12	June 13	June 14	Water Quality	Water Level	Comments
PC	04U881			---	Q,L(B)	---	Q,L(B)	---	1.a, OR	None	
PC	04U882			---	Q,L(B)	---	Q,L(B)	---	OR	None	
PC	04U883			---	Q,L(B)	---	Q,L(B)	---	1.a, OR	None	
PC	191942	BS118U4		---	---	---	---	---	---	---	aband. 2007, may need replacement
PC	200154	UM Golf Course		---	Q(B)	---	Q(B)	---	1.a, OR	---	
PC	200814	American Linen		---	---	---	---	---	---	---	
PC	206688	Cloverpond		---	Q(B)	---	Q(B)	---	1.a, OR	---	
PC	234547	Honeywell Ridgeway		---	---	---	---	---	---	---	
PC	409547	PCA1U4		---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	409548	PCA2U4		---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	409549	PCA3U4		---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	409555	PCA5U4		---	Q,L(B)	---	Q,L(B)	---	1.a, OR	3.b	
PC	512761	Gross Golf Course #2		---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
PC	554216	New Brighton #14									See Appendix A.2
PC	582628	New Brighton #15									See Appendix A.2
J	04J822			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	3.b	
J	04J834			---	Q,L(B)	---	Q,L(B)	---	OR	None	
J	04J835			---	---	---	---	---	---	---	
J	04J836	MW-2		---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
J	04J837	MW-4		---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
J	04J838	MW-6		---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
J	04J839	MW-8		---	Q,L(B)	---	Q,L(B)	---	OR	3.b	
J	04J847			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	3.b	
J	04J849			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	3.b	
J	04J882			---	Q,L(B)	---	Q,L(B)	---	OR	None	
J	200524	St. Anthony #5	(4)	---	Q(B)	---	Q(B)	---	OR	---	Army gets St. Anthony Data
J	200803	St. Anthony #4	(4)	---	Q(B)	---	Q(B)	---	OR	---	Army gets St. Anthony Data
J	206796	New Brighton #5									See Appendix A.2
J	206797	New Brighton #6									See Appendix A.2
PC/J	200804	St. Anthony #3	(4)	---	Q(B)	---	Q(B)	---	OR	---	Army gets St. Anthony Data
PC/J	200812	Gross Golf #1		---	---	---	---	---	---	---	
PC/J	206792	New Brighton #4									See Appendix A.2
PC/J	206793	New Brighton #3									See Appendix A.2
PC/J	233221	R&D Systems, N. Well		---	---	---	---	---	---	---	
PC/J	234549	Reiner		---	---	---	---	---	1.a, OR	---	Well out of service
PC/J	PJ#318			---	Q,L(B)	---	Q,L(B)	---	OR	None	
UNK	234546	Honeywell Ridgeway		---	Q(B)	---	Q(B)	---	OR	---	

Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 10	June 11	June 12	June 13	June 14	Water Quality	Water Level	Comments

Operable Unit 2

Site A Shallow Groundwater

Unit	Well I.D.	Common Name	Notes	June 10	June 11	June 12	June 13	June 14	Water Quality	Water Level	Comments
01U	01U038			L(B)	L(B)	L(B)	L(B)	L(B)	---	OR	
01U	01U039			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	Annual thru FY11, then semiannual
01U	01U040			L(B)	L(B)	L(B)	L(B)	L(B)	---	OR	
01U	01U041			L(B)	L(B)	L(B)	L(B)	L(B)	---	OR	
01U	01U063			L(B)	L(B)	L(B)	L(B)	L(B)	---	OR	
01U	01U067			L(B)	L(B)	L(B)	L(B)	L(B)	---	OR	
01U	01U102			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	
01U	01U103			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	
01U	01U104			L(B)	L(B)	L(B)	L(B)	L(B)	---	OR	
01U	01U105			L(B)	L(B)	L(B)	L(B)	L(B)	---	OR	
01U	01U106			L(B)	L(B)	L(B)	L(B)	L(B)	---	OR	
01U	01U107			L(B)	L(B)	L(B)	L(B)	L(B)	---	OR	
01U	01U108			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	
01U	01U110			L(B)	L(B)	L(B)	L(B)	L(B)	---	OR	
01U	01U115			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	Qtrly thru FY11, then annual
01U	01U116			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	Qtrly thru FY11, then annual
01U	01U117			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	
01U	01U118			L(B)	L(B)	L(B)	L(B)	L(B)	---	OR	
01U	01U119			L(B)	L(B)	L(B)	L(B)	L(B)	---	OR	
01U	01U120			L(B)	L(B)	L(B)	L(B)	L(B)	---	OR	
01U	01U125			---	---	---	---	---	---	---	
01U	01U126			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	Semiannual thru FY11, then annual
01U	01U127			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	
01U	01U133			L(B)	L(B)	L(B)	L(B)	L(B)	---	OR	
01U	01U135			L(B)	L(B)	L(B)	L(B)	L(B)	---	OR	

APPENDIX A.1

FY 2010 - FY 2014 MONITORING PLAN FOR GROUNDWATER MONITORING WELLS

Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 10	June 11	June 12	June 13	June 14	Water Quality	Water Level	Comments
01U	01U136			L(B)	L(B)	L(B)	L(B)	L(B)	---	OR	
01U	01U137			L(B)	L(B)	L(B)	L(B)	L(B)	---	OR	
01U	01U138			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	
01U	01U139			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	Qtrly thru FY11, then semiannual
01U	01U140			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	Annual thru FY11, then semiannual
01U	01U141			L(B)	L(B)	L(B)	L(B)	L(B)	---	OR	
01U	01U145	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	---	OR	
01U	01U146	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	---	OR	
01U	01U147	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	---	OR	
01U	01U148	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	---	OR	
01U	01U149	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	---	OR	
01U	01U150	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	---	OR	
01U	01U151	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	---	OR	
01U	01U152	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	---	OR	
01U	01U153	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	---	OR	
01U	01U154	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	---	OR	
01U	01U155	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	---	OR	
01U	01U156	Piezometer		L(B)	L(B)	L(B)	L(B)	L(B)	---	OR	
01U	01U157			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	Qtrly thru FY11, then semiannual
01U	01U158			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	Qtrly thru FY11, then semiannual
01U	01U350			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	
01U	01U351	EW-1		Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	Qtrly thru FY11, then annual
01U	01U352	EW-2		Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	Qtrly thru FY11, then semiannual
01U	01U353	EW-3		Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	Qtrly thru FY11, then semiannual
01U	01U354	EW-4		Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	Qtrly thru FY11, then semiannual
01U	01U355	EW-5		---	---	---	---	---	---	---	
01U	01U356	EW-6		---	---	---	---	---	---	---	
01U	01U357	EW-7		---	---	---	---	---	---	---	
01U	01U358	EW-8		---	---	---	---	---	---	---	
01U	01U901			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	Annual thru FY11, then semiannual
01U	01U902			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	Semiannual
01U	01U903			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	
01U	01U904			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	Semiannual

Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 10	June 11	June 12	June 13	June 14	Water Quality	Water Level	Comments
Site C Shallow Groundwater											
01U	01U045			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	
01U	01U046			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	Qtrly thru FY11, then annual
01U	01U085			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	
01U	01U551	EW-1		Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	Qtrly thru FY11, then annual
01U	01U552	EW-2		Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	Qtrly thru FY11, then annual
01U	01U553	EW-3		Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	Qtrly thru FY11, then annual
01U	01U561	MW-1		Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	
01U	01U562	MW-2		Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	
01U	01U563	MW-3		Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	
01U	01U564	MW-4		Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	Qtrly thru FY11, then annual
01U	01U565	MW-5		L(B)	L(B)	L(B)	L(B)	L(B)	---	OR	
01U	01U566	MW-6		Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	Qtrly thru FY11, then annual
01U	01U567	MW-7		Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	Qtrly thru FY11, then annual
01U	01U568	MW-8		Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	Qtrly thru FY11, then annual
01U	01U569	MW-9		L(B)	L(B)	L(B)	L(B)	L(B)	---	OR	
01U	01U570	MW-10		Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	
01U	01U571	MW-11		Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	Qtrly thru FY11, then annual
01U	01U572	MW-12		Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	Qtrly thru FY11, then annual
01U	01U573	MW-13		Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	
01U	01U574	MW-14		Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	
01U	01U575	MW-15		Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	
01U	01U576	MW-16		Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	

Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 10	June 11	June 12	June 13	June 14	Water Quality	Water Level	Comments
Site I Shallow Groundwater											
01U	01U064		(8)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	1a, OR	1a, OR	Sample in Mar/Apr
01U	01U632		(8)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	1a, OR	1a, OR	Sample in Mar/Apr
01U	01U636		(8)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	1a, OR	1a, OR	Sample in Mar/Apr
01U	01U639		(7) (8)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	1a, OR	1a, OR	Sample in Mar/Apr
01U	01U640		(8)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	1a, OR	1a, OR	Sample in Mar/Apr
01U	01U666		(8)	L(A)	L(A)	L(A)	L(A)	L(A)	---	1a, OR	GW elevations in Mar/Apr
01U	01U667		(8)	L(A)	L(A)	L(A)	L(A)	L(A)	---	1a, OR	GW elevations in Mar/Apr
01U	01U668		(8)	L(A)	L(A)	L(A)	L(A)	L(A)	---	1a, OR	GW elevations in Mar/Apr
01U	482086	I01MW	(8)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	1a, OR	1a, OR	Sample in Mar/Apr
01U	482087	I05MW	(8)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	1a, OR	1a, OR	Sample in Mar/Apr
01U	482088	I02MW	(8)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	1a, OR	1a, OR	Sample in Mar/Apr
01U	482089	I04MW	(7) (8)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	1a, OR	1a, OR	Sample in Mar/Apr
01U	482090	I03MW	(8)	L(A)	L(A)	L(A)	L(A)	L(A)	---	1a, OR	GW elevations in Mar/Apr

Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 10	June 11	June 12	June 13	June 14	Water Quality	Water Level	Comments

Site K Shallow Groundwater

Unit	Well I.D.	Common Name	Notes	June 10	June 11	June 12	June 13	June 14	Water Quality	Water Level	Comments
01U	01U047			L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
01U	01U048			L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
01U	01U052			L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
01U	01U065			L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
01U	01U128			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	3.a	
01U	01U601			L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
01U	01U602			L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
01U	01U603			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	3.a	
01U	01U604			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	3.a	
01U	01U605			L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
01U	01U607			L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
01U	01U608			L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
01U	01U609			L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
01U	01U611			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	3.a	
01U	01U612			L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
01U	01U613			L(A)	L(A)	L(A)	L(A)	L(A)	OR	3.a	
01U	01U615			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	3.a	
01U	01U616			L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
01U	01U617			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	3.a	
01U	01U618			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	3.a	
01U	01U619			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	3.a	
01U	01U620			L(A)	L(A)	L(A)	L(A)	L(A)	OR	3.a	
01U	01U621			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	3.a	
01U	01U624			L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
01U	01U625			L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
01U	01U626			L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
01U	01U627			L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
01U	01U628			L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
01U	482083	K04-MW		Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	3.a	
01U	482084	K02-MW		L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
01U	482085	K01-MW		L(A)	L(A)	L(A)	L(A)	L(A)	---	3.a	
03U	03U621			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	3.a	

Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 10	June 11	June 12	June 13	June 14	Water Quality	Water Level	Comments

Deep Groundwater (TGRS)

Unit	Well I.D.	Common Name	Notes	June 10	June 11	June 12	June 13	June 14	Water Quality	Water Level	Comments
03F	03F302	B1									See Appendix A.2
03F	03F303	B2	(5)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
03F	03F304	B3									See Appendix A.2
03F	03F305	B4									See Appendix A.2
03F	03F306	B5									See Appendix A.2
03F	03F307	B6									See Appendix A.2
03F	03F308	B7	(5)	---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03F	03F312	B11									See Appendix A.2
03F	03F319	B13									See Appendix A.2
03U	03U001			---	L(A)	---	L(A)	---	---	1.a	
03U	03U002			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U003			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U004			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U005			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U007			---	Q,L(A)	---	Q,L(A)	---	Background	1.a	
03U	03U008			---	L(A)	---	L(A)	---	---	1.a	
03U	03U009			---	Q,L(A)	---	Q,L(A)	---	Background	1.a	
03U	03U010			---	L(A)	---	L(A)	---	---	1.a	
03U	03U011			---	L(A)	---	L(A)	---	---	1.a	
03U	03U012			---	L(A)	---	L(A)	---	---	1.a	
03U	03U013			---	L(A)	---	L(A)	---	---	1.a	
03U	03U014			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U015			---	L(A)	---	L(A)	---	---	1.a	
03U	03U016			---	L(A)	---	L(A)	---	---	1.a	
03U	03U017			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U018			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U019			---	L(A)	---	L(A)	---	---	1.a	
03U	03U020			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U021			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U022			---	L(A)	---	L(A)	---	---	1.a	
03U	03U023			---	L(A)	---	L(A)	---	---	1.a	
03U	03U024			---	L(A)	---	L(A)	---	---	1.a	
03U	03U025			---	L(A)	---	L(A)	---	---	1.a	

APPENDIX A.1

FY 2010 - FY 2014 MONITORING PLAN FOR GROUNDWATER MONITORING WELLS

Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 10	June 11	June 12	June 13	June 14	Water Quality	Water Level	Comments
03U	03U026			---	L(A)	---	L(A)	---	---	1.a	
03U	03U027			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U028			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U029			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U030			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U031			---	L(A)	---	L(A)	---	---	1.a	
03U	03U032			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U075			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U076			---	L(A)	---	L(A)	---	---	1.a	
03U	03U077			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U078			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U079			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U082			---	L(A)	---	L(A)	---	---	1.a	
03U	03U083			---	L(A)	---	L(A)	---	---	1.a	
03U	03U084			---	L(A)	---	L(A)	---	---	1.a	
03U	03U087			---	L(A)	---	L(A)	---	---	1.a	
03U	03U088			---	L(A)	---	L(A)	---	---	1.a	
03U	03U089			---	L(A)	---	L(A)	---	---	1.a	
03U	03U090			---	L(A)	---	L(A)	---	---	1.a	
03U	03U092			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U093			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
03U	03U094			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
03U	03U096			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U097			---	---	---	---	---	---	---	
03U	03U099			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
03U	03U111			---	L(A)	---	L(A)	---	---	1.a	
03U	03U112			---	L(A)	---	L(A)	---	---	1.a	
03U	03U113			---	L(A)	---	L(A)	---	---	1.a	
03U	03U114			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U121			---	---	---	---	---	---	---	
03U	03U129			---	---	---	---	---	---	---	
03U	03U301	SC1									See Appendix A.2
03U	03U314	SC2									See Appendix A.2
03U	03U315	SC3	(5)	---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U316	SC4	(5)	---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U317	SC5									See Appendix A.2
03U	03U521			---	---	---	---	---	---	---	
03U	03U647			---	L(A)	---	L(A)	---	---	1.a	
03U	03U648			---	L(A)	---	L(A)	---	---	1.a	
03U	03U658			---	L(A)	---	L(A)	---	---	1.a	

APPENDIX A.1

FY 2010 - FY 2014 MONITORING PLAN FOR GROUNDWATER MONITORING WELLS

Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 10	June 11	June 12	June 13	June 14	Water Quality	Water Level	Comments
03U	03U659			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U671			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U672			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U674			---	L(A)	---	L(A)	---	---	1.a	
03U	03U675			---	---	---	---	---	---	---	
03U	03U676			---	L(A)	---	L(A)	---	---	1.a	
03U	03U701			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U702			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U703			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U704			---	L(A)	---	L(A)	---	---	1.a	
03U	03U705			---	L(A)	---	L(A)	---	---	1.a	
03U	03U706			---	L(A)	---	L(A)	---	---	1.a	
03U	03U707			---	L(A)	---	L(A)	---	---	1.a	
03U	03U708			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
03U	03U709			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U710			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U711			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
03U	03U715			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U716			---	L(A)	---	L(A)	---	---	1.a	
03U	03U801			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
03U	03U803			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U804			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U805			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03U	03U806			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
03U	519288	E101-MW		---	---	---	---	---	---	---	
03U	519289	E102-MW		---	---	---	---	---	---	---	
03U	519290	E103-MW		---	---	---	---	---	---	---	
03M	03M001			---	L(A)	---	L(A)	---	---	1.a	
03M	03M002			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03M	03M003			---	L(A)	---	L(A)	---	---	1.a	
03M	03M004			---	L(A)	---	L(A)	---	---	1.a	
03M	03M005			---	L(A)	---	L(A)	---	---	1.a	
03M	03M007			---	L(A)	---	L(A)	---	---	1.a	
03M	03M010			---	L(A)	---	L(A)	---	---	1.a	
03M	03M012			---	L(A)	---	L(A)	---	---	1.a	
03M	03M013			---	L(A)	---	L(A)	---	---	1.a	
03M	03M017			---	L(A)	---	L(A)	---	---	1.a	
03M	03M020			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03M	03M713			---	L(A)	---	L(A)	---	---	1.a	

APPENDIX A.1

FY 2010 - FY 2014 MONITORING PLAN FOR GROUNDWATER MONITORING WELLS

Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 10	June 11	June 12	June 13	June 14	Water Quality	Water Level	Comments
03M	03M802			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
03M	03M806			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
03L	03L001			---	L(A)	---	L(A)	---	---	1.a	
03L	03L002			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03L	03L003			---	L(A)	---	L(A)	---	---	1.a	
03L	03L004			---	L(A)	---	L(A)	---	---	1.a	
03L	03L005			---	L(A)	---	L(A)	---	---	1.a	
03L	03L007			---	Q,L(A)	---	Q,L(A)	---	Background	1.a	
03L	03L010			---	L(A)	---	L(A)	---	---	1.a	
03L	03L012			---	L(A)	---	L(A)	---	---	1.a	
03L	03L013			---	L(A)	---	L(A)	---	---	1.a	
03L	03L014			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03L	03L017			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03L	03L018			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03L	03L020			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03L	03L021			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03L	03L027			---	L(A)	---	L(A)	---	---	1.a	
03L	03L028			---	L(A)	---	L(A)	---	---	1.a	
03L	03L029			---	L(A)	---	L(A)	---	---	1.a	
03L	03L077			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03L	03L078			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03L	03L079			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03L	03L080			---	L(A)	---	L(A)	---	---	1.a	
03L	03L081			---	L(A)	---	L(A)	---	---	1.a	
03L	03L084			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03L	03L113			---	L(A)	---	L(A)	---	---	1.a	
03L	03L802			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
03L	03L806			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
03L	03L809			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
03L	03L833			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC	04U001			---	L(A)	---	L(A)	---	---	1.a	
PC	04U002			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC	04U003			---	L(A)	---	L(A)	---	---	1.a	
PC	04U007			---	Q,L(A)	---	Q,L(A)	---	Background	1.a	

FY 2010 - FY 2014 MONITORING PLAN FOR GROUNDWATER MONITORING WELLS

Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 10	June 11	June 12	June 13	June 14	Water Quality	Water Level	Comments
PC	04U012			---	L(A)	---	L(A)	---	---	1.a	
PC	04U020			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC	04U027			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC	04U077			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC	04U510			---	Q,L(A)	---	Q,L(A)	---	Background	1.a	
PC	04U701			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC	04U702			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC	04U708			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC	04U709			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC	04U711			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
PC	04U713			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC	04U714			---	L(A)	---	L(A)	---	---	1.a	
PC	04U802			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
PC	04U806			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
PC	04U833			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
J	04J077			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
J	04J702			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
J	04J708			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
J	04J713			---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
J	04J714			---	L(A)	---	L(A)	---	---	1.a	
PC/J	PJ#003			---	L(A)	---	L(A)	---	---	1.a	
PC/J	PJ#027			---	L(A)	---	L(A)	---	---	1.a	
PC/J	PJ#309	B8									See Appendix A.2
PC/J	PJ#310	B9									See Appendix A.2
PC/J	PJ#311	B10	(5)	---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC/J	PJ#313	B12	(5)	---	Q,L(A)	---	Q,L(A)	---	OR	1.a	
PC/J	PJ#802			---	L(A)	---	L(A)	---	---	1.a	
PC/J	PJ#806			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	1.a	
---	Staff Gauges			---	L(A)	---	L(A)	---	---	---	

Unit 1 Wells

01U	01U035			---	---	---	---	---	---	---	
01U	01U043			---	---	---	---	---	---	---	
01U	01U044			---	---	---	---	---	---	---	
01U	01U045			---	---	---	---	---	---	---	
01U	01U046			---	---	---	---	---	---	---	
01U	01U060			---	---	---	---	---	---	---	
01U	01U072			---	---	---	---	---	---	---	
01U	01U085			---	---	---	---	---	---	---	

APPENDIX A.1

FY 2010 - FY 2014 MONITORING PLAN FOR GROUNDWATER MONITORING WELLS

Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 10	June 11	June 12	June 13	June 14	Water Quality	Water Level	Comments
Operable Unit 3											
03U	03U673			---	Q,L(A)	---	Q,L(A)	---	OR	2.a	
03M	03M848			Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	2.a	
03L	03L673			---	Q,L(A)	---	Q,L(A)	---	OR	2.a	
03L	03L832			---	L(A)	---	L(A)	---	---	2.a	
03L	03L848			---	Q,L(A)	---	Q,L(A)	---	OR	2.a	
03L	03L854			---	Q,L(A)	---	Q,L(A)	---	OR	2.a	
03L	03L859			---	Q,L(A)	---	Q,L(A)	---	OR	2.a	
03L	03L860			---	L(A)	---	L(A)	---	---	2.a	
03L	03L861			---	---	---	---	---	---	---	Abandoned FY06
03L	476837	MW15H		---	---	---	---	---	---	---	
PC	04U414	414U4	(6)	---	---	---	Q,L(A)	---	OR	2.a	
PC	04U673			---	Q,L(A)	---	Q,L(A)	---	OR	2.a	
PC	04U832			---	Q,L(A)	---	Q,L(A)	---	OR	2.a	Contingency Action for FY08
PC	04U845			---	Q,L(A)	---	Q,L(A)	---	OR	2.a	Contingency Action for FY08
PC	04U848			---	Q,L(A)	---	Q,L(A)	---	OR	2.a	
PC	04U851		(6)	---	---	---	Q,L(A)	---	OR	2.a	
PC	04U852			---	---	---	---	---	---	---	Proposed for Abandonment
PC	04U854			---	Q,L(A)	---	Q,L(A)	---	OR	2.a	
PC	04U859			---	Q,L(A)	---	Q,L(A)	---	OR	2.a	
PC	04U860			---	Q,L(A)	---	Q,L(A)	---	OR	2.a	
PC	04U861			---	---	---	---	---	---	---	Abandoned FY06
PC	04U863	323U4		Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	Q,L(A)	OR	2.a	
PC	04U864	324U4		---	---	---	---	---	---	---	Proposed for Abandonment
PC	04U865	325U4		---	---	---	---	---	---	---	Proposed for Abandonment
PC	04U866	326U4		Q,L(A)	Q,L(A)	---	Q,L(A)	---	OR	2.a	
PC	520931	NBM #13		---	---	---	---	---	---	---	Abandoned FY07
J	04J864	324 J		---	---	---	---	---	---	---	Proposed for Abandonment
J	04J866	326 J		---	Q,L(A)	---	Q,L(A)	---	OR	2.a	

Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 10	June 11	June 12	June 13	June 14	Water Quality	Water Level	Comments
Other Installation Restoration Activities											
Building 102 Shallow Groundwater											
01U	01U048			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	
01U	01U578			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	
01U	01U579			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	
01U	01U580			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	
01U	01U581			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	
01U	01U582			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	
01U	01U583			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	
01U	01U584			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	
01L	01L581			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	
01L	01L582			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	
01L	01L583			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	
01L	01L584			Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	Q,L(B)	OR	OR	

Well Information									Purpose For Monitoring (3)		
Unit	Well I.D.	Common Name	Notes	June 10	June 11	June 12	June 13	June 14	Water Quality	Water Level	Comments
Well Inventory											
(Entries under "Notes" refer to the well inventory category)											
---	249608	Rapit Printing Inc	1a	---	---	---	Q(B)	---	Well Inventory	---	2520 Larpenteur Ave
---	S00444	Minneapolis Parks & Rec Dep	1a	---	---	---	Q(B)	---	Well Inventory	---	Ontario & E River Rd (Erie), Dartmoth Triangle
---	200173	KSTP Radio TV	1b	---	---	---	Q(B)	---	Well Inventory	---	3415 University Ave
---	200180	Town & Country Golf Course	1b	---	---	---	Q(B)	---	Well Inventory	---	2279 Marshal Ave
---	200522	Windsor Green	1b	---	---	---	Q(B)	---	Well Inventory	---	Silver Lake Rd & Cty Rd E
---	200523	Windsor Green	1b	---	---	---	Q(B)	---	Well Inventory	---	Silver Lake Rd & Cty Rd E
---	234338	Bosell	1b	---	---	---	Q(B)	---	Well Inventory	---	1575 14th Ave NW
---	234421	BioClean (BioChem)	1b	---	---	---	Q(B)	---	Well Inventory	---	2151 Mustang Dr
---	234469	Palkowski, T.	1b	---	---	---	Q(B)	---	Well Inventory	---	2816 Hwy 88
---	234544	R&D Systems	1b	---	---	---	Q(B)	---	Well Inventory	---	2201 Kennedy St NE
---	249632	Montzka, Harold	1b	---	---	---	Q(B)	---	Well Inventory	---	2301 N Upland Crest NE
---	433298	Town & Country Golf Course	1b	---	---	---	Q(B)	---	Well Inventory	---	2279 Marshall Ave
---	509052	Shriners Hospital	1b	---	---	---	Q(B)	---	Well Inventory	---	2025 E River Rd
---	756236	Alcan	1c	---	---	---	Q(B)	---	Well Inventory	---	150 26th Ave SE
---	S00437	Northern Star Co	1c	---	---	---	Q(B)	---	Well Inventory	---	3171 5th St SE
---	107405	Dimmick, Kay	2a	---	---	---	Q(B)	---	Well Inventory	---	4355 Hwy 10
---	200176	Waldorf Paper Products	2b	---	---	---	Q(B)	---	Well Inventory	---	2236 Myrtle Ave
---	249007	Walton, Toni	2b	---	---	---	Q(B)	---	Well Inventory	---	4453 Old Hwy 10
---	537801	Midway Industrial	2b	---	---	---	Q(B)	---	Well Inventory	---	4759 Old Hwy 8
---	S00002	Midland Hills Country Club	2b	---	---	---	Q(B)	---	Well Inventory	---	2001 N Fulham St
---	200076	Old Dutch Foods, Inc	2c	---	---	---	Q(B)	---	Well Inventory	---	2375 Terminal Rd
---	236029	R&D Systems, South Well	2c	---	---	---	Q(B)	---	Well Inventory	---	2201 Kennedy St NE
---	236439	Waldorf Paper Products	2c	---	---	---	Q(B)	---	Well Inventory	---	2250 Wabash Ave
---	249185	Novotny, Mark	4a	---	---	---	Q(B)	---	Well Inventory	---	1706 Malvern St
---	S00295	Alfson, Loren	4a	---	---	---	Q(B)	---	Well Inventory	---	2351 Summer St
---		Amundsen, Jason & Lucy	4a	---	---	---	Q(B)	---	Well Inventory	---	2816 St. Anthony Blvd
---		Hermes, Margo	4a	---	---	---	Q(B)	---	Well Inventory	---	2935 Old Hwy 8
---		Holland, Justin	4a	---	---	---	Q(B)	---	Well Inventory	---	1475 16th St NW
---		Macdonald, Jason	4a	---	---	---	Q(B)	---	Well Inventory	---	1672 14th Ave NW
---		Weisenberger, Heidi	4a	---	---	---	Q(B)	---	Well Inventory	---	2816 Silver Lake Rd

APPENDIX A.1
FY 2010 – FY 2014 MONITORING PLAN
FOR GROUNDWATER MONITORING WELLS

Unit Designations:

01U	- Upper Fridley Formation	03L	- Lower Hillside Formation	SL	- St. Lawrence
01L	- Lower Fridley Formation	SP	- St. Peter	UNK	- Unknown
03U	- Upper Hillside Formation	PC	- Prairie du Chien		
03M	- Middle Hillside Formation	J	- Jordan		

Notes:

(A) Indicates that the monitoring is the responsibility of ATK.
(B) Indicates that the monitoring is the responsibility of the Army.
(1) "L (A or B)" denotes a water level measurement by the appropriate party.
(2) "Q (A or B)" denotes a water quality sampling by the appropriate party. The required analyte list for each specific site is shown in Appendix A.4.
(3) The designations refer to the following purposes:

- ❖ Operable Unit 1 Water Quality
  - – 1.a = To contour the perimeter of the plume which defines the area of concern for alternate water supply/well abandonment
  - – OR = Overall remedy. To evaluate attainment of the cleanup levels throughout the plume
- ❖ Operable Unit 1 Water Levels
  - – 3.b = To contour water levels for evaluation of containment
- ❖ Site A Water Quality
  - – OR = Overall remedy. To evaluate attainment of the cleanup levels throughout the plume
- ❖ Site A Water Levels
  - – OR = Overall remedy. To evaluate groundwater flow direction relative to plume location
- ❖ Site C Water Quality
  - – OR = Overall remedy. To evaluate attainment of the cleanup levels throughout the plume
- ❖ Site C Water Levels
  - – OR = Overall remedy. To evaluate groundwater flow direction relative to plume location
- ❖ Site I Water Quality
  - – 1.a = To track remedy progress
  - – OR = Overall remedy. To evaluate attainment of the cleanup levels throughout the plume
- ❖ Site I Water Levels
  - – 1.a = To track remedy progress
- ❖ Site K Water Quality
  - – OR = Overall remedy. To evaluate attainment of the cleanup levels throughout the plume
- ❖ Site K Water Levels
  - – 3.a = To contour water levels for evaluation of containment
- ❖ TGRS Water Quality
  - – OR = Overall remedy. To evaluate attainment of the cleanup levels throughout the plume
- ❖ TGRS Water Levels
  - – 1.a = To contour water levels for evaluation of containment
- ❖ Operable Unit 3 Water Quality
  - – OR = Overall remedy. To evaluate attainment of the cleanup levels throughout the plume
- ❖ Operable Unit 3 Water Levels
  - – 2.a = To contour water levels for evaluation of MNA remedy

(4) Sampling performed by the City of Saint Anthony. Army collects sample only if in production and not being sampled by City of Saint Anthony, otherwise Army uses Saint Anthony data.
(5) Sample extraction well annually or biennially, as shown, since it is no longer being pumped.
(6) Wells 04U414 and 04U851 monitored every 5 years during event preceding 5-year review
(7) Of the two wells, well 01U639 will be the primary sampling location and 482089 (I04MW) will be the alternate sampling location. If it is not possible to collect a groundwater sample from 01U639, then an attempt will be made to collect a sample from 482089 (I04MW).
(8) Flexibility will be maintained to allow for groundwater sampling to occur in either March or April depending on current conditions.

A.2 Remedial Treatment Systems

APPENDIX A.2
FY 2010 - FY 2014 MONITORING PLAN
FOR REMEDIAL TREATMENT SYSTEMS

OU1: DEEP GROUNDWATER (1)

Location	Sampling Frequency	Parameters
• Extraction Wells NBM#4, #14, and #15	- Monthly	- Pumping Volumes
(and also NBM#3, #5, and #6)	- Monthly	- Water Quality (2)
• PGAC Effluent	- Monthly	- Water Quality (2)

OU2: SITE K REMEDIAL ACTION

Location	Sampling Frequency	Parameters
• Extracted Groundwater	- Monthly	- Pumping Volume
• Treatment System Effluent [Outfall 391 (010)]	- See Appendix A.3	- See Appendix A.3

OU2: TCAAP GROUNDWATER RECOVERY SYSTEM (TGRS)

Location	Sampling Frequency	Parameters
• Extraction Wells	- Monthly	- Pumping Volumes
	- Semi-Annually	- Water Levels
	- Semi-Annually	- Water Quality (2)
• Treatment System Influent	- Monthly	- Pumping Volumes
	- Monthly	- Water Quality (2)
• Treatment System Effluent	- Monthly	- Water Quality (2)

Notes:
(1) Performed by the City of New Brighton using their Sampling and Analysis Plan.
(2) The required analyte list for each specific site is presented in Appendix A.4.

A.3 Surface Water

APPENDIX A.3
FY 2010 - FY 2014 MONITORING PLAN
FOR SURFACE WATER

Analysis	Analytical Method	Units	Site K Effluent (Outfall 010)	Site C Surface Water Locations (SW-5)	(SW-6)	(NE Wetland)
Flow Rate	---	gal/day	Continuous			
Total Flow	---	gal	M			
pH	(field)	(pH)	Q			
Cyanide	9012A	µg/l	Q			
Copper	6020	µg/l	Q			
Lead	6020	µg/l	Q	3Q through FY11; then annual (June)	3Q through FY11; then annual (June)	3Q through FY11; then annual (June)
Mercury	7470A	µg/l	Q			
Phosphorus (Total)	365.4	µg/l	Q			
Silver	6020	µg/l	Q			
Zinc	6020	µg/l	Q			
Trichloroethene	8260C	µg/l	Q			
1,1-Dichloroethene	8260C	µg/l	Q			
1,1-Dichloroethane	8260C	µg/l	Q			
Cis-1,2-Dichloroethene	8260C	µg/l	Q			
Trans-1,2-Dichloroethene	8260C	µg/l	Q			
Vinyl Chloride	8260C	µg/l	Q			
1,2-Dichloroethane	8260C	µg/l	Q			

Notes:

M = Measurement required once per month

Q = Analysis required once per quarter

3Q = Analysis required in three quarters (March, June, and September)

A.4 Site Specific Lists of Required Analytes

APPENDIX A.4
SITE SPECIFIC LISTS OF REQUIRED ANALYTES

Note: Cleanup levels (in µg/l) from each Record of Decision are shown below for use in determining the required method detection limits. Also note that these lists represent the minimum list of analytes. A larger analyte list may be utilized by the monitoring organization, if so desired.

OU1 (DEEP GROUNDWATER) (1)

1,1-Dichloroethane	70
1,1-Dichloroethene	6
cis-1,2-Dichloroethene	70
1,1,1-Trichloroethane	200
1,1,2-Trichloroethane	3
Trichloroethene	5

SITE A (SHALLOW GROUNDWATER) (2)

Antimony*	6
1,1-Dichloroethene	6
1,2-Dichloroethane	4
Benzene	10
Chloroform	60
cis-1,2-Dichloroethene	70
Tetrachloroethene	7
Trichloroethene	30

*Antimony is only monitored at these wells:
01U103, 01U902 and 01U904 (June only)

SITE C (SHALLOW GROUNDWATER) (3)

Lead	15

SITE I (SHALLOW GROUNDWATER) (2)

1,2-Dichloroethene (cis and trans)	70
Trichloroethene	30
Vinyl Chloride	0.2

SITE K (SHALLOW GROUNDWATER) (2)

1,2-Dichloroethene (cis and trans)	70
Trichloroethene	30

OU2 (DEEP GROUNDWATER) (2)

1,1,1-Trichloroethane	200
1,1-Dichloroethane	70
1,1-Dichloroethene	6
1,2-Dichloroethane	4
cis-1,2-Dichloroethene	70
Tetrachloroethene	5
Trichloroethene	5

OU3 (DEEP GROUNDWATER) (4)

1,1-Dichloroethane	70
1,1-Dichloroethene	6
cis-1,2-Dichloroethene	70
1,1,1-Trichloroethane	200
1,1,2-Trichloroethane	3
Trichloroethene	5

Notes:

(1) From Page 18 of the OU1 Record of Decision.
(2) From Table 1 of the OU2 Record of Decision.
(3) From Table 1 of the OU2 Record of Decision - Amendment #1.
(4) From Page 26 of the OU3 Record of Decision.

Analytical Methods:
VOCs: SW-846 Method 8260C
Antimony & Lead: SW-846 Method 6020

APPENDIX A.4 (cont'd)
SITE SPECIFIC LISTS OF REQUIRED ANALYTES

OTHER INSTALLATION RESTORATION ACTIVITIES

BUILDING 102 SHALLOW GROUNDWATER[5]

Vinyl Chloride[6]	0.18
cis-1,2-Dichloroethene	70
Trichloroethene	5
1,1-Dichloroethene	6

WELL INVENTORY SAMPLING

VOCs (report full VOC list)

Notes:

(5) From Table 3-5 of the Building 102 Groundwater Engineering Evaluation/Cost Analysis (EE/CA).
(6) Vinyl chloride is also analyzed by SW-846 Method 8260C - SIM at wells 01U048, 01U582, and 01L582.

Analytical Methods:
VOCs: SW-846 Method 8260C (see Note 6 above)
Metals: SW-846 Method 6020

A.5 New Brighton Operating Rates

Table D-1
Remedial Production Ranges for Normal Operation
(Effective January 2008)

NBCGRS Well	Estimated Physical Capacity Range			Remedial Production Range		Flow Rate Equivalents (24-hr Production Basis)	
	Normal Individual Low (gpm)	Normal Individual High (gpm) (See Note 1)	Peak Combined High (gpm) (See Note 1)	Lower Limit (MGD)	Upper Limit (MGD)	Lower Limit (gpm)	Upper Limit (gpm)
3 (See Note 2)	300	600	400	0.000	0.576	0	400
4 (See Note 2)	500	1,100	900	1.152	1.296	800	900
3 + 4 (See Note 2)	800	n/a	1,300	1.152	1.872	800	1,300
5	400	850	750	0.864	1.080	600	750
6	400	850	750	0.000	1.080	0	750
5 + 6 (See Note 3)	800	1,700	1,500	0.864	2.160	600	1,500
14	500	1,200	1,000	0.000	1.440	0	1,000
15	500	1,200	1,000	1.152	1.440	800	1,000
TOTAL WELL CAPACITY	2,600	n/a	4,800	**3.168**	**6.912**	**2,200**	**4,800**
TREATMENT CAPACITY		3,200	5,000				
NBCGRS SYSTEM LIMIT		3,200	4,800				

NOTES:

1. During peak production periods with all wells running, individual well capacities are limited by interference, high drawdown, and high system head losses
2. While shown individually to illustrate normal operational intent, enforceable target is for combined Well 3 plus Well 4 since the wells are located in close proximity and effectively operate as a single point source. Wells 3 and 4 can be used interchangeably to produce total daily target.
3. While shown individually to illustrate normal operational intent, enforceable target is for combined Well 5 plus Well 6 since the wells are located in close proximity and effectively operate as a single point source. Wells 5 and 6 can be used interchangeably to produce total daily target.

15 FEB 2008
Michael R. Fix
Twin Cities Army Ammunition Plant

2/15/08
Grant M. Wyffels
City of New Brighton

Table D-2
Alternate Remedial Production Ranges for Contingent Events
(Effective January 2008)

Event	Normal Operation			Well 3 and/or 4 Down			Well 5 and/or 6 Down			Well 14 Down			Well 15 Down		
Well / Pair	Priority	Lower Limit (MGD)	Upper Limit (MGD)	Priority	Lower Limit (MGD)	Upper Limit (MGD)	Priority	Lower Limit (MGD)	Upper Limit (MGD)	Priority	Lower Limit (MGD)	Upper Limit (MGD)	Priority	Lower Limit (MGD)	Upper Limit (MGD)
3 + 4	2	1.152	1.872	NA	**0.000**	**0.000**	2	1.440	1.872	2	1.152	1.872	1	1.440	1.872
5 + 6	3	0.864	2.160	2	1.728	2.160	NA	**0.000**	**0.000**	3	0.864	2.160	2	1.728	2.160
14	4	0.000	1.440	3	1.152	1.440	3	1.152	1.440	NA	**0.000**	**0.000**	3	0.720	1.152
15	1	1.152	1.440	1	1.152	1.440	1	1.152	1.440	1	1.152	1.440	NA	**0.000**	**0.000**
Total		3.168	6.912		4.032	5.040		3.744	4.752		3.168	5.472		3.888	5.184

Appendix B

Description of Hydrogeologic Units/Well Nomenclature

APPENDIX B
NEW BRIGHTON/ARDEN HILLS SUPERFUND SITE WELL INDEX

FISCAL YEAR 2010

Purpose

The purpose of the well index is to identify all wells, both past and present, that:

- Have been used to collect water quality data or groundwater elevations in regard to work at the New Brighton/Arden Hills Superfund Site (including private wells and offsite monitoring wells sampled by the Army); or
- Are owned by the Army; or
- Are located within the boundaries of OU2 (the former TCAAP property)

In addition, the well index aims to identify the current status (in use, sealed, abandoned, etc.) of these wells.

The well index does not include wells identified in the Well Inventory Update (Appendix E) that have not been sampled by the Army at any point in history.

The list contained in the well index is by no means a compilation of all available data. Other data may exist regarding an individual well that was not discovered or searched out during the course of this effort. The list is intended to be a reasonable effort to gather the data concerning the wells that is readily available. Therefore, if additional data is desired concerning a certain well, it may be possible to search out and obtain that data from records not searched during the course of the investigation.

Background

OU2 and OU1/OU3 wells have been installed in four hydrogeologic units beneath the site. These hydrogeologic units, as referred to in this report, are conceptually illustrated on Figure B-1 and are described below:

Unit 1: This unit, referred to as the Fridley Formation, consists of alluvium and lacustrine deposits above the Twin Cities Formation (Unit 2). The formation is made up of fine- to medium-grained sand and clayey silt, which acts as an unconfined aquifer with an estimated hydraulic conductivity of 8.3 x 10^{-3} cm/sec (International Technology Corp. 1992). The Unit 1 deposits are discontinuous at the New Brighton/Arden Hills Superfund Site (NB/AH Site) and ranges in thickness from zero to 50 feet. They are predominantly limited to the north, east, and southwest portions of the site. Groundwater in Unit 1 is also discontinuous.

Unit 2: Known as the Twin Cities Formation, Unit 2 consists of Quaternary aged glacial till and, similar to Unit 1, is discontinuous at the NB/AH Site . Unit 2 is generally regarded as an aquitard to vertical migration of groundwater; however, sand and gravel lenses may contain water.

Unit 3: This unit consists primarily of the Quaternary aged Hillside Sand Formation, which is continuous beneath OU2. Near the center of OU2, the Hillside Sand Formation is overlain by the Arsenal Sand, which forms a kame. There is no distinct lithologic contact between the Hillside Sand and the Arsenal Sand, and both are considered included in Unit 3. Unit 3 ranges in thickness from 25 to 450 feet. For monitoring purposes, the Unit 3 aquifer thickness has been arbitrarily subdivided into thirds designated as upper, middle, and lower.

Unit 4: This unit consists collectively of bedrock from the Prairie du Chien Group and Jordan Formation (Ordovician and Cambrian periods, respectively). For monitoring purposes, the Prairie du Chien Group is referred to as Upper Unit 4, while the Jordan Formation is Lower Unit 4. The Jordan Formation varies from fine- to coarse-grained quartz sandstone. The Prairie du Chien Group in the NB/AH Site area consists of a finely crystalline dolomite of the Oneota Formation, as well as quartz sandstone and dolomite members of the Shakopee Formation. A more detailed description of the bedrock geology can be found in the Remedial Investigation Report (Argonne National Laboratory, 1991).

In order to identify the hydrogeologic unit in which each well is completed, the United States Army Environmental Center (USAEC), formerly the United States Army Toxic and Hazardous Materials Agency (USATHAMA), developed a standardized identification system for wells at the NB/AH Site (referred to as the Army Designation or IRDMIS number). Well designations consist of six characters, such as 03U093. The first two characters represent the hydrogeologic unit in which the well is completed, as follows:

01	-	Unit 1
03	-	Unit 3
04	-	Unit 4: Prairie du Chien Group <u>or</u> Jordan Formation
PJ	-	Unit 4: Prairie du Chien Group <u>and</u> Jordan Formation

The third character represents the relative position of the well screen or open hole within the specified hydrogeologic unit, as follows:

U	-	upper portion
M	-	middle portion
L	-	lower portion
J	-	Jordan Sandstone
F	-	fully penetrating Unit 3
#	-	open hole (total or partial thickness)

The remaining three characters represent the well number, as follows:

001 thru 500	USAEC wells and additional wells installed by others adjacent to an existing well with the 001-500 designation.

501 thru 600	NB/AH Site wells.
601 thru 800	OU2 Alliant wells.
801 thru 999	OU1/OU3 Alliant wells.

OU1/OU3 wells installed by parties other than USAEC, the Army, or Alliant are designated by their Minnesota unique number. Table B-1 is sorted by unique number, but includes the IRDMIS number and any other name(s) the wells may have. The well type in this table is abbreviated as follows:

UN	-	Unknown
MUNI	-	Municipal
MON	-	Monitoring
DOM	-	Domestic
IND	-	Industrial
P.S.	-	Public Supply
COM	-	Commercial
IRR	-	Irrigation
ABAND	-	Abandoned
PIEZ.	-	Piezometer
REM	-	Remedial

In recent years, as property transfer of the remaining land that is still indentified as TCAAP becomes more imminent, it became apparent that an updated well index with more information concerning each well would be of importance to pass on to future land owners. In addition, as groundwater quality continues to improve and contaminant plumes continue to shrink in vertical and horizontal extent, the index will function as a check to make sure that all Army owned wells are sealed and that all traces of the wells are removed from the area.

The FY 2010 Appendix B Table B-1 shows the most current well index. The well index continues to be a work in progress. Additional records continue to surface regarding individual wells, as new wells are drilled and old wells are sealed and removed.

Figures B-2 and B-3 show the location of wells identified in Table B-1. With a known well name, the location of that well can be determined using the "Edit, Find" or "Edit, Search" function and then typing in the desired well name, which will highlight this well name on the figure.

The Appendix B Attachment contains available documentation for each well, including boring logs (if available). The attachment is sorted by Minnesota unique number. To view the information concerning a well, click in the desired well number in the bookmarks with the mouse.

<u>FY 2010 Update</u>

During FY 2010 a major effort was undertaken to update the existing well index. A number of data sources, including old reports, well sealing records, property access agreements, the County Well Index, well index binders stored at the former TCAAP property, and other miscellaneous sources were searched in an attempt to update the existing well index and add data to the database that was considered useful for each well as it related to sampling, property transfer, and other activities associated with the New Brighton/Arden Hills Superfund Site.

The updated well index, Table B-1, was compared with the wells indentified in Appendix D, which contains historical water quality and groundwater elevation data. A number of wells were identified in Appendix D that did not exist in the well index. More efforts will continue to be made in the coming years to add information concerning the location and status of these wells to the well index in Appendix B.

Future updates to Appendix B

- The repository at the current TCAAP office is planned to be searched for additional well information.
- Records at the Wenck office are planned to be searched for additional well information.
- The well maintenance permit and well owner columns are intended to be completed for each well in the index.

Appendix B Table B-1 and Attachment

Available Well Information
Sorted by Minnesota Unique Well Number

Appendix B Table B-1 contains a summary of all information available concerning a certain well, and is sorted by Minnesota unique well number.

To search for detailed records regarding a well, open the appropriate file below and select the bookmark corresponding to the Minnesota unique well number of the well being searched. If the unique number is unknown for a well, it is included and sorted in the Appendix B Attachment by IRDMIS name or OTHER. Records included in the Appendix B Attachment that may or may not be available for each well include:

- The County Well Index well log,
- Access agreement(s),
- Correspondence related to the well,
- Field notes and boring logs,
- Well construction diagrams,
- Documentation of well modifications, and
- Sealing records.

Appendix B Attachment

1. Wells Numbered 104772 through 194772

2. Wells Numbered 200070 through 225906

3. Wells Numbered 231741 through 235753

4. Wells Numbered 236066 through 257443

5. Wells Numbered 265735 through 482709

6. Wells Numbered 500248 through IRDMIS and OTHER

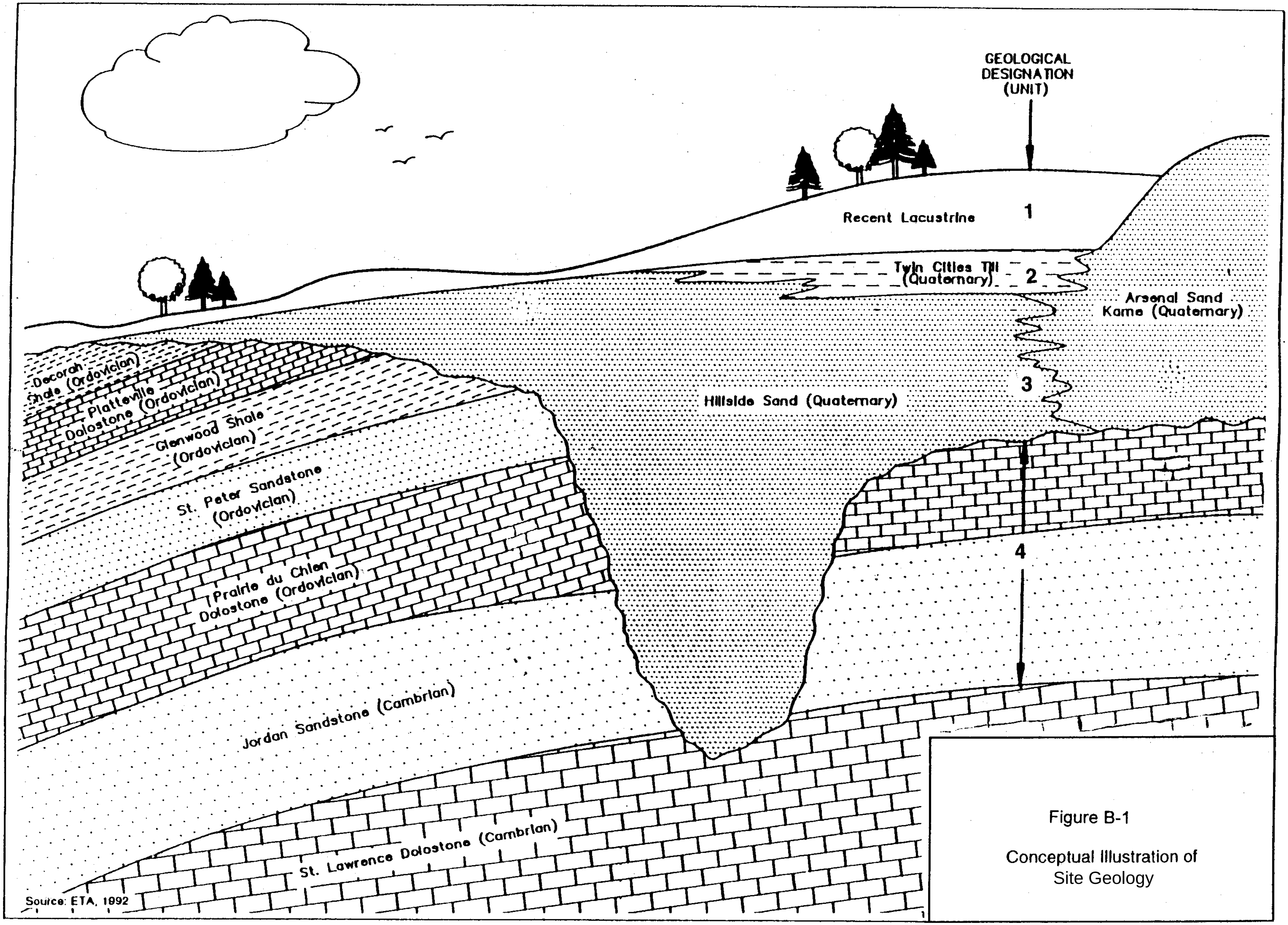
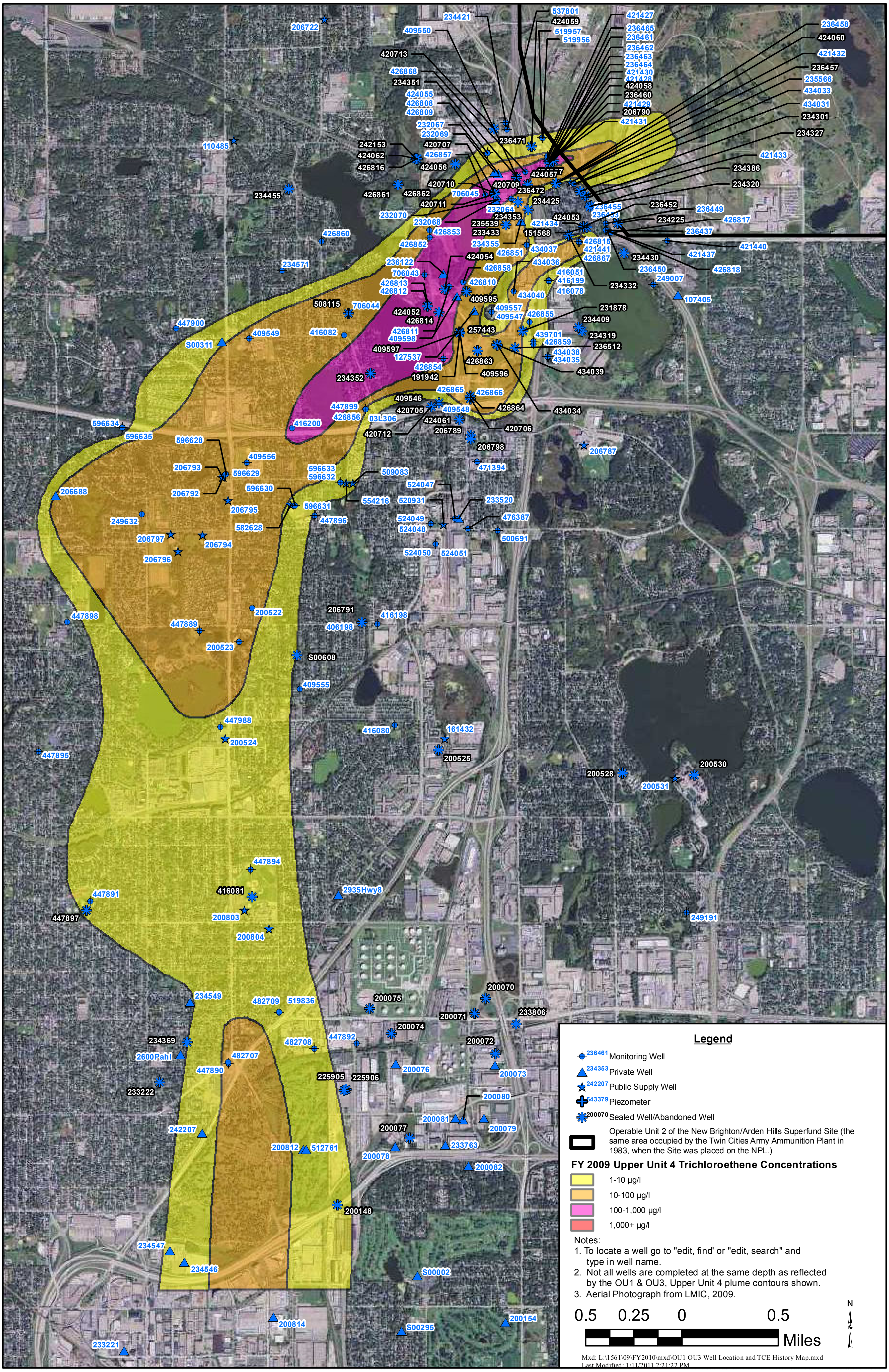
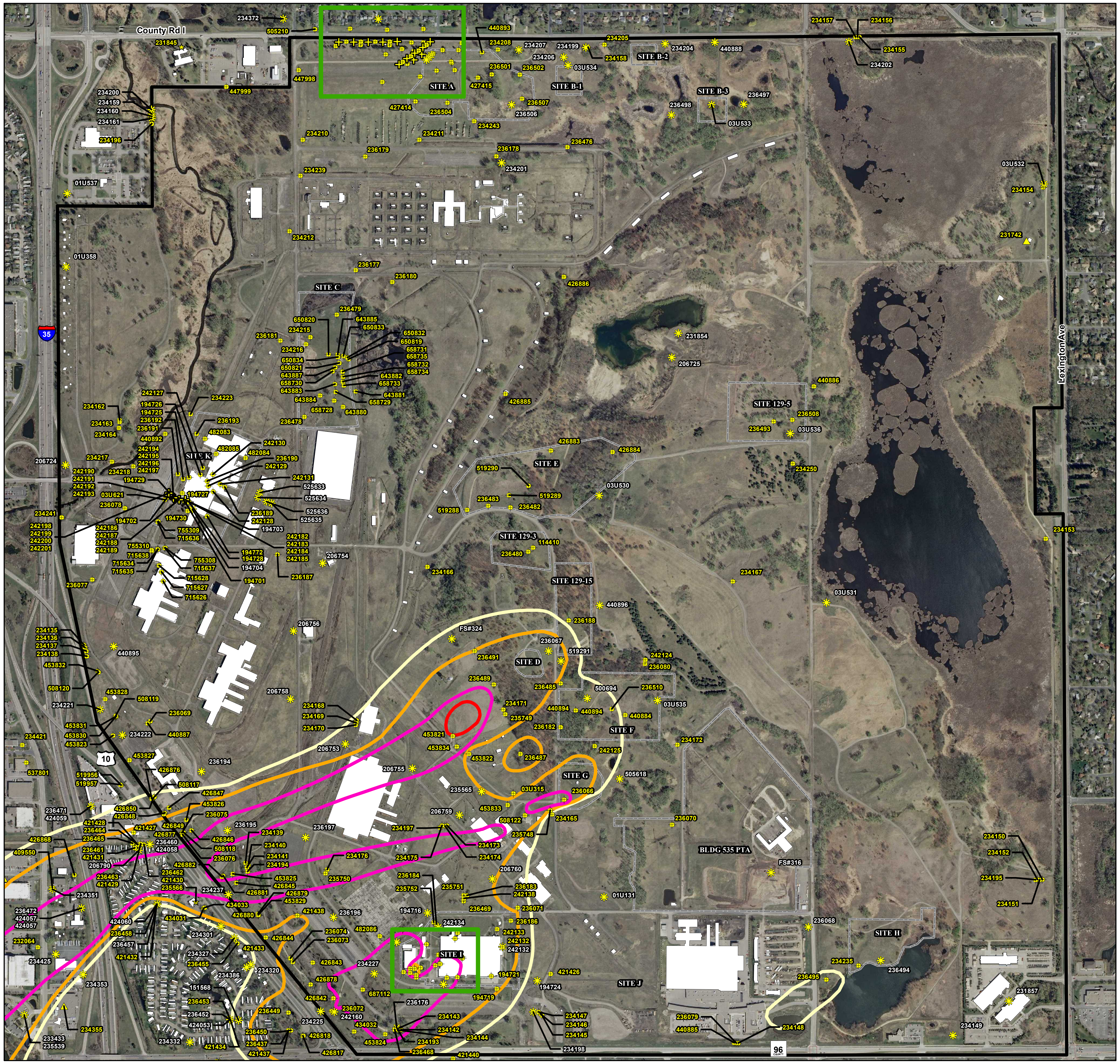


Figure B-1

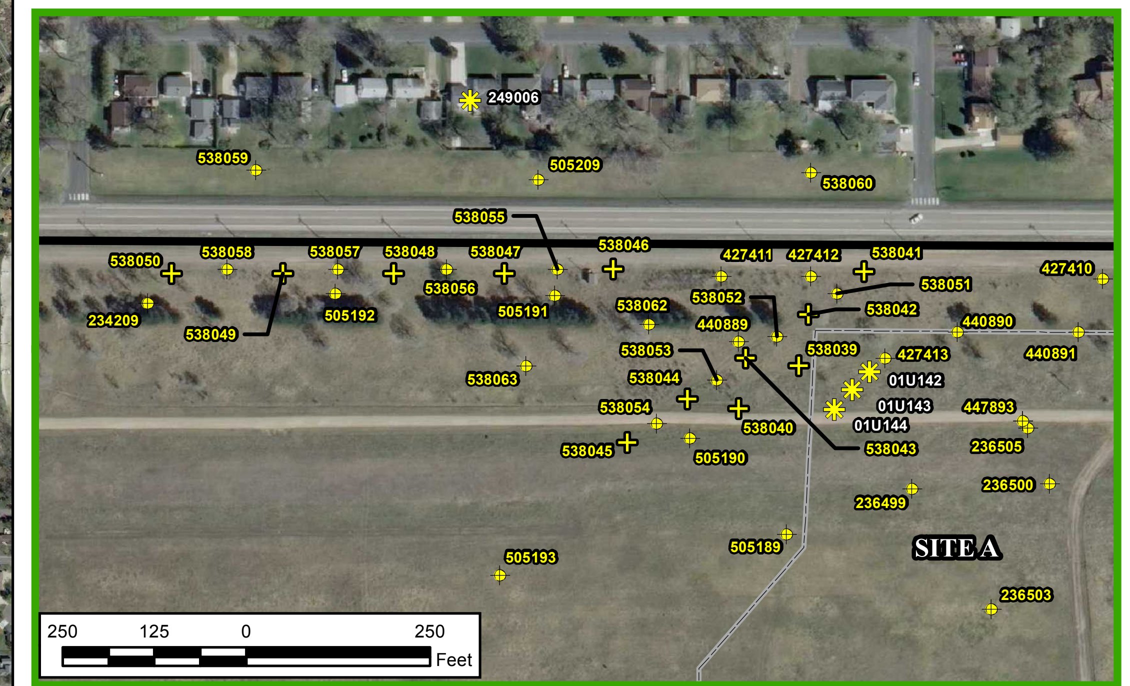
Conceptual Illustration of
Site Geology



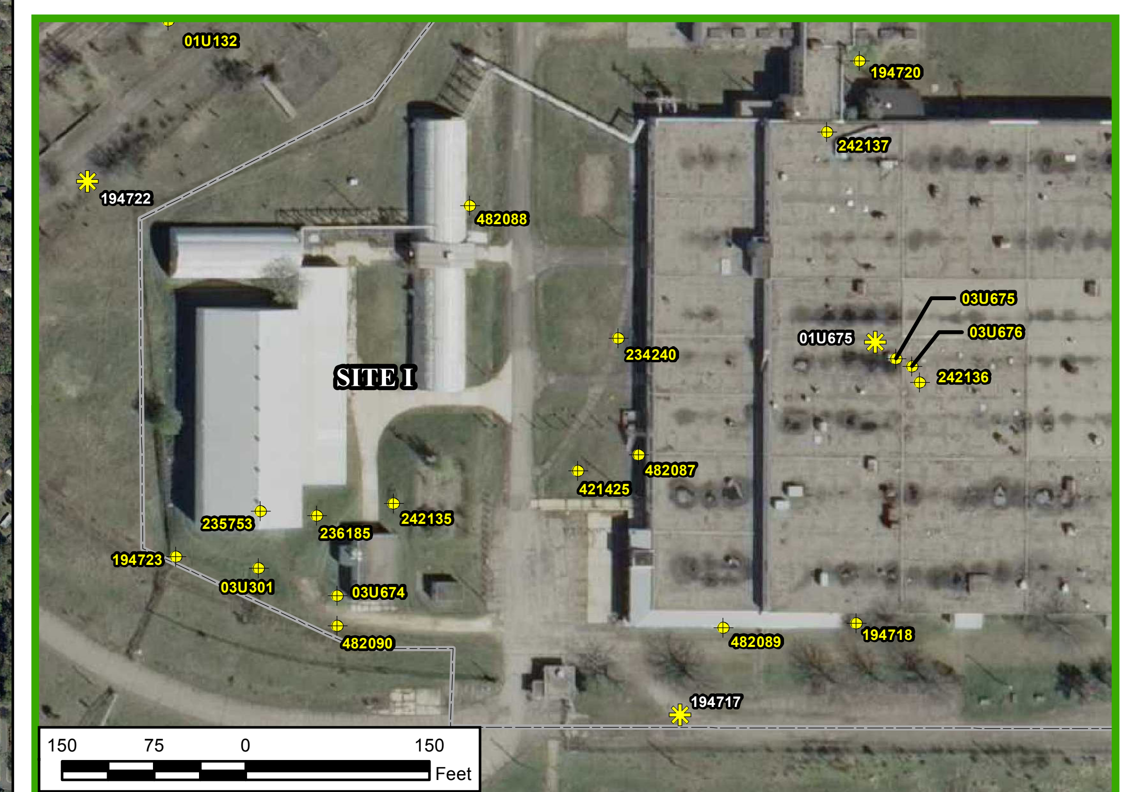
ANNUAL PERFORMANCE REPORT	Wenck Associates, Inc. 1800 Pioneer Creek Center Environmental Engineers Maple Plain, MN 55359-0429	FY 2010
OU1 & OU3 Well Location		Figure B-2



INSET A



INSET B



Legend

- Monitoring Well
- Private Well
- Public Supply Well
- Piezometer
- Sealed Well/Abandoned Well

FY2009 Upper Unit 3 Trichloroethene Concentrations

- 1 µg/l
- 100 µg/l
- 10 µg/l
- 1,000 µg/l

- Buildings
- Site Boundaries
- Operable Unit 2 of the New Brighton/Arden Hills Superfund Site (the same area occupied by the Twin Cities Army Ammunition Plant in 1983, when the Site was placed on the NPL.)

Notes:
1. To locate a well go to "edit, find" or "edit, search" and type in well name.
2. 2010 Aerial Photograph (Source: LMIC), 2006 Aerial Photograph shown on insets.
3. Not all wells are completed at the same depth as reflected by the OU2, Upper Unit 3 plume contours shown.

1,600 800 0 1,600 Feet

N

Mxd: L:\1561\09\FY2010\mxd\OU2 Well Location and TCE History.mxd

ANNUAL PERFORMANCE REPORT

OU2 Well Location

Wenck

Wenck Associates, Inc.
Environmental Engineers
1800 Pioneer Creek Center
Maple Plain, MN 55359-0429

FY 2010

Figure B-3

Appendix C

FY 2010 Data Collection and Management

C.1 Data Collection, Management, and Presentation

APPENDIX C.1

DATA COLLECTION, MANAGEMENT, AND PRESENTATION

1.0 INTRODUCTION

A groundwater monitoring program was initiated in January 1984 to obtain water level and water quality data at OU1, OU2 and OU3. Each year has been divided into quarters with each quarter assigned a number. Accordingly, FY 2010 was comprised of Quarter 105 (October through December), Quarter 106 (January through March), Quarter 107 (April through June), and Quarter 108 (July through September). Water sampling, water level measurements, and laboratory analyses were conducted in accordance with three separate Quality Assurance Project Plans (QAPPs): "QAPP for Performance Monitoring", (Wenck, Revision 8, April 3, 2009), "QAPP for Site C Groundwater and Surface Water", (Wenck, Revision 8, April 3, 2009), and "QAPP for Monitored Natural Attenuation of Building 102 Groundwater", (Wenck, Revision 2, April 3, 2009). The Site C and Building 102 QAPPs are applicable to only those specific sites, and all other sites are covered by the Performance Monitoring QAPP.

Prior to November 1, 2001, data collected from OU1, OU2 and OU3 was stored in the U.S. Army Environmental Command (USAEC) Installation Restoration Data Management Information System (IRDMIS). USAEC replaced the IRDMIS System on November 1, 2001, with a new system, the Environmental Restoration Information System (ERIS), which incorporated all of the data that had previously been entered into IRDMIS. The Army has continued to enter data into ERIS; however, ERIS is not being used as the primary database for the OU1, OU2 and OU3 data. The historical databases in Appendix D.1 are the primary databases.

2.0 GROUNDWATER LEVELS AND GROUNDWATER QUALITY

2.1 Data Collection and Management

Groundwater level and groundwater quality data were collected in accordance with the FY 2010 Annual Monitoring Plan (Appendix A), which established the monitoring responsibilities for both the Army and Alliant. Water level monitoring and water sampling were conducted by Wenck for the Army and by CRA and Stantec for Alliant. Laboratory analysis of samples from all sites was performed by ALS Laboratory Group, Salt Lake City, Utah. Appendix A.4 contains lists of required analytes, as referenced by the monitoring plans in Appendix A. The lists are site-specific, based on the chemicals of concern. At sites other than Site C, halogenated volatile organic compounds are the parameters of primary interest, though some of the sites (or specific wells at a site) are sampled for aromatic volatile organic compounds and/or metals. At Site C, dissolved lead is the only chemical of concern. Appendix C.2 presents deviations from the FY 2010 Annual Monitoring Plan.

Data verification and validation was conducted in accordance with procedures and requirements outlined in the three QAPPs. Data qualifiers assigned to data through data verification and/or data validation appear in the data tables included within the individual sections of this report, with qualifier definitions given in the table footnotes. Data qualifiers are also included in the historical databases (Appendix D.1), which include a database of organic water quality, a database of inorganic water quality (excluding Site C), and a database for Site C water quality (for both groundwater and surface water). Data verification was performed by Wenck for the Wenck-collected data, CRA for the CRA-collected data, and Diane Short & Associates, Inc., Lakewood, Colorado, for the Stantec-collected data. Data validation was performed by CRA for the CRA-collected data, and Diane Short & Associates for the Wenck- and Stantec-collected data. Data verification and validation information from the three sampling firms was compiled by Wenck into quarterly Data Usability Reports (DURs) that were submitted to the MCPA and USEPA for review. If any MPCA/USEPA-requested revisions were necessary, a final DUR was resubmitted. The final MPCA/USEPA approval letter for the FY 2010 DURs is included in Appendix C.3.

For water level measurements, the depth to water from the surveyed top of the well casing elevation was measured. Groundwater elevations were calculated by subtracting the depth to water from the surveyed top of the well casing elevation and are included in the historical water elevation database (Appendix D.1).

2.2 Groundwater Elevation Contour Maps

The most extensive water level monitoring event performed during FY 2010 was in June (Quarter 107). This data was used to prepare groundwater elevation contour maps for shallow groundwater at Site A, Site C, Site K and Building 102. These maps are included within the individual sections of this report. Most of the wells at Site I were dry and hence no contour map was prepared. There was not a comprehensive water level event for deep groundwater at OU1/OU3 and OU2.

2.3 Groundwater Quality Contour Maps and Cross-Sections

The most extensive sampling event performed during FY 2010 was in June (Quarter 107). This data was used to prepare groundwater quality isoconcentration contour maps and/or cross-sections for shallow groundwater at Site A, Site C, Site K and Building 102. Contour maps were generated by hand, based on the observed contaminant concentrations and the extent of past site contamination. These maps are included within the individual sections of this report.

For deep groundwater at OU1/OU3 and OU2, groundwater quality isoconcentration maps and cross-sections were not prepared since this was a minor sampling year.

For Site A shallow groundwater, an isoconcentration map is provided for cis-1,2-dichloroethene, since this is the chemical of concern with the largest aerial extent at Site A, and also for tetrachloroethene, which illustrates the source area and contaminant degradation. Cross-sections were also prepared for Site A to illustrate the vertical distribution of cis-1,2-dichloroethene. The isoconcentration maps for Site A were prepared only for Unit 1, since this is the only contaminated aquifer.

For Site C shallow groundwater, an isoconcentration map is provided for dissolved lead, since this is the only chemical of concern at Site C. Results for surface water monitoring is also shown on this same map to show that impacts to surface water are not occurring as a result of the shallow groundwater contamination. Cross-sections were also prepared for Site C to illustrate the vertical distribution of dissolved lead. The isoconcentration map for Site C was prepared only for Unit 1, since this is the only contaminated aquifer.

For Site I, most of the wells were dry and hence no groundwater quality isoconcentration maps or cross-sections were prepared.

For Site K, an isoconcentration map is provided for trichloroethene, since this is the primary chemical of concern on a concentration basis. The isoconcentration map for Site K was prepared only for Unit 1, since this is the only contaminated aquifer.

For Building 102 shallow groundwater, an isoconcentration map is provided for vinyl chloride, since this is the chemical of concern that has historically had the largest aerial extent at Building 102, and also for trichloroethene and cis-1,2-dichloroethene, which illustrates the source area and contaminant degradation. Cross-sections were also prepared for Building 102 to illustrate the vertical distribution of vinyl chloride. The isoconcentration maps for Building 102 were prepared only for Unit 1, since this is the only contaminated aquifer.

Contaminant concentrations for recovery wells that are actively pumping are shown in parentheses on the isoconcentration maps. These values were considered, but were generally not used alone to prepare the isoconcentration contours. Concentrations of recovery wells generally represent an average contaminant value for all groundwater being drawn to the well; hence, the concentrations do not necessarily represent a discrete location or depth. Contaminant concentrations for recovery wells that are not actively pumping are fully utilized for purposes of contouring.

C.2 Deviations from Monitoring Program

APPENDIX C.2
DEVIATIONS FROM MONITORING PROGRAM

Fiscal Year 2010

OU2: Site C Shallow Groundwater

March 2010:
Well 01U046: No sample collected: well was frozen.

OU2: Site I Shallow Groundwater

June 2010:
Well I01MW: No sample collected: well was dry.
Well I02MW: No sample collected: well was dry.
Well 01U632: No sample collected: insufficient water for sampling (less than 1 inch).
Well 01U639: No sample collected: well was dry. Sampled alternate location I04MW.
Well 01U640: No sample collected: insufficient water for sampling (less than 3 inches and no recharge).

C.3 Regulatory Approvals of Data Usability Reports

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

February 28, 2011

REPLY TO THE ATTENTION OF: SR-6J

Mr. Michael R. Fix
Commander's Representative
Twin Cities Army Ammunition Plant
470 West Highway 96 - Suite 100
Shoreview, MN 55126

Subject: **Approval of Data Usability Report Numbers 65, 66, 67 and 68**

Dear Mr. Fix:

This letter shall serve to document that the U.S. Environmental Protection Agency (EPA) and the Minnesota Pollution Control Agency (MPCA) received and reviewed draft versions of Data Usability Reports (DURs) 65, 66, 67 and 68. EPA and MPCA provided the U.S. Army (Army) with comments on the DURs. The DURs were revised to the satisfaction of EPA and MPCA and the following final DURs were received:

- Data Usability Report Number 65 (**DUR 65**), TCAAP FY 2010 Performance Monitoring Program, 1st Quarter Monitoring (October – December, 2009), September 3, 2010;
- Data Usability Report Number 66 (**DUR 66**), TCAAP FY 2010 Performance Monitoring Program, 2nd Quarter Monitoring (January – March, 2010), November 5, 2010;
- Data Usability Report Number 67 (**DUR 67**), TCAAP FY 2010 Performance Monitoring Program, 3rd Quarter Monitoring (April – June, 2010), February 8, 2011;
- Data Usability Report Number 68 (**DUR 68**), TCAAP FY 2010 Performance Monitoring Program, 4th Quarter Monitoring (July – September, 2010), February 8, 2011.

Based upon our review of the information provided by the Army, USEPA and MPCA agree that the subject DURs are acceptable. You are hereby advised that the USEPA and the MPCA approve Data Usability Report Numbers 65, 66, 67, and 68. If you have any questions, please contact Tom Barounis of the EPA at (312) 353-5577 or Deepa de Alwis of the MPCA at (651) 757-2572.

Sincerely,

Tom Barounis

Tom Barounis
Remedial Project Manager
U.S. Environmental Protection Agency
Region 5

Tom Barounis for

Deepa de Alwis
Project Manager
Closed Landfill and Superfund Section
Remediation Division
Minnesota Pollution Control Agency

Appendix D

Comprehensive Groundwater Quality and Groundwater Level Databases

D.1 Comprehensive Groundwater Quality and Groundwater Level Databases

APPENDIX D.1
COMPREHENSIVE GROUNDWATER QUALITY AND GROUNDWATER LEVEL DATABASES

The historical groundwater tables are located on this DVD in a directory named Appendix D.1. This directory contains four Microsoft Excel files:

File	Contents
Compelev_FY10	Groundwater elevations
Comporwq _FY10	Groundwater quality: organic data
Compinwq _FY10	Groundwater quality: inorganic data (excluding Site C)
Site C wq _FY10	Groundwater quality: inorganic data (Site C only)

D.2 Operable Unit 1 Statistical Analysis

D.2.1 Well Groups and Statistical Evaluation Criteria Tables

Table D.2.1
Statistical Evaluation
Well Groups

Group 1 – Downgradient of TGRS

03U806	04U806	03L802	03U801
03M806	PJ#806	04U802	03U711
03L806	03M802	PJ#802*	04U711

Group 2 – Areal Extent of Plume

03U805	409557	04U841	04U875
03U672	04U673	04U843	04U877
03L848	04U832	04U833	206688
03L673	04U845	04U846	04U849
03L833	04U854	04U861 abandoned	04U821
03L859	04U859	409549	191942 abandoned

Group 3 ** – Downgradient Sentinel

04U871	04U875	04U851	

Group 4 – Lateral Sentinel

03U831 abandoned	03L846	409556	409548
03U811	03L832	04U855	04U839
03U804	03L861 abandoned	04U879	04U838
03U673	03L854	04U860	04U848
03U672	03L841	409547	04J839
03M843	03L811	04U863	

Group 5 – Global Plume

04J077	04U702	04U848	04U877
04J702	04U709	04U851	04U879
04J708	04U711	04U852 abandoned	04U880
04J713	04U713	04U855	04U881
04J834	04U802	04U859	04U882
04J864 abandoned	04U806	04U860	200154
04J866	04U832	04U861 abandoned	234546
04J882	04U833	04U863	234549 out of service
04U002	04U834	04U864 abandoned	409547
04U020	04U841	04U865 abandoned	409548
04U027	04U843	04U866	409549
04U077	04U844	04U871	409555
04U673	04U845	04U872	512761
04U701	04U846	04U875	PJ#318

Group 5 Unit 3 wells (evaluated as individual trends)

03L822	03U821	03U822	03L822
409550	409596	409597	03U831abandoned

Group 6 – Jordan Aquifer

04J077	04J838	04U713	04U882
04J702	04J839	04U834	NBM#3
04J708	04J882	04U836	NBM#4
04J713	04J847	04U837	NBM#5
04J822	04J849	04U838	NBM#6
04J834	04U077	04U839	
04J836	04U702	04U847	
04J837	04U708	04U849	

* PJ#802 will not be monitored or used for evaluation unless 04U802 shows TCE concentrations greater than 1 ppb.

** Group 3 is analyzed as a rectangular area taken from the Group 5 contouring.

Table D.2.2

MAROS Decision Matrix

Mann-Kendall S	Confidence	Coefficient of Variance	Trend Conclusion
S > 0	> 95%	NA	Increasing
S > 0	90-95%	NA	Probably Increasing
S > 0	< 90%	NA	No Trend
S</= 0	< 90%	>/= 1	No Trend
S </= 0	< 90%	< 1	Stable
S < 0	90-95%	NA	Probably Decreasing
S < 0	>95%	NA	Decreasing

Table D.2.3
Summary of Groups, Purpose, and Statistical Tests

Well Group	**Purpose**	**Measure**	**Time Window/ Monitoring Frequency**	**Test**	**Response Threshold**
Group 1	AWC Immediately Downgradient of TGRS	AWC Trend	6 years/annual	Mann-Kendall and MAROS	Stable, Increasing, or No Trend
Group 2	Defining Plume Size (Low Concentration Edges)	Individual Well Trend for TCE	12 years/biennial	Mann-Kendall and MAROS	Increasing or No Trend
Group 3	AWC Immediately Downgradient of NBCGRS	AWC Trend	12 years/biennial	Mann-Kendall and MAROS	Stable, Increasing, or No Trend
Group 4	Lateral (Clean) Sentinel Wells	Individual Well Concentration	12 years/biennial	Individual Concentrations	Greater than ROD goals
Group 5	Global Plume Mass Reduction	AWC Trend	12 years/biennial	Mann-Kendall and MAROS	Stable, Increasing, or No Trend
Group 6	Evaluating and comparing trends in Jordan Aquifer	Individual Well Trend for TCE	12 years/biennial	Mann-Kendall and MAROS	Stable, Increasing or No Trend

Note: A Response Threshold is the test result(s) that triggers further response. See text for additional explanation of response process.

AWC = Area-Weighted Concentration.

Table D.2.4
Group 1 – Downgradient of TGRS, Evaluation Process

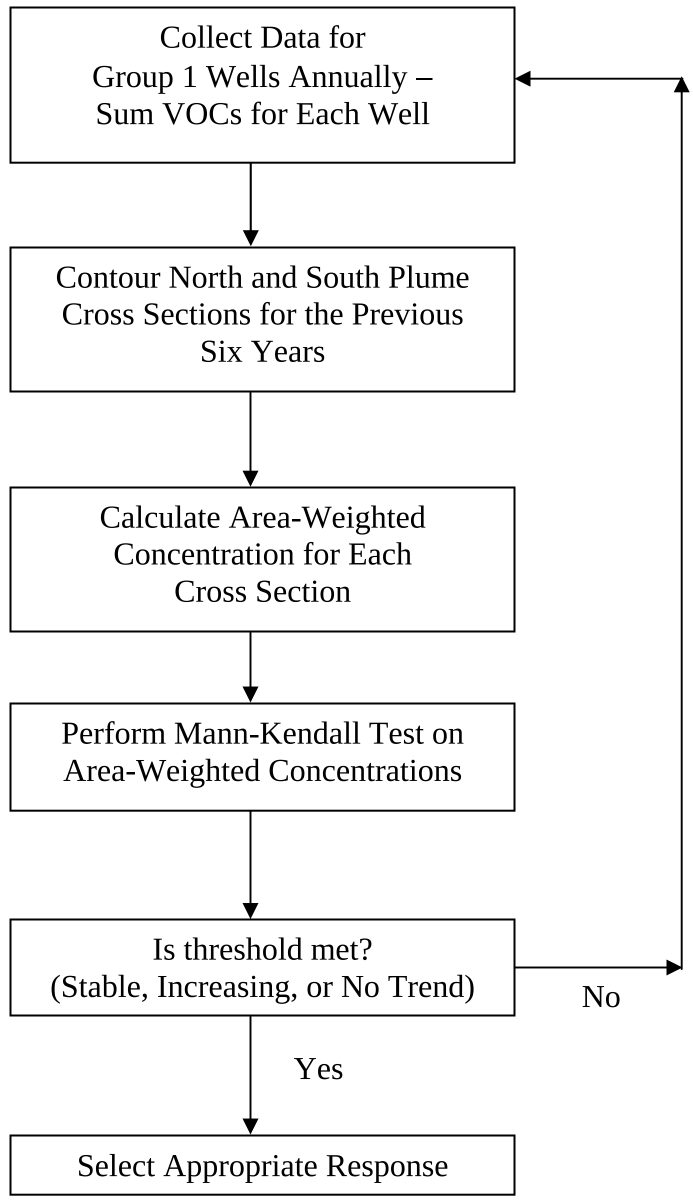


Table D.2.5
Group 2 – Areal Extent of Plume, Evaluation Process

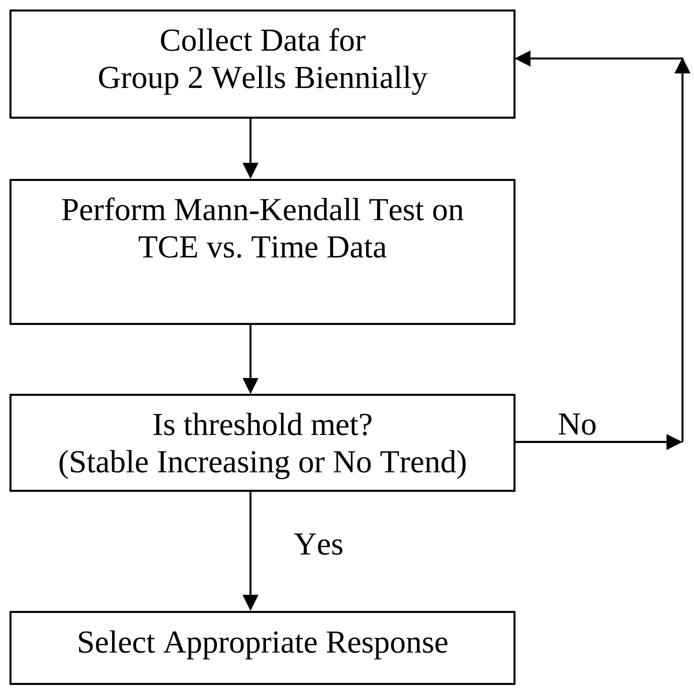


Table D.2.6
Group 3 and Group 5 – Downgradient Sentinel and Global Plume, Evaluation Processes

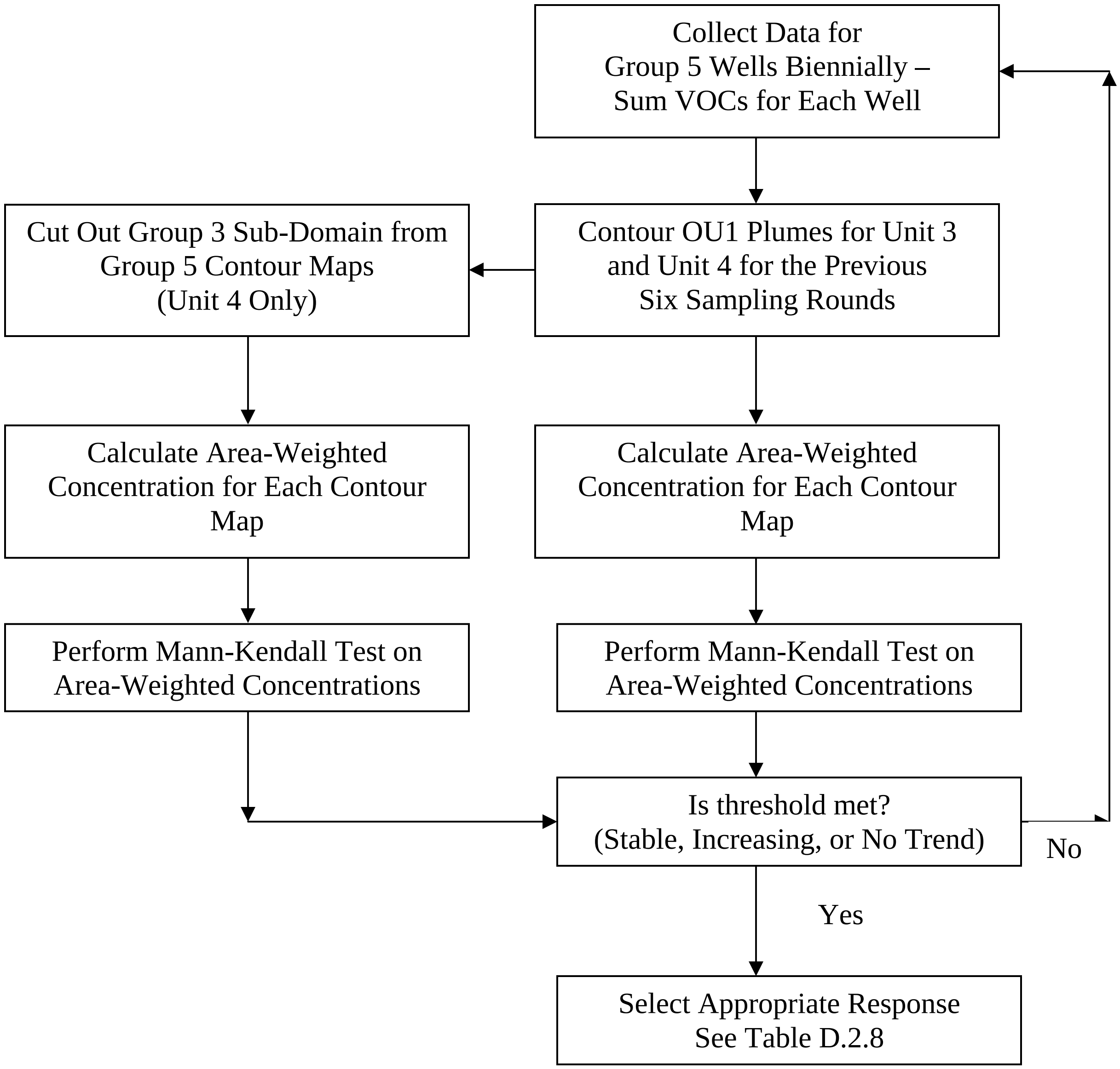


Table D.2.7
Group 4 – Lateral Sentinel Wells, Evaluation Process

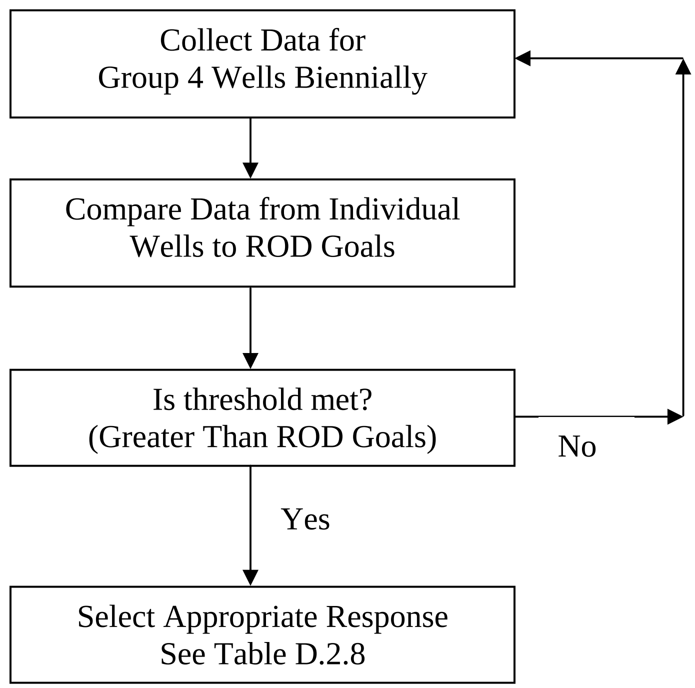


Table D.2.8

Responses to Threshold Indicators

Factors to Consider

- Contaminant concentrations
- Location (vertical and horizontal)
- Surrounding data
- Risks to human health or the environment
- Need for urgency in response

Possible Evaluation Responses

- Perform additional or confirmation sampling
- Write up in the Annual Performance Report
- Perform separate evaluation and write-up (Tech Memo)

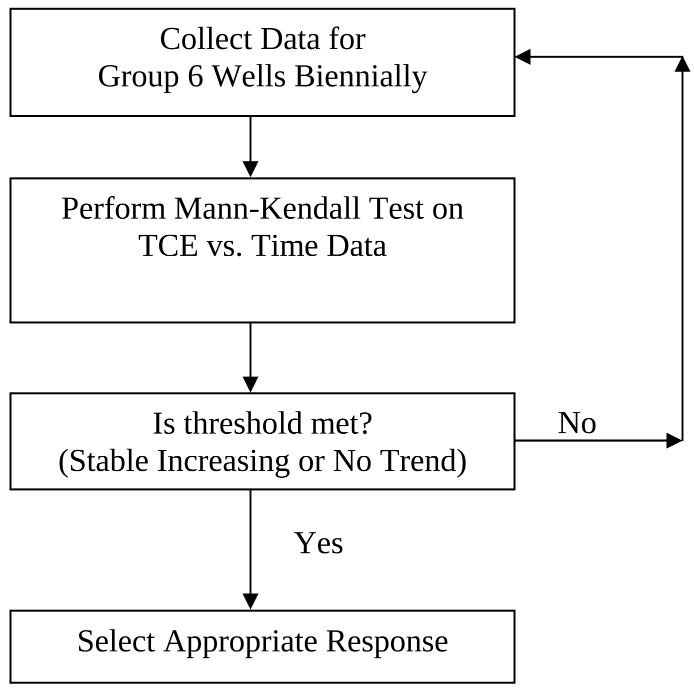
Possible Long-Term Responses

- Increase sampling frequency
- Modify operation of remedial system(s)
- Perform new remedy evaluation
- Install additional monitoring well(s)
- Modify the Special Well Construction Area
- Control risk at the receptors

Note: Threshold responses to be described and evaluated in the Annual Performance Reports.

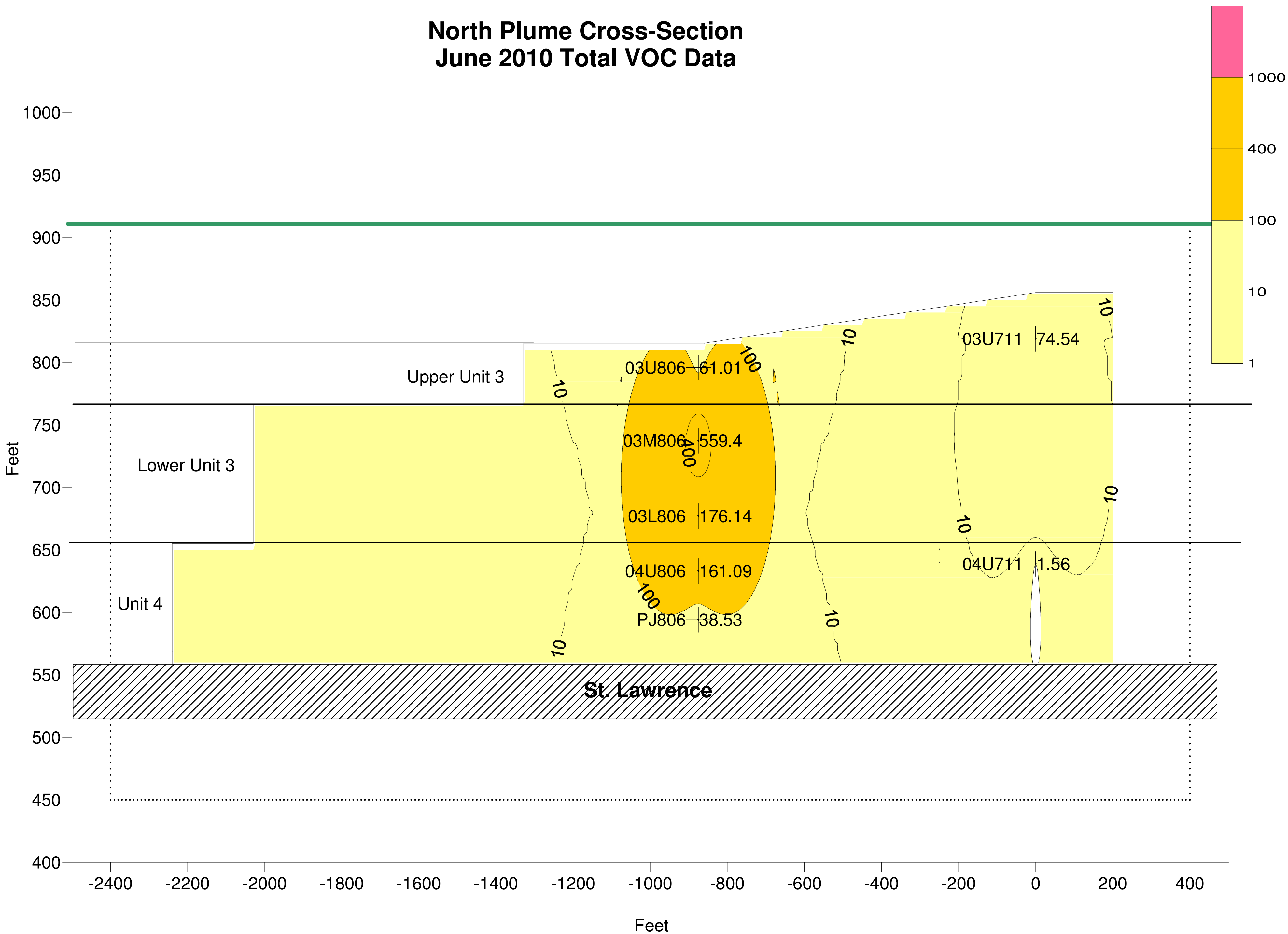
Table D.2.9

Group 6 – Jordan Aquifer, Evaluation Process



D.2.2 Group 1 Kriging Evaluation

2010


North Plume Cross-Section
June 2010 Total VOC Data
1000
400
100
10
1
Upper Unit 3
Lower Unit 3
Unit 4
St. Lawrence
03U806 61.01
03M806 559.4
03L806 176.14
04U806 161.09
PJ806 38.53
03U711 74.54
04U711 1.56
Feet
Feet
1000
950
900
850
800
750
700
650
600
550
500
450
400
-2400
-2200
-2000
-1800
-1600
-1400
-1200
-1000
-800
-600
-400
-200
0
200
400

South Plume Cross-Section
June 2010 Total VOC Data

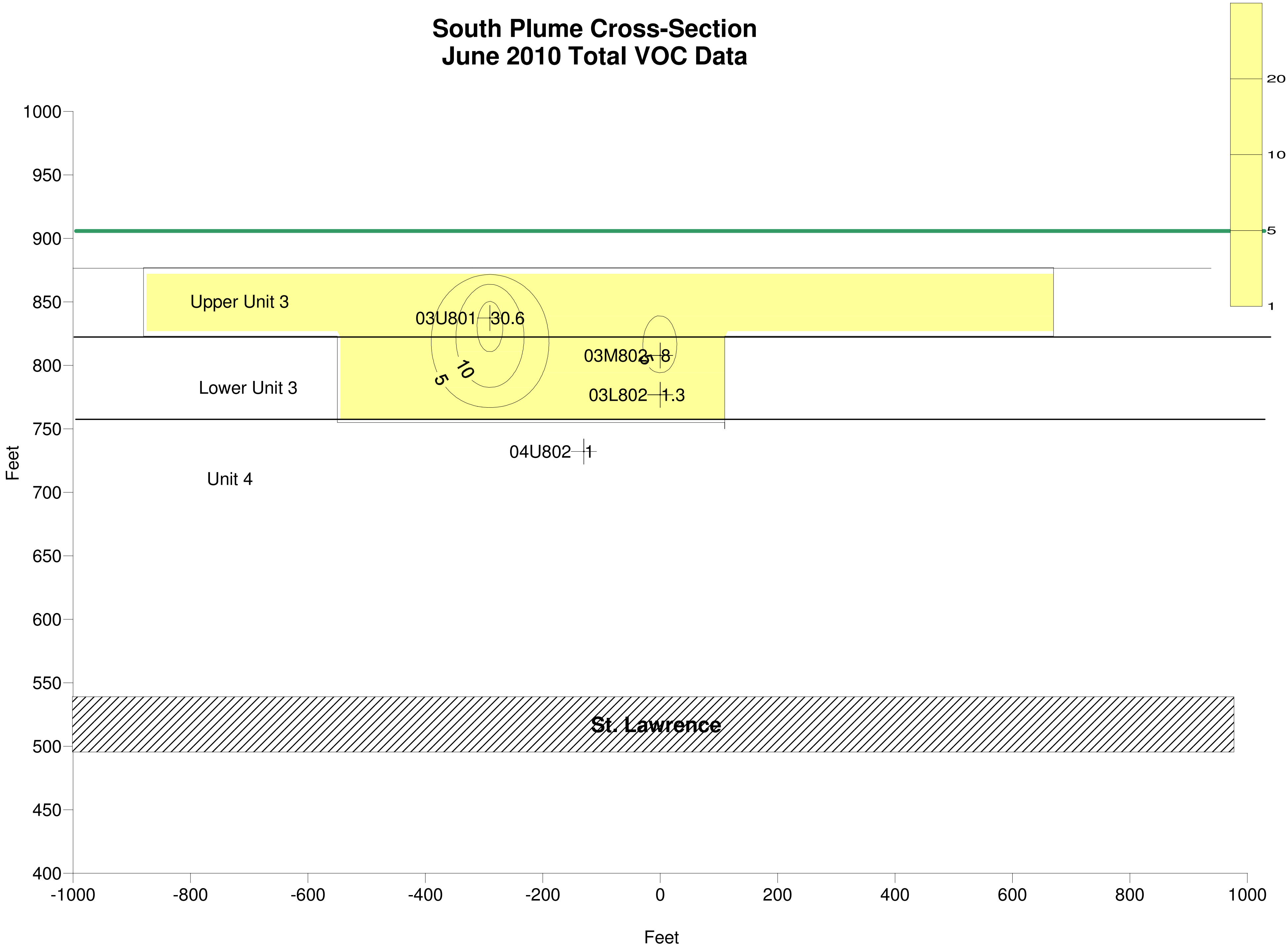


TABLE 1

VOC CONCENTRATIONS IN TGRS MONITORING WELLS

Location	Date	1,1,1-Trichloroethane µg/L	1,1-Dichloroethane µg/L	1,1-Dichloroethene µg/L	1,2-Dichloroethane µg/L	cis-1,2-Dichloroethene µg/L	Tetrachloroethene µg/L	Trichloroethene µg/L	Total VOCs
03L802	6/4/10	ND	ND	ND	ND	ND	ND	1.30	1.3
03M802	6/4/10	1	ND	ND	ND	0.20	ND	6.80	8
03U801	6/3/10	1	ND	ND	ND	0.60	ND	29.00	30.6
04U802	6/4/10	1	ND	ND	ND	ND	ND	ND	1
03L806	6/2/10	0.93	28	24	0.27	2.4	0.54	120	176.14
03M806	6/2/10	2	50	23	ND	4.4	ND	480	559.4
03U711	6/3/10	7.2	2.3	2.9	ND	0.94	1.2	60	74.54
03U806	6/4/10	1	1.2	1	ND	0.31	1.5	56	61.01
04U711	6/3/10	1	ND	ND	ND	ND	ND	0.56	1.56
04U806	6/2/10	2	16	11	ND	1.6	0.49	130	161.09
PJ#806	6/2/10	0.6	2.6	2	ND	0.33	ND	33	38.53

Notes:

South Plume

North Plume

ND=Non-detect

Assumptions:

non-detect values were treated as 0

Any value with a data qualifier (e.g. JP) treated as the detection.

North Plume
Total VOC Concentration Calculations
Vertical Cross-Section
Expanded Contouring and Blanking
TCAAP
June 2010

Concentration	Positive Planar Area (ft2)
Plume to 1	572525
Plume to 5	275684
Plume to 10	246682
Plume to 50	129416
Plume to 100	64966
Plume to 200	18912
Plume to 300	6248
Plume to 400	1830
Plume to 500	206
Plume to 600	0
Plume to 700	0

TCE (µg/L)	Avg TCE (µg/L)	Area (ft2)	Areal Conc (µg*ft2/L)
1 to 5	3	296841	890523
5 to 10	7.5	29001	217511
10 to 50	30	117267	3517996
50 to 100	75	64450	4833766
100 to 200	150	46053	6907993
200 to 300	250	12664	3166043
300 to 400	350	4419	1546557
400 to 500	450	1623	730439
500 to 600	550	206	113476
600 to 700	650	0	0
	Sum	572525	21924304

Area Wtd Conc	38	µg/L

South Plume
Total VOC Concentration Calculations
Vertical Cross-Section
Contouring and Blanking
TCAAP
June 2010

Concentration	Positive Planar Area (ft2)
Plume to 1	115236
Plume to 5	18842
Plume to 10	7401
Plume to 25	331
Plume to 50	0

Total VOCs (µg/L)	Avg Total VOCs (µg/L)	Area (ft2)	Areal Conc (µg*ft2/L)
1 to 5	3	96395	289184
5 to 10	7.5	11441	85809
10 to 25	17.5	7070	123725
25 to 50	37.5	331	12396
	Sum	115236	511113

Area Wtd Conc	4	µg/L

D.2.3 Group 1, 2, 3, 5, and 6 Mann-Kendall Evaluations

Summary Table

Group 1, 2, 3, and 5 Mann-Kendall Summary and MAROS Conlusion

Group	Kendall S	N	Raw Trend	Confidence	COV	Raw Trend Decision	MAROS Conclusion	Threshold Triggered?	Comments
Group 2	--	--	--	--	--	--	--	--	Not sampled in FY 2010
Group 3	--	--	--	--	--	--	--	--	Not sampled in FY 2010
Group 5	--	--	--	--	--	--	--	--	Not sampled in FY 2010
Group 1 NP	-9	6	Decreasing	93.00%	0.2377	Probable	**Decreasing**	no	Changed to decreasing in FY10
Group 1 SP	-9	6	Decreasing	93.00%	0.1217	Probable	**Decreasing**	no	Changed to decreasing in FY10

Notes:
S or NT = Stable or No Trend
N = Number of data points
COV = Coefficient of Variance

MAROS Decision Matrix

M-K S	Confidence	COV	Trend
S > 0	> 95%	na	Increasing
S > 0	90-95%	na	Pr. Incr.
S > 0	< 90%	na	No Trend
S</= 0	< 90%	>/= 1	No Trend
S </= 0	< 90%	< 1	Stable
S < 0	90-95%	na	Pr. Decr.
S < 0	>95%	na	Decreasing

Group 6 Mann-Kendall Summary and MAROS Conlusion

Group	Kendall S	N	Raw Trend	Confidence	COV	Raw Trend Decision	MAROS Conclusion	Threshold Triggered?	Comments
Group 6 OU1 Jordan Wells:									
04J822	-15	6	Decreasing	99.00%	0.1940	Definite	**Decreasing**	No	Improved from increasing in FY2007 to decreasing
04J847	-3	6	Decreasing	64.00%	0.1137	S or NT	**Stable**	Yes	Down from 1100 µg/L in 2004, see extended trend belo
04J849	-3	6	Decreasing	64.00%	1.5543	S or NT	**No Trend**	Yes	All detections below 0.5 µg/L, 4 of 6 ND
04J847 (ext.)	-29	45	Decreasing	99.00%	0.1345	Definite	**Decreasing**	no	Extended trend for all ten data sets since 2004

Notes:
S or NT = Stable or No Trend
N = Number of data points
COV = Coefficient of Variance

MAROS Decision Matrix

M-K S	Confidence	COV	Trend
S > 0	> 95%	na	Increasing
S > 0	90-95%	na	Pr. Incr.
S > 0	< 90%	na	No Trend
S</= 0	< 90%	>/= 1	No Trend
S </= 0	< 90%	< 1	Stable
S < 0	90-95%	na	Pr. Decr.
S < 0	>95%	na	Decreasing

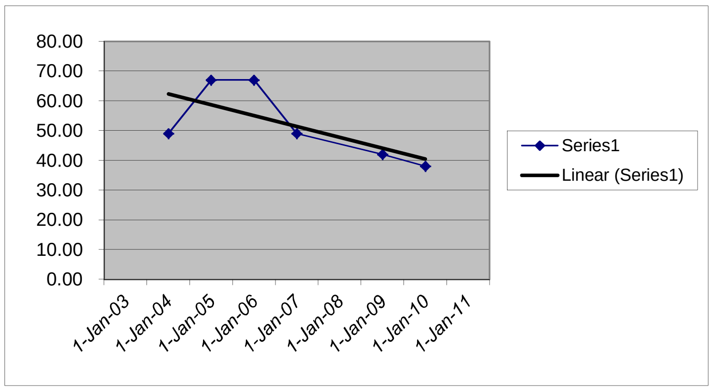
Mann-Kendall Plots

Well: **Group 1 NP**

Date	TCE (µg/l)	Mann-Kendall Calculation:					
6/18/2004	49.00	1					
6/18/2005	67.00	1	1				
6/8/2006	67.00	1	1	0			
6/11/2007	49.00	1	0	-1	-1		
6/11/2009	42.00	1	-1	-1	-1	-1	
6/16/2010	38.00	1	-1	-1	-1	-1	-1

N		6	5	4	3	2	1	15
	sum		0	-3	-3	-2	-1	-9
Possibles		15						

Mean	52.00
STNDEV	12.36123
COV	0.237716
Trend:	Negative
Confidence (lookup)	93.00%



S	-9
tau	-0.6

Decision Matrix

M-K S	Confidence	COV	Trend
S > 0	> 95%	na	Increasing
S > 0	90-95%	na	Pr. Incr.
S > 0	< 90%	na	No Trend
S</= 0	< 90%	>/= 1	No Trend
S </= 0	< 90%	< 1	Stable
S < 0	90-95%	na	Pr. Decr.
S < 0	>95%	na	Decreasing

Well: **Group 1 SP**

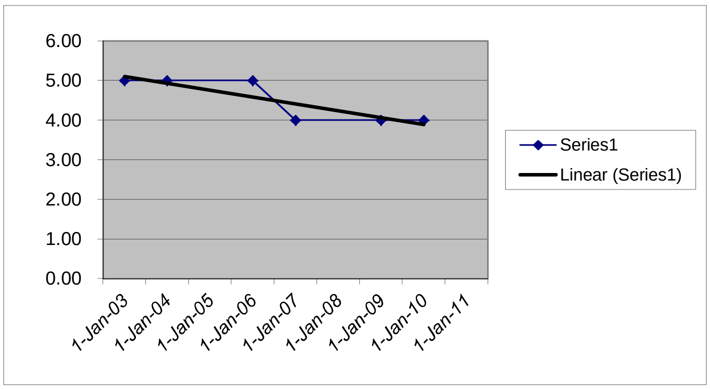
Date	TCE (µg/l)	Mann-Kendall Calculation:					
6/18/2003	5.00	1					
6/18/2004	5.00	1	0				
6/8/2006	5.00	1	0	0			
6/11/2007	4.00	1	-1	-1	-1		
6/11/2009	4.00	1	-1	-1	-1	0	
6/11/2010	4.00	1	-1	-1	-1	0	0

N		6	5	4	3	2	1	15
	sum		-3	-3	-3	0	0	-9
Possibles		15						

Mean 4.50
STNDEV 0.547723
COV 0.121716

Trend: Negative

Confidence (lookup) 93.00%



S -9

tau -0.6

Decision Matrix

M-K S	Confidence	COV	Trend
S > 0	> 95%	na	Increasing
S > 0	90-95%	na	Pr. Incr.
S > 0	< 90%	na	No Trend
S</= 0	< 90%	>/= 1	No Trend
S </= 0	< 90%	< 1	Stable
S < 0	90-95%	na	Pr. Decr.
S < 0	>95%	na	Decreasing

Well: 04J849

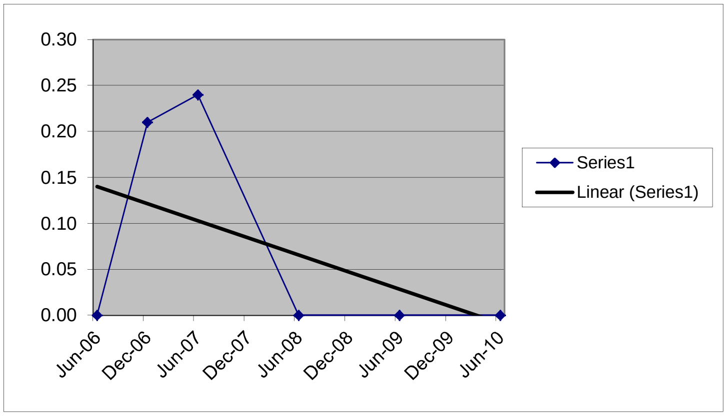
Date	TCE (µg/l)	Mann-Kendall Calculation:					
6/5/2006	0.00	1					
12/11/2006	0.21	1	1				
6/12/2007	0.24	1	1	1			
6/25/2008	0.00	1	0	-1	-1		
6/16/2009	0.00	1	0	-1	-1	0	
6/8/2010	0.00	1	0	-1	-1	0	0

N		6	5	4	3	2	1	15
	sum		2	-2	-3	0	0	-3
Possibles		15						

Mean 0.08
STNDEV 0.116576
COV 1.554349

Trend: Negative

Confidence (lookup) 64.00%



S -3

tau -0.2

Decision Matrix

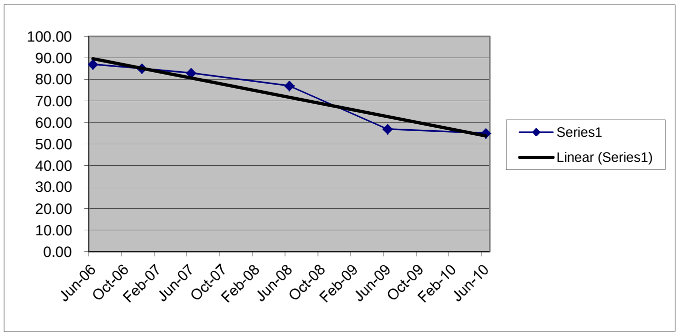
M-K S	Confidence	COV	Trend
S > 0	> 95%	na	Increasing
S > 0	90-95%	na	Pr. Incr.
S > 0	< 90%	na	No Trend
S</= 0	< 90%	>/= 1	No Trend
S </= 0	< 90%	< 1	Stable
S < 0	90-95%	na	Pr. Decr.
S < 0	>95%	na	Decreasing

Well: 04J822

Date	TCE (µg/l)	Mann-Kendall Calculation:					
6/6/2006	87.00	1					
12/11/2006	85.00	1	-1				
6/13/2007	83.00	1	-1	-1			
6/25/2008	77.00	1	-1	-1	-1		
6/16/2009	57.00	1	-1	-1	-1	-1	
6/10/2010	55.00	1	-1	-1	-1	-1	-1

N		6	5	4	3	2	1	15
	sum		-5	-4	-3	-2	-1	-15
Possibles		15						

Mean	74.00
STNDEV	14.3527001
COV	0.19395541
Trend:	Negative
Confidence (lookup)	99.00%



S	-15
tau	-1

Decision Matrix

M-K S	Confidence	COV	Trend
S > 0	> 95%	na	Increasing
S > 0	90-95%	na	Pr. Incr.
S > 0	< 90%	na	No Trend
S</= 0	< 90%	>/= 1	No Trend
S </= 0	< 90%	< 1	Stable
S < 0	90-95%	na	Pr. Decr.
S < 0	>95%	na	Decreasing

Well: 04J847

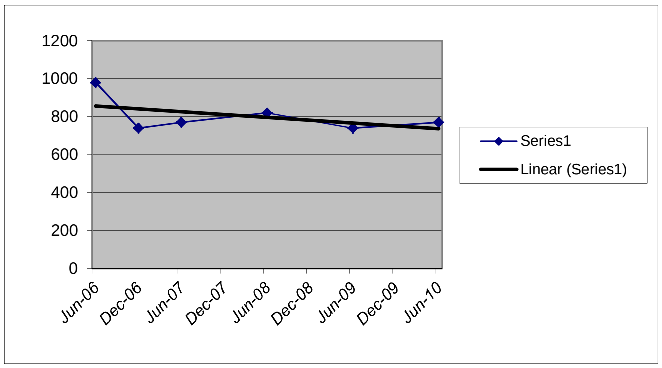
Date	TCE (µg/l)	Mann-Kendall Calculation:					
6/6/2006	980	1					
12/11/2006	740	1	-1				
6/18/2007	770	1	-1	1			
6/25/2008	820	1	-1	1	1		
6/9/2009	740	1	-1	0	-1	-1	
6/10/2010	770	1	-1	1	0	-1	1

N		6	5	4	3	2	1	15
	sum		-5	3	0	-2	1	-3
Possibles		15						

Mean 803.33
STNDEV 91.36009
COV 0.113726

Trend: Negative

Confidence (lookup) 64.00%



S -3

tau -0.2

Decision Matrix

M-K S	Confidence	COV	Trend
S > 0	> 95%	na	Increasing
S > 0	90-95%	na	Pr. Incr.
S > 0	< 90%	na	No Trend
S</= 0	< 90%	>/= 1	No Trend
S </= 0	< 90%	< 1	Stable
S < 0	90-95%	na	Pr. Decr.
S < 0	>95%	na	Decreasing

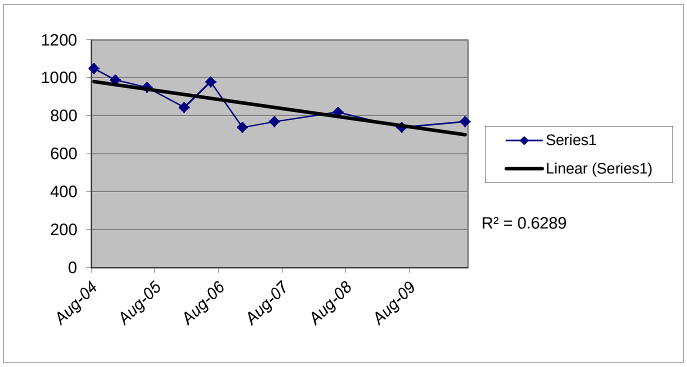
Well: **04J847 (ext.)**

Date	TCE (µg/l)		Mann-Kendall Calculation:									
8/4/2004	1050		1									
12/28/2004	990		1	-1								
6/15/2005	950		1	-1	-1							
1/11/2006	845		1	-1	-1	-1						
6/6/2006	980		1	-1	-1	1	1					
12/11/2006	740		1	-1	-1	-1	-1	-1				
6/18/2007	770		1	-1	-1	-1	-1	-1	1			
6/25/2008	820		1	-1	-1	-1	-1	-1	1	1		
6/18/2009	740		1	-1	-1	-1	-1	-1	0	-1	-1	
6/10/2010	770		1	-1	-1	-1	-1	-1	1	0	-1	1
	N		10	9	8	7	6	5	4	3	2	1	45
		sum		-9	-8	-5	-4	-5	3	0	-2	1	-29
	Possibles		45										

Mean 865.50
STNDEV 116.4391
COV 0.134534

Trend: Negative

Confidence (lookup) 99.00%



S -29

tau -0.64444

Decision Matrix

M-K S	Confidence	COV	Trend
S > 0	> 95%	na	Increasing
S > 0	90-95%	na	Pr. Incr.
S > 0	< 90%	na	No Trend
S</= 0	< 90%	>/= 1	No Trend
S </= 0	< 90%	< 1	Stable
S < 0	90-95%	na	Pr. Decr.
S < 0	>95%	na	Decreasing

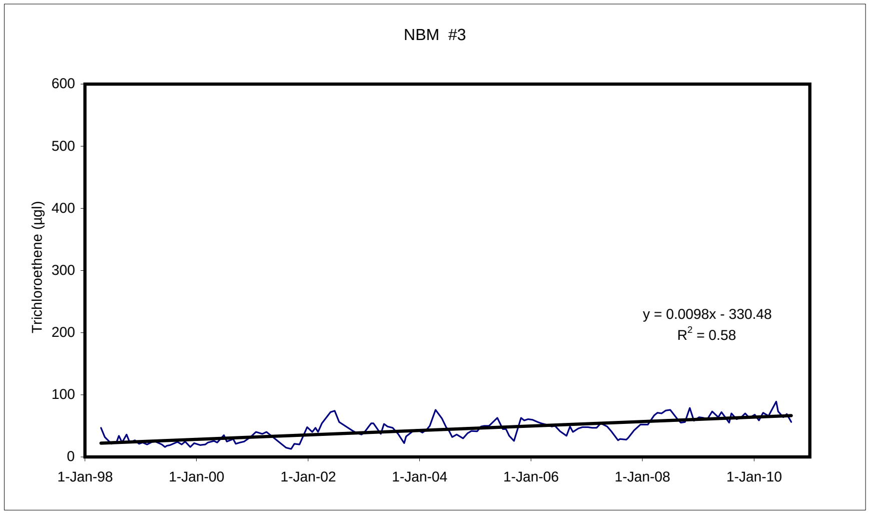
D.2.4 Group 3 and Group 5 Kriging Evaluation

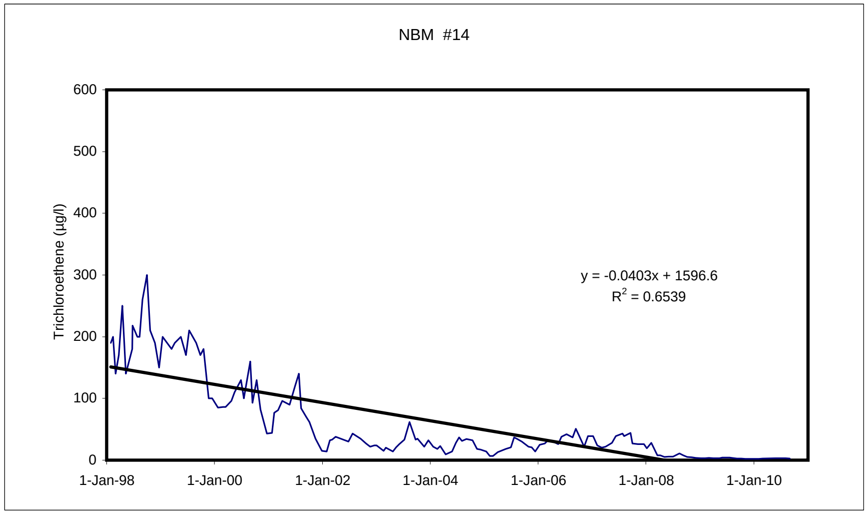
2010

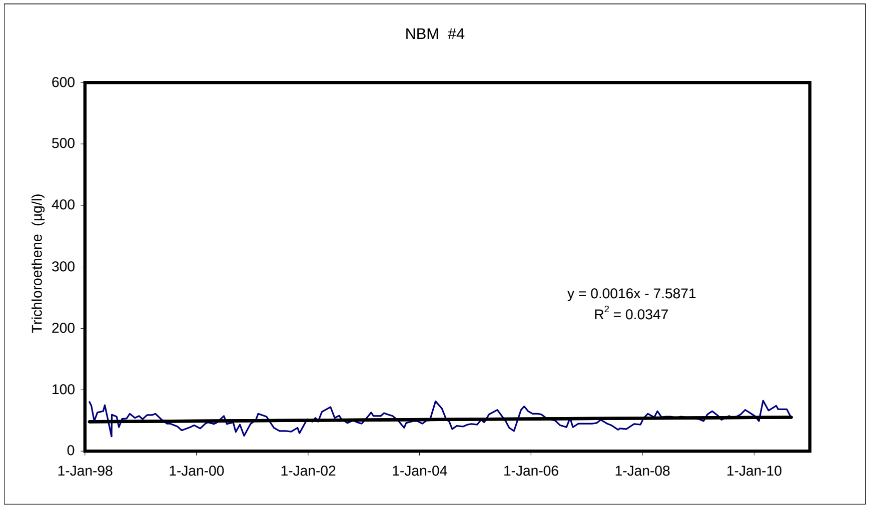
Group 3 and Group 5 Kriging Evaluation
not completed for FY 2010.

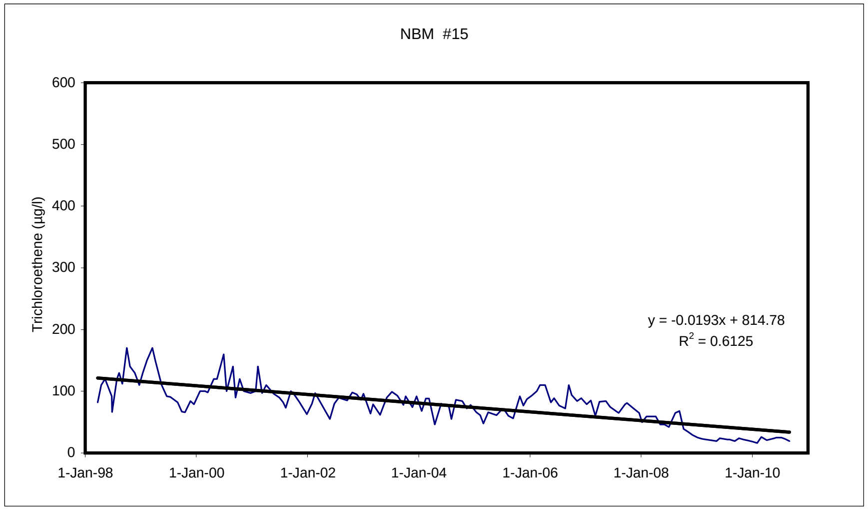
D.2.5 Group 6 New Brighton Municipal Well Regression Analysis

NEW BRIGHTON MUNICIPAL WELLS: Regression Analysis Since 1998: TRICHLOROETHENE





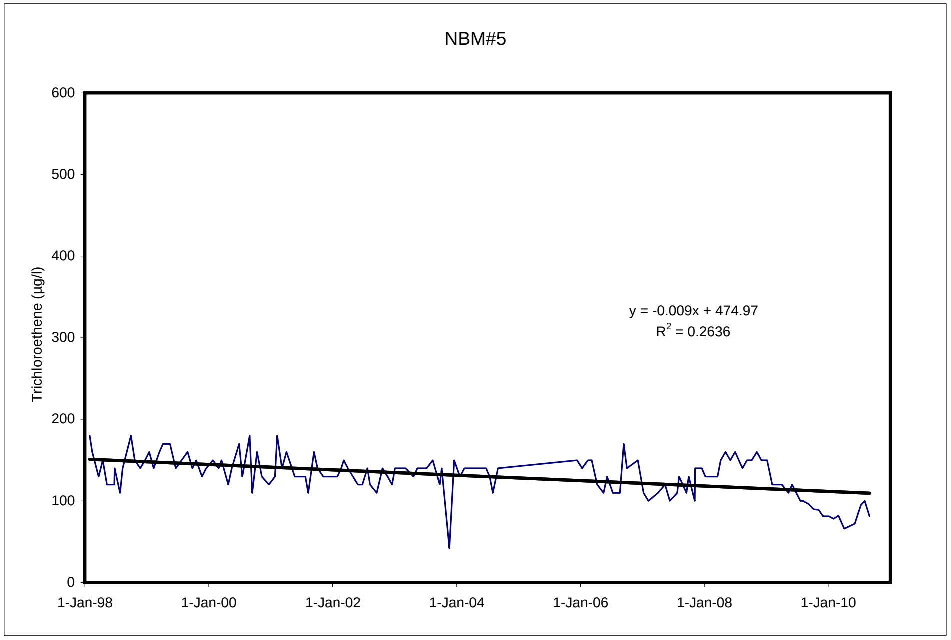


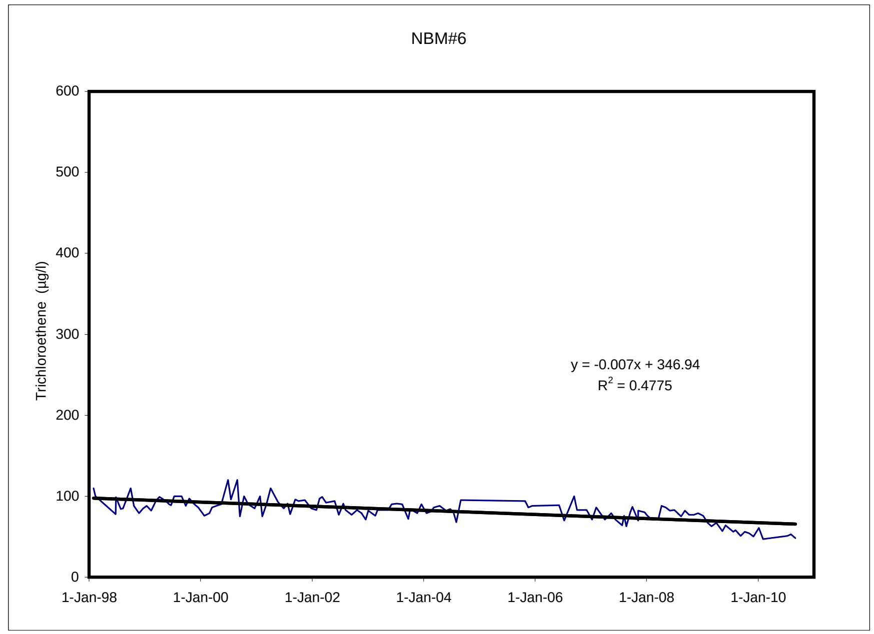


T:\1561 TCAAP\APR\FY10 APR\Preliminary Draft\APR Appendices\App D\App D.2.5 2010\NBM 3-4-14-15 REGRESSION-2010.xls

Wenck Associates, Inc.

NEW BRIGHTON MUNICIPAL WELLS: Regression Analysis Since 1998: TRICHLOROETHENE





Appendix E

Well Inventory Update, FY 2010

APPENDIX E
WELL INVENTORY UPDATE

FISCAL YEAR 2010

Purpose

The purpose of well inventory is to identify wells that have been impacted or could potentially be impacted by contaminants from the New Brighton/Arden Hills Superfund Site.

Background

Developing and maintaining the well inventory is a process that was initiated in 1991, with the work efforts documented in several update reports since that time. Beginning in FY 1999, the update reporting was incorporated into the Annual Performance Reports.

The well inventory "study area," as defined by the Minnesota Pollution Control Agency, is shown on Figure E-1, and coincides with the Minnesota Department of Health (MDH) Special Well Construction Area.

The aquifers of concern are defined by the 1 μg/L trichloroethene contour for the Unit 3 and Unit 4 aquifers, and the 1 μg/L cis-1,2-dichloroethene contour for the Unit 1 aquifer north of OU2.

The "area of concern" for the Unit 3 and Unit 4 aquifers is created by adding a quarter mile buffer area outside the 1 μg/L trichloroethene contour. The area of concern for the Unit 3 and Unit 4 aquifers is shown on Figure E-2.

The area of concern for the Unit 1 aquifer north of OU2 is delineated by city streets. The area of concern for the Unit 1 aquifer is shown on Figure E-3.

Wells within the study area are categorized based on location, depth/aquifer, and use. Well categories for the well inventory are described in Table E-1.

Program Requirements

The well inventory program requirements have evolved over time, with changes documented through the update reports. A flowchart that describes the annual requirements for maintaining the well inventory database is shown on Figure E-4. Requirements are summarized below.

Near the beginning of each fiscal year, a database of study area wells is acquired from the MDH. This MDH database query is limited to study area wells that were constructed, sealed, or disclosed in the previous fiscal year. The MDH database consists of three lists:

1. Constructed Wells (generated through drillers submitting Water Well Records);
2. Sealed Wells (generated through drillers submitting Well Sealing Records); and
3. Disclosed Wells (made known through property transfer).

With the new MDH information, the well inventory database is updated by recategorizing wells, as necessary, and by adding any new wells that are within the study area. Any new wells found in Categories 1a, 1b, 1c, 2a, 2b, 2c, or 4a are targeted for sampling in that fiscal year; however, an attempt to reclassify any new category 4a wells will be made prior to sampling. Wells that are not sampled due to non-responsive well owners are targeted for sampling in the next major sampling event.

Category 4 wells are those with an unknown depth or unknown location, or both. Ideally, there should be no wells in Category 4. Each year, an attempt is made to reclassify Category 4 wells into one of the other categories. This is accomplished through phone calls, letters, and/or site visits in an attempt to obtain additional information. Any wells which are re-classified as Category 1a, 1b, 1c, 2a, 2b, or 2c are targeted for sampling in that fiscal year.

“Major” well inventory sampling events occur every four years and are shown in Appendix A.1. The major sampling events are scheduled to coincide with the biennial sampling events for performance purposes as delineated in the APR. For each major event, all wells in Categories 1a, 1b, 1c, 2a, 2b, 2c, and 4a are targeted for sampling. After every sampling event, each well owner is mailed a copy of their testing results. Wells that are not sampled due to non-responsive well owners are targeted for sampling in the next major sampling event.

For each sampling event, if any well has a detection which exceeds the applicable New Brighton/Arden Hills Superfund Site groundwater cleanup level for that contaminant (or an additivity of 1.0, similar to the MDH Hazard Index calculation), the well is evaluated using the flow chart presented in Figure E-4 to determine the timing of additional sampling. Wells that are used for drinking water are sampled again within one month of data validation. Wells that are not used for drinking water, but have possible contact exposure risks, are sampled the next fiscal year. If a cleanup level exceedance is confirmed (two consecutive events), and the contaminant concentrations in the well are proportional to contaminant concentrations of the New Brighton/Arden Hills Superfund Site OU1 plume, the Army offers to abandon the well and/or provide an alternate water supply.

The annual reporting requirements for the New Brighton/Arden Hills Superfund Site well inventory will include:

- A list of any wells found or reclassified.
- Analytical results and a summary of sampling efforts from that fiscal year.
- Recommendations for participation in the Well Abandonment/Alternate Water Supply Program.
- An updated well inventory database that lists wells by well category.
- An updated database listing water quality of wells.

FY 2010 Update

The updated MDH database was provided to Wenck on October 13, 2009. MDH generates the database from specific Township, Range, and Section data. This comprehensive database was screened to extract the lists of wells that were constructed, disclosed, or sealed between October 1, 2008 and September 30, 2009. Further investigative efforts were primarily focused on determining each well's location (inside or outside the study area and/or area of concern), status (active, inactive, or sealed), and water use (supply/non-supply).

Newly constructed active and inactive wells, and wells of unknown status that were determined to be located within the study area, are presented in Table E-3. Twelve of the fourteen newly constructed wells were monitoring wells and were classified into Category 6. The additional two wells were for dewatering and an elevator, and were also classified into Category 6.

Disclosed wells that were identified as being in use, inactive, or of unknown status (but not sealed) and that were determined to be located within the study area are identified in Table E-4. Four of these sixteen wells were classified into Category 6. Twelve of the wells were outside of the area or aquifer of concern and were classified into Category 3.

Sealed wells were found by reviewing the MDH sealed well list, by screening the MDH disclosed and new construction lists (which also contain sealed wells), and by talking with well owners. Wells identified as sealed are shown in Table E-5. Disclosed wells that were located within the area of concern and that the MDH identified as having a change in status from active or inactive to sealed were further investigated for confirmation of their sealed status. Any wells that were already in the well inventory database that the MDH identified as having a change in status from active or inactive to sealed are shown in Table E-5 with strikeouts through the old well category entry. Wells identified as sealed in the MDH database updates were assigned to Category 7a (documented as sealed/abandoned). Wells that were determined to be sealed through conversations with well owners were assigned to Category 7b (undocumented as sealed, or improperly abandoned).

Thirty-six Category 4 wells were studied in FY 2010. This study was accomplished through mapping of well locations, internet searches, telephone calls, letters, and/or site visits in an attempt to reclassify Category 4 wells that were in the existing well inventory database into one of the other categories. Contact information was updated as well as reclassification of some wells out of Category 4 due to new information and/or responses. One well was reclassified from

Category 4 to Category 7 based on a response to a letter sent to the property owner. Two wells were reclassified as Category 3 because they were located outside of the most recent (FY 2009) area of concern line. No new wells were added to Category 4a or 4b. An investigation summary is included in Table E-6.

During the FY 2010 well inventory, any new Category 1a, 1b, 1c, 2a, 2b, 2c, and 4a wells were to be sampled. Through the FY 2010 well inventory update effort, no new wells were added to these categories; therefore, no wells were sampled. Therefore, no analytical data from well sampling was collected during the FY 2010 well inventory update (see Table E-2.)

Information contained in Tables E-3 through E-6 has been updated in the well inventory database (Filename "Well Inventory Main Database FY 2010", an Excel file included on this DVD).

Recommendations

- At this time no wells are recommended for the Army to offer alternate water supply or well abandonment.
- The next "major" sampling event is in FY 2013. Wells to be sampled in FY 2013 are:
    - All wells in Categories 1a, 1b, 1c, 2a, 2b, 2c, and 4a
    - Any previously undiscovered wells determined to be in Categories 1a, 1b, 1c, 2a, 2b, 2c, or 4a based on the FY 2010-FY2012 review of the MDH database.
    - Any Category 4b wells that are determined, from further investigation, to be in Category 1a, 1b, 1c, 2a, 2b, 2c, or 4a.

TABLE E-1
WELL INVENTORY CATEGORY DESCRIPTIONS

Category	*Subcategory*	*Explanation*
1		Water supply wells screened in an aquifer of concern, inside the 1 μg/l contour. Wells are divided into the following subcategories:
	1a	• Drinking water well
	1b	• Nondrinking but possible contact water
	1c	• Nondrinking, noncontact water
	1d	• Well is inoperable or has not been used for several years
	1e	• Well for which the owner has refused (or has been unresponsive to) an Army offer for abandonment, or for which the water use has been deemed acceptable
2		Water supply wells in an area of concern, inside the buffer lines, but outside the 1 μg/l contour, screened in an aquifer of concern. Wells are divided into the following subcategories:
	2a	• Drinking water well
	2b	• Nondrinking but possible contact water
	2c	• Nondrinking, noncontact water
	2d	• Well is inoperable or has not been used for several years
3		Water supply wells within the Study Area that are either outside the area of concern, or are within the area of concern but are not screened in an aquifer of concern.
4		Water supply wells with missing information, divided into the following subcategories:
	4a	• Unknown depth or aquifer, but located in the area of concern.
	4b	• Unknown location, but potentially located within the Study Area. Wells with both an unknown depth and an unknown location are included in 4b.
5		Wells that are in the study area, but that have been field checked and not located. No further action is recommended for these wells.
6		Nonsupply wells (primarily monitoring wells).
7		Sealed or abandoned wells. Wells are divided into the following subcategories:
	7a	• Documented as sealed/abandoned
	7b	• Undocumented as sealed, or improperly abandoned

TABLE E-2

WELL INVENTORY SAMPLING RESULTS
Fiscal Year 2010

No sampling conducted in FY10

TABLE E-3
CONSTRUCTED WELLS

Unique Number	Category	Last Name or Business Name	Street	City	Use	Depth	Date Drilled
762709	6	MCES		Minneapolis	Dewatering	30	Feb-09
760128	6	Van Cleve Apartments	919 12th Avenue SE	Minneapolis	Elevator Shaft	46	Dec-08
763229	6	Gateway Washington, Inc.	2100 Snelling Avenue N	Roseville	Monitoring	74	Dec-08
763230	6	Gateway Washington, Inc.	2100 Snelling Avenue N	Roseville	Monitoring	68	Dec-08
763231	6	Gateway Washington, Inc.	2100 Snelling Avenue N	Roseville	Monitoring	74	Dec-08
765019	6	Raees Chohan	5300 Central Avenue NE	Fridley	Monitoring	35	Feb-09
765020	6	Raees Chohan	5300 Central Avenue NE	Fridley	Monitoring	36	Feb-09
765021	6	Raees Chohan	5300 Central Avenue NE	Fridley	Monitoring	33	May-09
765046	6	Raees Chohan	756 53rd Street NE	Fridley	Monitoring	32	May-09
765084	6	Raees Chohan		Fridley	Monitoring	34	Aug-09
765083	6	Raees Chohan	5300 Central Avenue NE	Fridley	Monitoring	37	Sep-09
770715	6	Univar USA, Inc.	111 22nd Avenue NE	Minneapolis	Monitoring	20	Aug-09
770714	6	Univar USA, Inc.	111 22nd Avenue NE	Minneapolis	Monitoring	18	Aug-09
770713	6	Univar USA, Inc.	111 22nd Avenue NE	Minneapolis	Monitoring	16	Aug-09

Indicates wells that were both constructed and later sealed during FY 2009.

TABLE E-4
WELLS DISCLOSED THROUGH PROPERTY TRANSFER

Unique Number	Category	Last Name or Business Name	Street	City	Use	Status	Date Sealed	Depth	Aquifer	Date Drilled
463072	3	1209 Tylere, LLC	1209 Tyler Street NE	Minneapolis		In Use		0		
463073	3	1209 Tylere, LLC	1209 Tyler Street NE	Minneapolis		In Use		0		
463074	3	1209 Tylere, LLC	1209 Tyler Street NE	Minneapolis		In Use		0		
463075	3	1209 Tylere, LLC	1209 Tyler Street NE	Minneapolis		In Use		0		
730143	3	1209 Tylere, LLC	1209 Tyler Street NE	Minneapolis		In Use		0		
730142	3	1209 Tylere, LLC	1209 Tyler Street NE	Minneapolis		In Use		0		
730141	3	1209 Tylere, LLC	1209 Tyler Street NE	Minneapolis		In Use		0		
730140	3	1209 Tylere, LLC	1209 Tyler Street NE	Minneapolis		In Use		0		
742739	6	~~David Frost, Inc.,~~ 1209 Tylere, LLC	1209 Tyler Street NE	Minneapolis		In Use		0		
742740	6	~~David Frost, Inc.,~~ 1209 Tylere, LLC	1209 Tyler Street NE	Minneapolis		In Use		0		
740244	6	~~David Frost, Inc.,~~ 1209 Tylere, LLC	1209 Tyler Street NE	Minneapolis		In Use		0		
756587	6	~~David Frost, Inc.,~~ 1209 Tylere, LLC	1209 Tyler Street NE	Minneapolis		In Use		0		
Not Given	3	~~Larson,~~ Atkinson	1615 Lois Drive	Shoreview		In Use		0		
Not Given	3	Ness	7473 Lakeside Road	Fridley		In Use		0		
Not Given	3	~~Holmes,~~ Crusiani	763 Ninth Avenue NW	New Brighton		No Status Reported		0		
Not Given	3	Falk	5053 Longview Drive	Mounds View		Not In Use		0		

TABLE E-5
SEALED WELLS

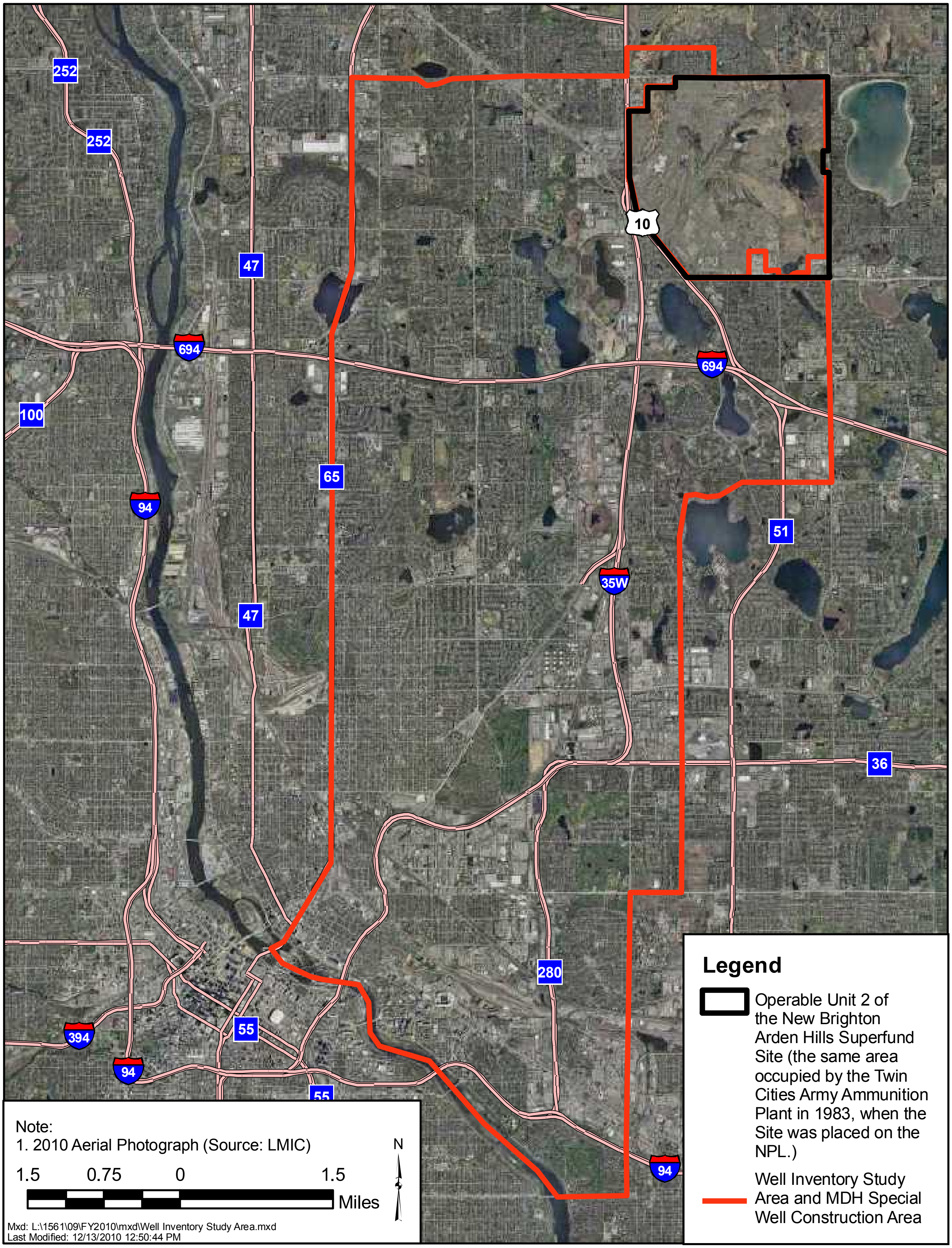
Unique Number	*Category*	*Last Name or Business Name*	*Street*	*City*	*Status*	*Date Sealed*
747713	~~6,~~ 7a	Speedway SuperAmerica	1130 73rd Avenue NE	Fridley	Sealed	5/21/2009
726801	~~6,~~ 7a	~~Body Cote Thermal Processing,~~ Tankenoff	900 E Hennepin	Minneapolis	Sealed	10/10/2008
524047	~~6,~~ 7a	~~Alliant Techsystems, Inc.,~~ TCAAP	~~440 5th Ave NW,~~ 440 Fifth Street NW	New Brighton	Sealed	11/12/2008
524050	~~6,~~ 7a	~~Alliant Techsystems, Inc.,~~ TCAAP	778 First Street NW	New Brighton	Sealed	11/15/2008
524051	~~6,~~ 7a	~~Alliant Techsystems, Inc.,~~ TCAAP	778 First Street NW	New Brighton	Sealed	11/19/2008
234159	~~6,~~ 7a	~~ST-12-03,~~ Ramsey County Parks and Recreation	4700 Highway 10	Arden Hills	~~Active,~~ Sealed	11/14/2008
234160	~~6,~~ 7a	~~ST-12-M3,~~ Ramsey County Parks and Recreation	4700 Highway 10	Arden Hills	~~Active,~~ Sealed	11/14/2008
234161	~~6,~~ 7a	~~ST-12-L3,~~ Ramsey County Parks and Recreation	4700 Highway 10	Arden Hills	~~Active,~~ Sealed	11/14/2008
757552	~~6,~~ 7a	City of New Brighton	1400 Old Highway 8 NW	New Brighton	~~Active,~~ Sealed	4/3/2009
416080	~~6,~~ 7a	~~04U852 312-U4,~~ TCAAP	382 County Road D W	New Brighton	~~Active,~~ Sealed	11/19/2008
702839	~~6,~~ 7a	City of Roseville	2814 Cleveland Avenue N	Roseville	~~Active,~~ Sealed	6/29/2009
752830	~~6,~~ 7a	Carleton University	2251 University Avenue W	St. Paul	~~Active,~~ Sealed	11/11/2008
752831	~~6,~~ 7a	Carleton University	2251 University Avenue W	St. Paul	~~Active,~~ Sealed	11/11/2008
752832	~~6,~~ 7a	Carleton University	2251 University Avenue W	St. Paul	~~Active,~~ Sealed	11/11/2008
752833	~~6,~~ 7a	Carleton University	2251 University Avenue W	St. Paul	~~Active,~~ Sealed	11/11/2008
H011578	7a	Stark	1934 Edgewater Ave	Arden Hills	Sealed	9/3/2009
H011579	7a	Stark	1934 Edgewater Ave	Arden Hills	Sealed	9/3/2009
Not Given	7a	Idrizow	1955 County Road D W	Arden Hills	Sealed	5/27/2009
H035789	7a	Kolmer	1960 Glen Paul Ave	Arden Hills	Sealed	2/19/2009
Not Given	7a	Munson	2015 County Road D	Arden Hills	Sealed	7/2/2009
H259714	7a	Sanders	2021 Glen Paul Ave	Arden Hills	Sealed	12/5/2008
H277475	7a	~~Mcgovern Sadusky Investments,~~ Ms. Relocation Services, Inc.	3926 Glenview Avenue	Arden Hills	Sealed	4/30/2009
H278241	7a	Morrissey	3947 Glenview	Arden Hills	Sealed	8/20/2009
525634	7a	TCAAP	4700 Highway 10	Arden Hills	Sealed	5/1/2009
525635	7a	TCAAP	4700 Highway 10	Arden Hills	Sealed	5/1/2009
525636	7a	TCAAP	4700 Highway 10	Arden Hills	Sealed	5/1/2009
H281813	7a	Wenkel	1825 Fairview Ave N	Falcon Heights	Sealed	8/4/2009
622605	7a	Determan Brownie	1200 72nd Avenue NE	Fridley	Sealed	3/13/2009
632115	7a	Determan Brownie	1200 72nd Avenue NE	Fridley	Sealed	3/13/2009
614162	7a	Determan Brownie	1241 72nd Avenue NE	Fridley	Sealed	3/13/2009
614163	7a	Determan Brownie	1241 72nd Avenue NE	Fridley	Sealed	3/13/2009
632114	7a	Determan Brownie	1241 72nd Avenue NE	Fridley	Sealed	3/13/2009
632116	7a	Determan Brownie	1241 72nd Avenue NE	Fridley	Sealed	3/13/2009
H266000	7a	Tostengard	2079 W Skillman Ave	Fridley	Sealed	4/23/2009
H067968	7a	Lissick	4648 2½ STREET NE	Fridley	Sealed	6/16/2009
H259732	7a	Korzeniowski	515 66th Avenue NE	Fridley	Sealed	9/4/2009
H259732	7a	Martin	515 66th Avenue NE	Fridley	Sealed	10/20/2008
H196845	7a	Watkins	6140 Sunrise Drive	Fridley	Sealed	1/7/2009
Not Given	7a	Brillhart	830 W Moore Lake Drive NE	Fridley	Sealed	6/2/2009
H278076	7a	Baker	1975 Carl Street	Lauderdale	Sealed	4/20/2009
H275300	7a	U of M	1024 27th Avenue SE	Minneapolis	Sealed	3/20/2009
H240623	7a	Hillcrest Development, LLLP	1229 Tyler Street	Minneapolis	Sealed	2/12/2009
H279060	7a	Newman Center	1701 University Ave NE	Minneapolis	Sealed	7/23/2009
H272031	7a	Jax Restaurant and Banquet	1928 University Avenue NE	Minneapolis	Sealed	10/30/2008
H265830	7a	BBD Holdings, Inc.	2010 E Hennepin Avenue	Minneapolis	Sealed	10/7/2008
H275208	7a	Interplastics Corp.	2014 Broadway Avenue NE	Minneapolis	Sealed	10/31/2008
H277448	7a	Repubus Ventures, LLC.	2428 Delaware Street	Minneapolis	Sealed	3/5/2009
H275241	7a	U of M	2609 Fourth Street	Minneapolis	Sealed	11/21/2008
H267644	7a	Lowry Repair Center	2907 Central Ave	Minneapolis	Sealed	5/14/2009
H269284	7a	Anderson	2919 Como	Minneapolis	Sealed	5/19/2009
H265895	7a	Way	329 Quincy Street	Minneapolis	Sealed	5/12/2009
H278684	7a	Wau Development Co., LLC	504 Malcolm Ave	Minneapolis	Sealed	5/21/2009
H269518	7a	Eparchy of Our Lady of Lebanon of Los Angeles	617 Second Street NE	Minneapolis	Sealed	11/26/2008
H275289	7a	SKB Environmental	620 Malcolm Avenue	Minneapolis	Sealed	2/20/2009
H275271	7a	Hennepin County	620 Malcom Avenue SE	Minneapolis	Sealed	1/20/2009
H269267	7a	Welcher Transfer	630 Arthur Street NE	Minneapolis	Sealed	12/16/2008
H102077	7a	Tankenoff	900 Hennepin Ave E	Minneapolis	Sealed	10/10/2008
H118456	7a	Tankenoff	936 E Hennepin Ave	Minneapolis	Sealed	10/10/2008
H220134	7a	Tankenoff	936 E Hennepin Ave	Minneapolis	Sealed	10/10/2008
762709	7a	Metropolitan Council Environmental Services		Minneapolis	Sealed	3/13/2009
H280542	7a	U of M		Minneapolis	Sealed	4/22/2009
H276001	7a	Halverson	2400 County Road H2	Mounds View	Sealed	11/26/2008
H275786	7a	~~Jurek Estate,~~ Fields	2431 Ridge Lane	Mounds View	Sealed	9/3/2009
Not Given	7a	Grandy	2432 Clearview Ave	Mounds View	Sealed	2/19/2009
H275779	7a	Blocher	2932 County Road H2	Mounds View	Sealed	9/3/2009
H275780	7a	Blocher	2932 County Road H2	Mounds View	Sealed	9/3/2009
H275781	7a	Blocher	2932 County Road H2	Mounds View	Sealed	9/3/2009
H275782	7a	Blocher	2932 County Road H2	Mounds View	Sealed	9/3/2009
H275779	7a	Rice	2932 County Road H2	Mounds View	Sealed	5/29/2009
H275780	7a	Rice	2932 County Road H2	Mounds View	Sealed	5/29/2009
H275781	7a	Rice	2932 County Road H2	Mounds View	Sealed	5/29/2009
H275782	7a	Rice	2932 County Road H2	Mounds View	Sealed	5/29/2009
H274810	7a	~~Olson,~~ Bode	3033 Wooddale Drive	Mounds View	Sealed	9/3/2009
H268729	7a	McCauley	5315 Clifton Drive	Mounds View	Sealed	8/19/2009
H256390	7a	No Owner Found	7406 Spring Lake Road	Mounds View	Sealed	10/23/2008
Not Given	7a	Engler	1230 12th Ave	New Brighton	Sealed	2/19/2009
H273525	7a	~~Kluthe,~~ Anderson	127 Second Avenue SE	New Brighton	Sealed	5/27/2009
553025	7a	City of New Brighton	1275 Old Highway 8	New Brighton	Sealed	1/8/2009
553028	7a	City of New Brighton	1275 Old Highway 8	New Brighton	Sealed	5/6/2009
628990	7a	City of New Brighton	1369 Old Highway 8	New Brighton	Sealed	10/9/2008
H278053	7a	HSNB, LLC.	1815 Old Highway 8	New Brighton	Sealed	2/2/2009
H275775	7a	Huhtala	2575 Rainbow Lane	New Brighton	Sealed	5/19/2009
H274427	7a	Peterson	291 12th Avenue NW	New Brighton	Sealed	10/8/2008
H143836	7a	Ingvaldsen	739 Tenth Street NW	New Brighton	Sealed	9/3/2009
H271452	7a	Bell Lumber and Pole Co.	778 First Street NW	New Brighton	Sealed	10/23/2008
H271453	7a	Bell Lumber and Pole Co.	778 First Street NW	New Brighton	Sealed	10/23/2008
H271454	7a	Bell Lumber and Pole Co.	778 First Street NW	New Brighton	Sealed	10/23/2008

TABLE E-5
SEALED WELLS

Unique Number	Category	Last Name or Business Name	Street	City	Status	Date Sealed
H198063	7a	Brown	1010 W Shryer Ave	Roseville	Sealed	2/19/2009
H267264	7a	Poeschl	1602 Ridgewood Lane W	Roseville	Sealed	8/6/2009
H277489	7a	Biladeau	1654 Stanbridge Ave	Roseville	Sealed	4/13/2009
Not Given	7a	Taylor	1685 Stanbridge Ave	Roseville	Sealed	7/6/2009
H186144	7a	Morgan	1729 Maple Lane	Roseville	Sealed	7/24/2009
H275778	7a	Bondy	1856 Ryan Ave W	Roseville	Sealed	6/10/2009
H267253	7a	~~Paulin,~~ Murray	1859 Ryan Avenue W	Roseville	Sealed	3/5/2009
H275777	7a	Menke	1880 Draper Drive	Roseville	Sealed	6/2/2009
Not Given	7a	Doneen	1886 Shryer Ave W	Roseville	Sealed	10/23/2008
H091281	7a	West	1945 Roselawn W	Roseville	Sealed	2/19/2009
H278113	7a	Dally	1995 Hershel Street	Roseville	Sealed	7/6/2009
Not Given	7a	Manthey	2079 Skillman Ave W	Roseville	Sealed	7/28/2009
H267588	7a	Donahue	2095 Fairway Lane	Roseville	Sealed	5/4/2009
H267586	7a	Yardley	2107 Fairways Lane	Roseville	Sealed	4/9/2009
H267583	7a	~~Norelius,~~ Franklin	2115 Fulham Street	Roseville	Sealed	3/14/2009
H278249	7a	Buwell	2151 Fairways Lane	Roseville	Sealed	9/8/2009
H267266	7a	Hopstock	2201 Draper	Roseville	Sealed	8/22/2009
H275774	7a	Still	2206 Midlothian Road	Roseville	Sealed	5/20/2009
Not Given	7a	Saad	2248 Laurie Road W	Roseville	Sealed	1/20/2009
H276907	7a	~~Munson,~~ Malone	2519 Millwood Avenue	Roseville	Sealed	4/22/2009
H274124	7a	Mcgovern Sadusky Investments	2532 Millwood Street	Roseville	Sealed	10/7/2008
Not Given	7a	Gallop Solutions, Inc.	2591 Fry Street	Roseville	Sealed	7/28/2009
H271906	7a	Thephrasouvanh	2845 Fairview Ave	Roseville	Sealed	3/2/2009
525633	7a	TCAAP	4700 Highway 10	Roseville	Sealed	5/1/2009
H267639	7a	Hoosline	7350 Central Ave N	Roseville	Sealed	4/20/2009
H102296	7a	Mezzenga	1009 Oakridge Ave	Shoreview	Sealed	9/3/2009
H265315	7a	Mcardle	1688 Lois Drive	Shoreview	Sealed	9/3/2009
H198116	7a	Liknes	2417 St. Anthony Blvd.	St. Anthony	Sealed	9/25/2009
H273720	7a	Crown Castle USA, Inc.	2801 37th Avenue NE	St. Anthony	Sealed	10/28/2008
H176325	7a	MNDOT	Highway 280	St. Anthony	Sealed	2/27/2009
H269519	7a	Midland Hills Country Club	2001 Fulham Street	St. Paul	Sealed	12/29/2008
705555	7a	Pillars Investment Group, LLC	217 Como Ave	St. Paul	Sealed	4/16/2009
705556	7a	Pillars Investment Group, LLC	217 Como Ave	St. Paul	Sealed	4/16/2009
705561	7a	Pillars Investment Group, LLC	217 Como Ave	St. Paul	Sealed	4/16/2009
705562	7a	Pillars Investment Group, LLC	217 Como Ave	St. Paul	Sealed	4/16/2009
H250440	7a	Enpro Assessment Corp.	2340 Capp Road	St. Paul	Sealed	11/5/2008
200256	7a	Jax Restaurant and Banquet	1928 University Avenue NE	Minneapolis	Sealed	10/30/2008
539578	7a	Interplastics Corp.	2015 Broadway Street NE	Minneapolis	Sealed	10/31/2008
200385	7a	~~MNDOT,~~ City of Minneapolis	721 Second Street SE	Minneapolis	Sealed	12/8/2008
553026	7a	City of New Brighton	1275 Old Highway 8	New Brighton	Sealed	10/9/2008
553027	7a	City of New Brighton	1275 Old Highway 8	New Brighton	Sealed	10/9/2008
553029	7a	City of New Brighton	1275 Old Highway 8	New Brighton	Sealed	10/9/2008
628988	7a	City of New Brighton	1369 Old Highway 8	New Brighton	Sealed	10/9/2008
628989	7a	City of New Brighton	1369 Old Highway 8	New Brighton	Sealed	10/9/2008
628991	7a	City of New Brighton	1369 Old Highway 8	New Brighton	Sealed	10/9/2008

TABLE E-6
FY 2010 FIELD INVESTIGATION AND SAMPLING SUMMARY

Unique Number	*Category*	*Last Name or Business Name*	*Street*	*City*	*Date Last Sampled*	*Status*	*Depth*	*Comments*
	4a to 3	Cuddihy	2933 Troseth Road	Roseville		Not in Use		Outside area of concern for FY 2010. Reclassified as category 3 well.
	4a to 3	Olson	4439 Old Hwy 10	Arden Hills		In Use		Outside area of concern for FY 2010. Reclassified as category 3 well.
S00295	4a	Alfson	2351 Summer St	Lauderdale		Unknown		Sent letter 4/7/10. No Response
	4a	Amundsen	2816 St. Anthony Blvd	St. Anthony		Not in Use		Sent letter 4/7/10. No Response
	4a	Hermes	2935 Old Hwy 8	Roseville	6/16/2009	Active		Sent letter 4/7/10. No Response
UNKNOWN	4a	Holland	1475 16TH STREET NW	NEW BRIGHTON		Disclosure	0	Sent letter 4/7/10. No Response
UNKNOWN	4a	Macdonald	1672 14TH AVENUE NW	NEW BRIGHTON		Disclosure	0	Sent letter 4/7/10. No Response
249185	4a	Novotny	1706 Malvern St	Lauderdale		Unknown		Sent letter 4/7/10. No Response
	4a	Weisenberger	2816 Silver Lake Rd	St. Anthony		Inactive		Sent letter 4/7/10. No Response
130000	4b	550 Associates		Arden Hills		Inactive		Could not locate.
126463	4b	B & M Construction	Nordeen Estates			Active	216	Could not locate.
S00650	4b	CME		New Brighton	6/24/1984			Could not locate.
239465	4b	Lennox				Active	256	Could not locate.
234434	4b	Marquart		Arden Hills		Unknown		Could not locate.
	4b	Murray Heights				Not In Use		Could not locate.
105271	4b	Nelson				Active	137	Could not locate.
S00471	4b	R Komarek/Nelson-Miller Cons				Inactive		Could not locate.
S00551	4b	Tamarack Care Temp			2/17/1982	Unknown		Could not locate.
105242	4b	Weber, Nordeen Jr.				Unknown	214	Could not locate.
201192	4b					Unknown		Could not locate.
234532	4b					Unknown		Could not locate.
234537	4b					Unknown		Could not locate.
234545	4b				PHASE I	Unknown		Could not locate.
234658	4b				6/7/1982	Unknown		Could not locate.
	4a to 7b	Burton	2073 10th St NW	New Brighton		Inactive		Sent letter 4/7/10. Received letter back 4/12/10 saying well was "sealed." Reclassified to category 7b well.



ANNUAL PERFORMANCE REPORT

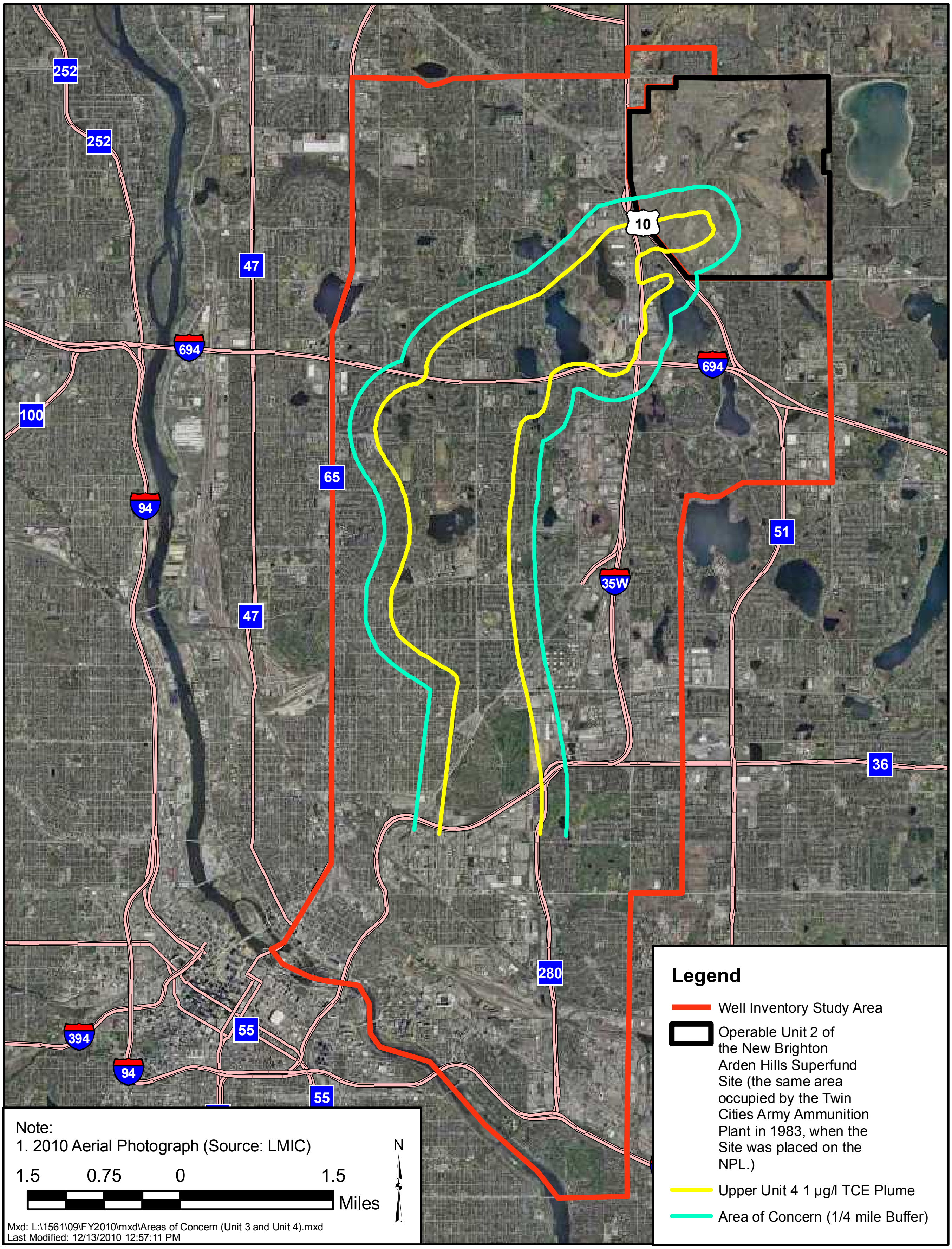
Well Inventory Study Area

Wenck

Wenck Associates, Inc.
Environmental Engineers
1800 Pioneer Creek Center
Maple Plain, MN 55359-0429

FY 2010

Figure E-1



ANNUAL PERFORMANCE REPORT

Areas of Concern (Unit 3 and Unit 4)

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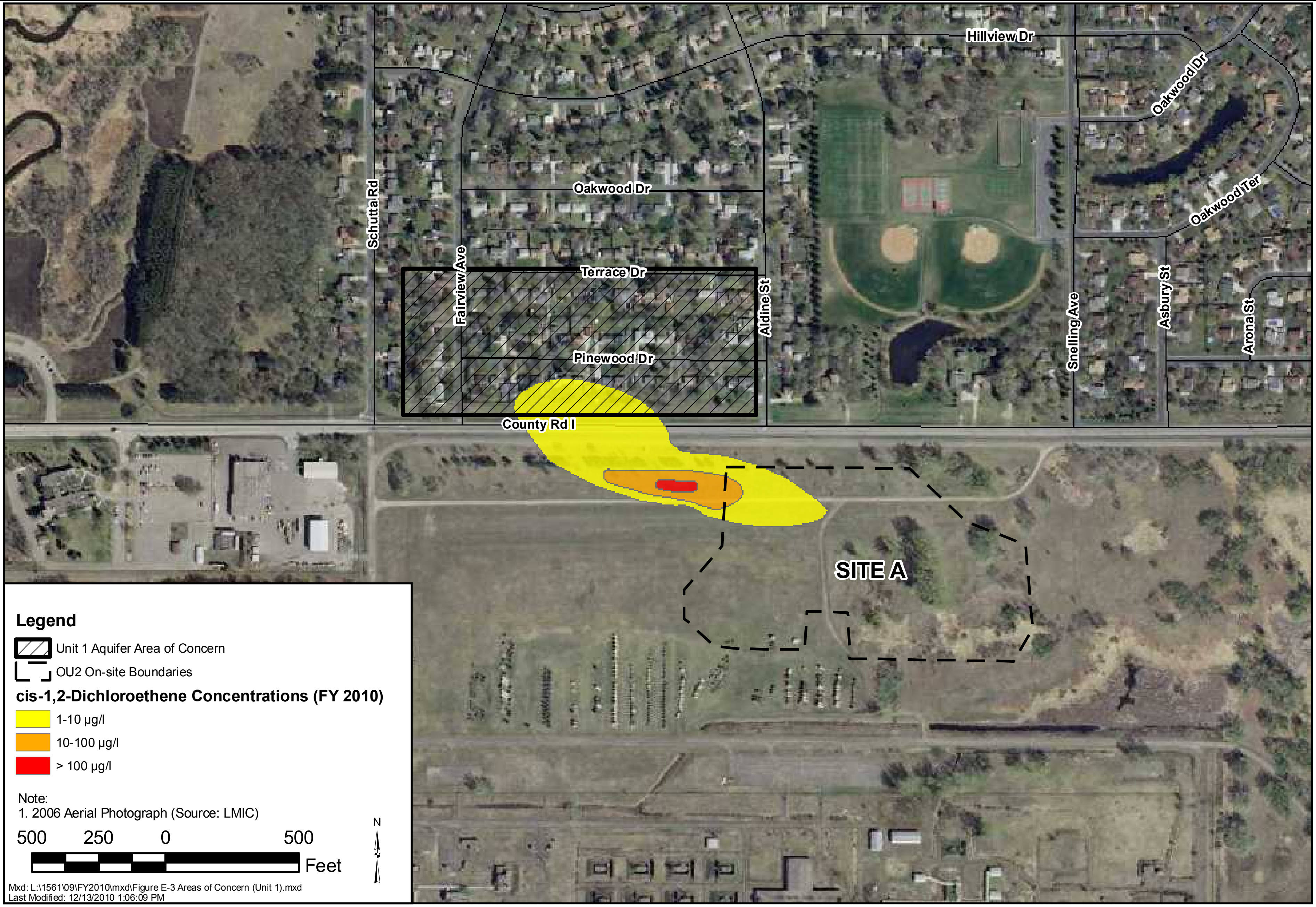
Wenck

Wenck Associates, Inc. Environmental Engineers
1800 Pioneer Creek Center Maple Plain, MN 55359-0429

FY 2010

Figure E-2



Legend

Unit 1 Aquifer Area of Concern

OU2 On-site Boundaries

cis-1,2-Dichloroethene Concentrations (FY 2010)

1-10 µg/l

10-100 µg/l

> 100 µg/l

Note:
1. 2006 Aerial Photograph (Source: LMIC)

500 250 0 500 Feet

N

Mxd: L:\1561\09\FY2010\mxd\Figure E-3 Areas of Concern (Unit 1).mxd
Last Modified: 12/13/2010 1:06:09 PM

ANNUAL PERFORMANCE REPORT

Area of Concern (Unit 1)

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Wenck Associates, Inc.
Environmental Engineers

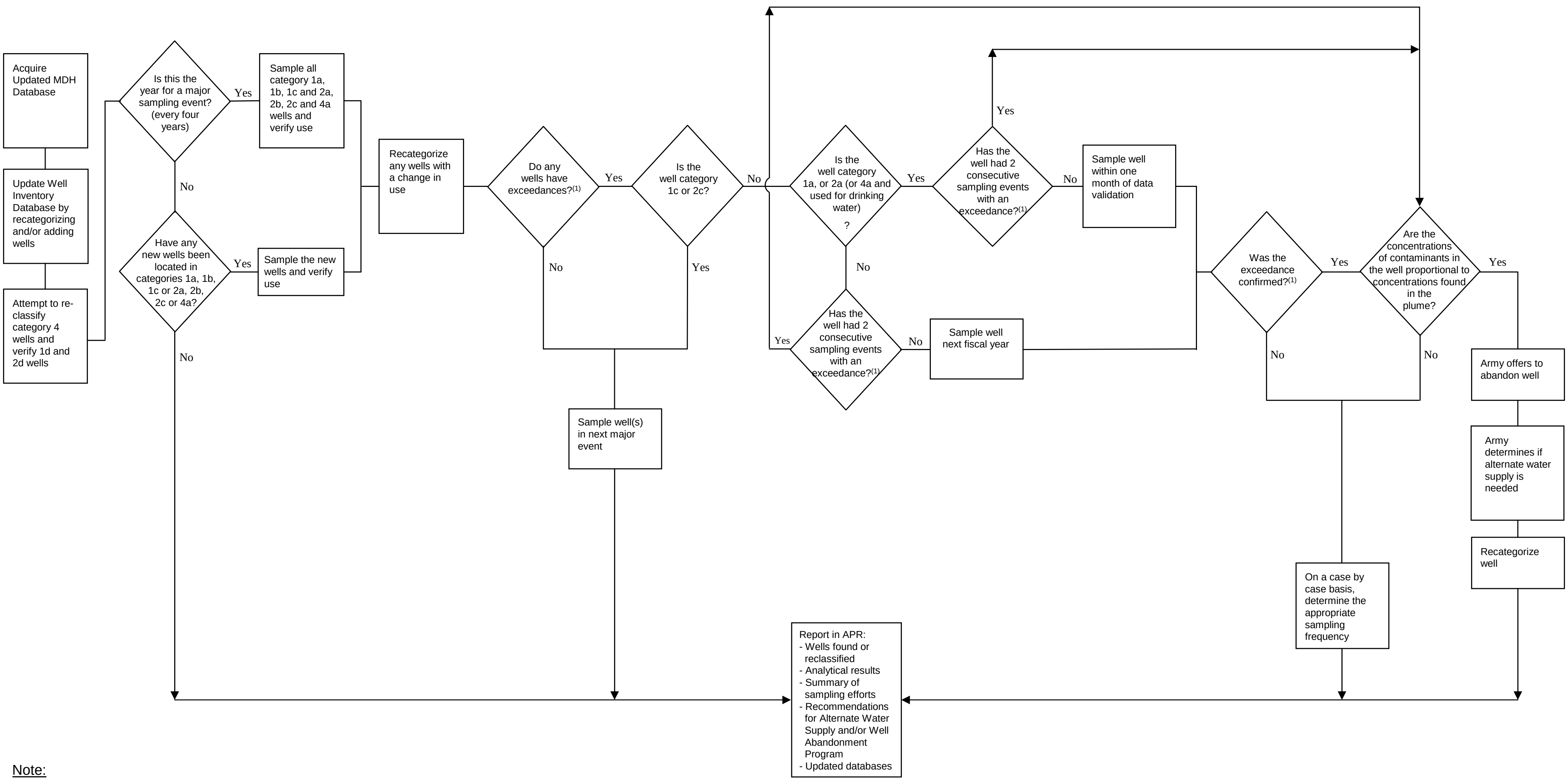
1800 Pioneer Creek Center
Maple Plain, MN 55359-0429

FY 2010

Figure E-3

Figure E-4

Annual Requirements for Maintaining Well Inventory Database



Note:

(1) = Exceedance of a New Brighton/Arden Hills Superfund Site Groundwater Cleanup Level

WELL INVENTORY DATABASE

The Well Inventory Database is located on
this DVD in the following Microsoft Excel file:

Well Inventory Main Database FY 2010.xls

Appendix F

Site K and TGRS Operational Data

F.1 Inspection and Maintenance Activities, Fiscal Year 2010, Site K, OU2

APPENDIX F.1

INSPECTION AND MAINTENANCE ACTIVITIES
FISCAL YEAR 2010
SITE K, TCAAP
ARDEN HILLS, MINNESOTA

October 2009

1) 10/1/09 - Low building temperature fault- System reset. System downtime 19 hours

2) 10/13/09 - Performed annual system cleaning

3) 10/14/09 - Increased flow to 14 gpm

November 2009

1) 11/19/09 - Performed Monthly O&M

December 2009

1) 12/11/09 - In suspense, system o.k.

2) 12/14/09 - Reduces flow to 11 gpm

3) 12/22/09 - Performed Monthly O&M

January 2010

1) 1/11/10 - Increased flow to 10.7 gpm

2) 1/15/10 - Reduced flow to 11 gpm

3) 1/19/10 - Pressure at 15" H_2O; air intake clogged with snow. Cleared snow and pressure returned to 25"

4) 1/22/10 - Performed Monthly O&M

February 2010

1) 2/16/10 - In suspense, system o.k.

2) 2/19/10 - Performed Monthly O&M

3) 2/24/10 - In suspense, system o.k.

March 2010

1) 3/8/10 - Collected Quarterly Inf/Eff samples; performed monthly O&M

2) 3/10/10 - Increased flow to 11 gpm

3) 3/26/10 - Replaced influent flow control valve; Down time 1 hour

APPENDIX F.1

INSPECTION AND MAINTENANCE ACTIVITIES
FISCAL YEAR 2010
SITE K, TCAAP
ARDEN HILLS, MINNESOTA

April 2010

1) 4/7/10 - In suspense, system OK.

2) 4/21/10 - Increased flow rate to 15 gpm.

3) 4/22/10 - Performed monthly O&M

4) 4/26/10 - Reduced flow rate to 12 gpm.

May 2010

1) 5/26/10 - Performed monthly O&M

2) 5/27/10 - High water fault, adjusted effluent flow and restart system. Total downtime approximately 23 hours.

June 2010

1) 6/21/10 - Performed monthly O&M

July 2010

1) 7/8/10 - Painting of building interior and exterior framework, system shut down at 7:25 AM.

2) 7/9/10 - Restart system at 10:20 AM. Approximate downtime 27 hours.

3) 7/20/10 - Performed monthly O&M.

August 2010

1) 8/18/10 - Performed monthly O&M.

September 2010

1) 9/14/10 - Performed annual system cleaning. System downtime approximately 6 hours.

F.2 Maintenance Activities, Fiscal Year 2010, TGRS, OU2

APPENDIX F-2

MAINTENANCE ACTIVITIES
FISCAL YEAR 2010
TGRS, OU2
ARDEN HILLS, MINNESOTA

October 2009

10/1/2009	Treatment System and Well Field; Call out from the auto dialer; Power is off; Xcel Energy contacted and they respond in the morning during day light hours; Two fusible switches were open. Down time: 17 hours at B1, B13, B3, B4, B5, B6, B8, B9, B11, SC1, SC2 and SC5.
10/8/2009	Push cart found by gate 4; A voicemail message was left with Mike Fix. Down time: None.
10/8/2009	Treatment System; Ball valve was closed on ECV #4 operating solenoid valve; Opened the ball valve and observed normal valve operation. Down time: None.
10/8/2009	Pumphouse B6; Starter coil was buzzing loudly; Reset the starter and normal operation resumed. Down time: None.
10/12/2009	Pumphouses and Treatment System; Installed foam board insulation in door vents and vent fan openings; Turned on all heaters and set thermostats in pumphouses and control panels in building 116; Turned on portable heaters in old chlorine room. Down time: None.
10/30/2009	Well 03U003; Turned the pump off at meter reading 2551900; Sampled the well for VOCs prior to shut down. Down time: None.
10/30-31/2009	Pumphouse B5; The light was flashing on the PLC in Building 116; Reset the PLC but the light continued to flash; At the pumphouse, the ECV will not open; Locked the valve in the full open position until the control piping can be repaired. Down time: 22.5 hours.

November 2009

11/2/2009	Pumphouse SC2; Changed out flow meter with new; Old one out at meter reading 58446900 and new one in at meter reading 42657100 at 3:00 PM. Down time: None.

APPENDIX F-2

MAINTENANCE ACTIVITIES
FISCAL YEAR 2010
TGRS, OU2
ARDEN HILLS, MINNESOTA

11/12/2009	Pumphouse B1; Rattling noise down hole; Will inspect daily to determine if the noise worsens. Down time: None.
11/12/2009	Pumphouse B5; ECV will not open at pump startup; Adjust ECV control valves until the ECV opens and schedule solenoid valve replacement. Down time: None.
11/18-25/2009	Pumphouse B1; Turned the pump off due to the rattling noise worsening; Replaced the pump and reused the motor. Down time: 197 hours.
11/30/2009	Pumphouses B1, B3, B8 and B9; Slowed their flow rates to their minimum flow rate. Down time: None.
11/30/2009	Treatment System; Pump 1 in the treatment center would not turn on in "auto", causing the well field to cycle; Troubleshooting indicates a failed pump stop float; Replaced the failed pump stop float with a new one and the pump worked in "auto" normally. Down time: 5 hours at B13, B3, B4, B6, SC1 and SC5 each.
11/30/2009	Pumphouse SC1; The flow meter stopped totaling; Removed the flow meter and cleaned it and replaced it. Down time: The down time is already accounted for above.

December 2009

12/1/2009	Treatment System; Replaced the "pump stop" float in wet well 1 on 11/30/2009; Well field cycled during work. Down time: 1.5 hours at B3, B9 and SC5; 3 hours at SC1; 4 hours at B5.
12/2/2009	Pumphouse B5; Changed out pump and motor; The motor was new and the pump was from B1 and was cleaned and reused. Down time: 9.5 hours.
12/2/2009	Treatment System and Well Field; Pump 1 failed to open; Exercised control valves, flushed control piping and cycled the valve several times; normal operation observed. Down time: None.

APPENDIX F-2

MAINTENANCE ACTIVITIES
FISCAL YEAR 2010
TGRS, OU2
ARDEN HILLS, MINNESOTA

12/2/2009	Pumphouse B5; Changed out the old solenoid valve and installed a new solenoid valve. Down time: None.
12/16/2009	Pumphouse B13; Removed and cleaned the flow meter; Re-installed the cleaned flow meter and observed normal operation. Down time: None.
12/16/2009	Pumphouse B11; Removed and cleaned the flow meter; Re-installed the cleaned flow meter and observed normal operation. Down time: None.
12/27/2009	Treatment System; PDU indicates an opening fault at ECV 3; Acknowledged the fault and exercised the control valves; Cycled the valve and observed normal operation. Down time: None.
12/28/2009	Treatment System; Another opening fault at ECV 3; Change the filter, adjust the opening and closing speed valves and flush the control piping; Cycle the valve and observed normal operation. Down time: None.
12/29/2009	Treatment System; Control piping on ECV 4 is leaking; Install new bushing, nipple and union. Down time: 1 hour at B9; 2 hours at SC1 .
12/31/2009	Pumphouse SC5; The ECV is fluctuating slightly; Cleaned the strainer screen and adjusted the opening and closing speed control needles. Down time: 2 hours.

January 2010

1/1/2010	No Daily Inspection today due to New Years Day holiday. Down time: None.
1/8-11/2010	Pumphouse B1; Installed a new 3" ECV; Laughlin Electric on site to perform electrical hook up. Down time: 75.5 hours.

APPENDIX F-2

MAINTENANCE ACTIVITIES
FISCAL YEAR 2010
TGRS, OU2
ARDEN HILLS, MINNESOTA

1/12-13/2010	Treatment System; Several opening faults at ECV 3; Acknowledged PDU faults and exercised control piping valves; Lessened the pressure on the back pressure sustaining pilot; Valve now opens and closes normally. Down time: None.
1/14/2010	Treatment System; Control piping leaking at downstream valve port on ECV 4; Disassemble control piping and reinstall new hex bushing and nipple; Restart pump 4 and observe no leaks. Down time: None.
1/19/2010	Treatment System and Well Field; Shut down the treatment system and well field as part of the quarterly preventive maintenance work. Down time: 2 hours each at B1, B13, B5, B6 and SC1.
1/20/2010	Pumphouse B1; Turned the pump off to update the ECV control piping. Down time: 5 hours.
1/24/2010	Treatment System; Opening fault on the PDU; ECV 3 failed to open 4 times; Acknowledged faults and adjusted ECV control valves; Cycled valve several times and observed normal operation. Down time: None.
1/25/2010	Treatment System; Opening fault on PDU; ECV 3 failed to open 12 times; Acknowledged faults and adjusted ECV control valves; Cycled valve several times and observed normal operation. Down time: None.
1/25-30/2010	Forcemain; Forcemain break with water ponding on ground surface approximately 400 feet south of Building 116; Turned the treatment system and well field off; Set up a utility meet and an excavation contractor (SDE); Repaired 3 different holes in the forcemain with repair clamps; Backfilled the excavation and restarted the TGRS. Down time: 95 hours each at B1, B5, B8 and B11; 100 hours each at B13, B3, B4, B6, B9, SC1, SC2 and SC5.
1/26/2010	Pumphouse B1; Pulled the lift system and changed the pump to a 9-stage A.Y. McDonald stainless steel pump. Down time: None, downtime already accounted for to repair the forcemain leaks.

APPENDIX F-2

MAINTENANCE ACTIVITIES
FISCAL YEAR 2010
TGRS, OU2
ARDEN HILLS, MINNESOTA

1/27/2010	Treatment System; With the system off to repair the forcemain leaks, outside cold air blew in through the blower vents and froze the water in the base of towers 2, 3 and 4 not allowing water to flow to the wet wells upon system start up; Thawed the ice and removed the water from the base of the towers. Down time: None, the system was already down to repair the forcemain leaks.

February 2010

2/2/2010	Pumphouse B3; Flow rate was too high. Increased the pressure on the ECV to decrease the flow rate, but increased the pressure too much slowing the flow rate below operational minimum. Down time: 1.5 hours.
2/9/2010	Treatment System; Changed the oil in Pump 4 turbine motor. Down time: None.
2/11/2010	Pumphouse B6; Changed out the leaky ball valves with new ones. Down time: None.
2/12/2010	Pumphouse B5; Pilot will not hold pressure. Replaced old pilot with a rebuilt from inventory. Down time: None.
2/16/2010	Treatment System; Installed a new pressure gauge on the influent sampling port. The new pressure gauge reads approximately 10 psi higher than the previous pressure gauge. Down time: None.
2/16/2010	Treatment System; Leaking spigot on the influent forcemain line in the treatment center. Turned the system off and replaced the leaky spigot with a new one. Down time: None.
2/23/2010	Treatment System; Installed new larger diameter (1/2") control piping and changed out the pressure sustaining valve and the 3-way normally open solenoid valve on the ECV 3 control piping harness. Down time: None.

APPENDIX F-2

MAINTENANCE ACTIVITIES
FISCAL YEAR 2010
TGRS, OU2
ARDEN HILLS, MINNESOTA

March 2010

3/14/2010	Treatment System and Well Field. Well field down on arrival. Wet well pump 4 is not running. The lead to the starter coil is broken off. Lockout power to MCC #4, stripped and relanded lead to coil. Reset pump director, cycled pump and observed normal Down time: 7 hours at B5 and B13; 10 hours at B3, B8 and SC1; 6 hours at B6; 3 hours at
3/19/2010	Pumphouse SC1. Removed and cleaned the flow meter. Down time: None.
3/25/2010	Pumphouses B6 and B9. Check the data line protectors to ensure they are not blown. Down time: None.
3/25/2010	Treatment System. The high level float switch in wet well 3 has failed. Replaced it with a new float switch. Down time: None.
3/26/2010	Treatment System and Well Field. The well field is cycling on arrival. The drain valve on the ECV 4 control piping was left in the open position causing the valve to close partially. Opened the valve and observed normal ECV operation. Down time: 5 hours at B13, B6 and B8; 7 hours at B3 and SC1 and 2 hours at B4.
3/29/2010	Pumphouse SC2. Removed and cleaned the flow meter. Down time: None.
3/29/2010	Pumphouse B6. Relocated the breaker switch inside the control panel to a safer location. LOTO performed prior to initiating work. Down time: None.
3/29-4/2/2010	Pumphouse SC5. Turned the pump off and re-developed the well with jetting and chemicals. March down time: 52 hours.

April 2010

4/1-2/2010	Pumphouse SC5; Pump off for well re-development. Down time: 43 hours.

APPENDIX F-2

MAINTENANCE ACTIVITIES
FISCAL YEAR 2010
TGRS, OU2
ARDEN HILLS, MINNESOTA

4/8/2010	Treatment System and Well Field; Turned the system off as part of the required quarterly operation and maintenance work. Down time: 1 hour at B13 and 1 hour at B4.
4/26/2010	Pumphouse SC2; Increased the valve pressure to slow the flow rate but increased the valve pressure to much. Re-adjusted the valve pressure on 4/27/2010 to the proper setting and observed normal operation. Down time: 5 hours.

May 2010

5/8-10/2010	Pumphouse SC1; Cover off outside electric meter, the breaker box is partially open and the outside power line has been cut near the weather head; Contacted Xcel Energy to repair. Down time: 9 hours.
5/9/2010	Pumphouse B8; Pinhole leak on one of the side plugs of the ECV; Turned the pump off and repaired the side plug. Down time: 14 hours.
5/18/2010	Pumphouses; All pumphouses locked. Down time: None.

June 2010

6/3,10-11/2010	Treatment System and Well Field. Laughlin Electric on Site performing the annual electrical maintenance work. Down time: None.
6/4-7/2010	Pumphouse SC1. Meter not rotating. Removed the flow meter and cleaned 3 pieces of manganese from the inlet. Reinstalled the meter and flow resumed normally. Down time: None. The readings were adjusted as if the meter had been totaling.
6/7-9/2010	Pumphouse B9; Upon entering the pumphouse, there was a burning electrical like odor. Turned the pump off and called Laughlin Electric. Laughlin Electric determined that the "hot" lead had a poor connection at the well head. Re-connected the hot lead and observed normal operation. Down time: 43.5 hours.

APPENDIX F-2

MAINTENANCE ACTIVITIES
FISCAL YEAR 2010
TGRS, OU2
ARDEN HILLS, MINNESOTA

6/8/2010	Pumphouse B6; Adjusted the pilot which slowed the flow rate overnight. Down time: 4.5 hours.
6/11/2010	Pumphouses B3 and SC5; The indicator lights were flashing on the PLC in Building 116. Reset the PLC and the well pumps restarted normally. Down time: 2 hours at B3 and 7.5 hours at SC5.
6/11-14/2010	Pumphouse SC1; The ball valve was closed on the forcemain line in the pumphouse. Opened the valve and normal flow resumed. Down time: 101 hours.
6/16/2010	Treatment System; Call out from autodialer-TGRS fail; Pump 1 failed to turn on because the breaker was tripped; Reset the breaker and restarted the pump; Normal operation observed. Down time: None.
6/21/2010	Treatment System and Well Field; Turned the system off during the forcercemain replacement and excavation work. Down time: 2 hours at B1, B13, B8, and B9. 3 hours at B3, B4 and B6.
6/24/2010	Pumphouses B1, B6, B8, B11 and SC1. The B1 and B6 lights were flashing and the B8, B11 and SC1 lights were off on the PLC. There was an electrical storm last night that likely knocked out power to the pumps. Reset the PLC and pumps B1 and B6 restarted normally. The lights for B8, B11 and SC1 remained off. Further troubleshooting shows the electrical storm knocked out the disconnect box on the power pole outside the B11 pumphouse. The communication lines for B11, B8 and SC1 are paired together so all 3 of the pumps turned off. Laughlin Electric on Site to replace the breaker box on the power pole outside the B11 pumphouse and the pumps restart normally. Down time: 9 hours at B1 and B6. Four hours at SC1 and 18 hours at B11.
6/25-28/2010	Pumphouse SC1; There were associated communication problems with the electrical outage at B11. Replaced the relay in the control panel, restared the pump and normal operation resumed. Down time: 88 hours.

APPENDIX F-2

MAINTENANCE ACTIVITIES
FISCAL YEAR 2010
TGRS, OU2
ARDEN HILLS, MINNESOTA

6/26/2010	Pumphouses B6, B8, B11, SC1 and SC5; The B6 and SC5 lights were flashing and the B8, B11 and SC1 lights were off on the PLC. There was another electrical storm last night that again likely knocked out power to the pumps. Reset the PLC and B6 and SC5 restarted normally. Troubleshooting at the B11 pumphouse shows the power switch was tripped inside the control cabinet. Reset the power switch and normal operation resumed for B8, B11 and SC1. Down time: 2 hours at B6 and SC5 and 10.5 hours at B11. The SC1 downtime is already noted due to the relay mentioned above.
6/28-30/2010	Treatment System and Well Field; Turned the TGRS off for forcemain replacement and testing. Down time: 25 hours at B1, B13, B3, B4, B5, B6, B8, B9, B11 and SC5; 31 hours at SC2 and 44 hours at SC1.

July 2010

7/7/2010	Pumphouses B1 and B5; Reduced their flow rates to their target rates. Down time: None.
7/9/2010	Pumphouses B4 and SC5; Reduced their flow rates to their target rates. Down time: None.
7/12/2010	Treatment System; Reset the airflow meter at blower 1. Down time: None.
7/13/2010	Treatment System and Well Field; Turned the TGRS off and drained the forcemain so SDE could install a saddle tap and drain valve on the influent forcemain in the treatment center. Down time: 2 hours at B1, B5, B8 and SC5. Three hours at B13 and B3.
7/18/2010	Pumphouse SC5; Light flashing on the PLC. Last nights storm knocked out power to the communication card. Reset the PLC and SC5 restarted normally. Down time: 14.5 hours.
7/21/2010	Pumphouse B6; The pumping water level is activating the low level probe causing the pump to turn on and off. Reduced the flow rate so the pumping water level remains above the low level probe. Down time: None.

APPENDIX F-2

MAINTENANCE ACTIVITIES
FISCAL YEAR 2010
TGRS, OU2
ARDEN HILLS, MINNESOTA

7/22/2010	Pumphouse B11; The light is flashing on the PLC; Last nights storm knocked out power to the communication card; Reset the PLC and the pump restarted normally. Down time: 31 hours.
7/24/2010	Pumphouse SC5; Light flashing on the PLC. Last nights storm knocked out power to the communication card. Reset the PLC and SC5 restarted normally. Down time: 9 hours.
7/26/2010	Pumphouse B11; The coil on the solenoid valve is buzzing loudly. The output card was only putting out 88 volts to the solenoid valve. Replaced the output card and the observed normal operation of the coil. Down time: None.
7/29/2010	Well 03U003/B11; Installed a pump in well 03U003 and plumbed it into the B11 pumphouse. The meter reading of the flow meter prior to start up was 30594200. Turned the pump on at 16:25. Down time: None.

August 2010

8/2/2010	Pumphouse B11; Light is flashing on well field panel. Electrical storm last night likely knocked out power to the pump. Reset the well field and B11 restarted normally. Down time: None.
8/2/2010	Well 03U003; The temporary forcemain line from 03U003 to B11 became separated at the union. Repaired the connection and restarted the pump. The pump restarted normally however the flow meter is not turning. Removed some sand and restarted the pump. Normal operation observed. Down time: None.
8/3/2010	Pumphouse SC5; The light is flashing on the well field panel and not able to reset at the PLC. There was an electrical storm last night. At pumphouse there is an adapter fault and the active lights were flashing back and forth. Cycled power to the controls and reset the power switch. Restarted the pump and the pump restarted normally. Down time: 23 hours.

APPENDIX F-2

MAINTENANCE ACTIVITIES
FISCAL YEAR 2010
TGRS, OU2
ARDEN HILLS, MINNESOTA

8/6/2010	Pumphouses B1, B3, B4, B5 and B9; Adjusted flow rates to maximize well grouping flow rates. Down time: None.
8/10/2010	Treatment System; Well field cycling. Pressure switch for pump 1 failed. Removed the pressure switch, cleaned out the piping and reinstalled the pressure switch. Cycled the pump and observed normal operation. Down time: 1.5 hours at B1 and B3; 11 hours at B13, B4 and B8.
8/10/2010	Pumphouse SC1; Storm last night blew 2 fuses near SC1. Xcel Energy replaced the 2 fuses and power was restored to the pump. Down time: 20 hours.
8/10-12/2010	Pumphouse B4; Storm last night blew the submersible pump motor. T. L. Stevens replaced the motor with a new one. Restarted the pump and normal operation observed. Down time: 59 hours.
8/11/2010	Pumphouses B6, B8, SC2 and SC5; Lights flashing on well field panel. Electrical storm last night interrupted power to the pumphouses. Reset the well field panel and all pumphouses restarted normally. Down time: 16 hours at B6, B8 and SC5; 27 hours at SC2.
8/13/2010	Pumphouse SC5; Light is flashing on the well field panel. Storm last night interrupted power to the pumphouse. Reset the well field panel and the pump restarted normally. Down time: 6 hours.
8/23-27/2010	Pumphouse B6; Turned the pump off to redevelop the well. Thein well on site to jett, airlift, add chemicals and surge block the well. Down time: 93 hours.
8/24/2010	Treatment System; Call from Time Communication. TGRS fail. ECV 1 failed to open. Adjusted the opening and closing speed valves, flushed the control piping and cycled the valve. Normal operation observed. Down time: None.

APPENDIX F-2

MAINTENANCE ACTIVITIES
FISCAL YEAR 2010
TGRS, OU2
ARDEN HILLS, MINNESOTA

September 2010

9/2/2010	Pumphouse SC5; There was a storm last night and the SC5 light is flashing on the PLC. Reset the PLC and the pump restarted normally. Down time: 5 hours.
9/10/2010	Pumphouse B11; The ECV closed slightly which slowed the flow rate overnight. Flushed the control piping and decreased the pressure on the pilot and normal flow rate resumed. Down time: 10 hours.
9/10-14/2010	Well 03U003; Turned the pump off at 1630 because the flow meter was no longer totaling. Further inspection indicates the pump has become disconnected from the piping down in the well. Remove the pump and piping and re-connect them. Restarted the pump and normal operation resumed. Down time: 115 hours.

F.3 Maintenance Activities by Location, Fiscal Year 2010, TGRS, OU2

APPENDIX F-3

MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2010
TGRS, OU2
ARDEN HILLS, MINNESOTA

Pumphouse B1

10/1/2009	Treatment System and Well Field; Call out from the auto dialer; Power is off; Xcel Energy contacted and they respond in the morning during day light hours; Two fusible switches were open. Down time: 17 hours at B1, B13, B3, B4, B5, B6, B8, B9, B11, SC1, SC2 and SC5.
10/12/2009	Pumphouses and Treatment System; Installed foam board insulation in door vents and vent fan openings; Turned on all heaters and set thermostats in pumphouses and control panels in building 116; Turned on portable heaters in old chlorine room. Down time: None.
11/12/2009	Pumphouse B1; Rattling noise down hole; Will inspect daily to determine if the noise worsens. Down time: None.
11/18-25/2009	Pumphouse B1; Turned the pump off due to the rattling noise worsening; Replaced the pump and reused the motor. Down time: 197 hours.
11/30/2009	Pumphouses B1, B3, B8 and B9; Slowed their flow rates to their minimum flow rate. Down time: None.
1/8-11/2010	Pumphouse B1; Installed a new 3" ECV; Laughlin Electric on site to perform electrical hook up. Down time: 75.5 hours.
1/20/2010	Pumphouse B1; Turned the pump off to update the ECV control piping. Down time: 5 hours.
1/26/2010	Pumphouse B1; Pulled the lift system and changed the pump to a 9-stage A.Y. McDonald stainless steel pump. Down time: None, downtime already accounted for to repair the forcemain leaks.
5/18/2010	Pumphouses; All pumphouses locked. Down time: None.
6/3,10-11/2010	Treatment System and Well Field. Laughlin Electric on Site performing the annual electrical maintenance work. Down time: None.

APPENDIX F-3

MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2010
TGRS, OU2
ARDEN HILLS, MINNESOTA

6/24/2010	Pumphouses B1, B6, B8, B11 and SC1. The B1 and B6 lights were flashing and the B8, B11 and SC1 lights were off on the PLC. There was an electrical storm last night that likely knocked out power to the pumps. Reset the PLC and pumps B1 and B6 restarted normally. The lights for B8, B11 and SC1 remained off. Further troubleshooting shows the electrical storm knocked out the disconnect box on the power pole outside the B11 pumphouse. The communication lines for B11, B8 and SC1 are paired together so all 3 of the pumps turned off. Laughlin Electric on Site to replace the breaker box on the power pole outside the B11 pumphouse and the pumps restart normally. Down time: 9 hours at B1 and B6. Four hours at SC1 and 18 hours at B11.
6/28-30/2010	Treatment System and Well Field; Turned the TGRS off for forcemain replacement and testing. Down time: 25 hours at B1, B13, B3, B4, B5, B6, B8, B9, B11 and SC5; 31 hours at SC2 and 44 hours at SC1.
7/7/2010	Pumphouses B1 and B5; Reduced their flow rates to their target rates. Down time: None.
8/6/2010	Pumphouses B1, B3, B4, B5 and B9; Adjusted flow rates to maximize well grouping flow rates. Down time: None.

Pumphouse B3

10/1/2009	Treatment System and Well Field; Call out from the auto dialer; Power is off; Xcel Energy contacted and they respond in the morning during day light hours; Two fusible switches were open. Down time: 17 hours at B1, B13, B3, B4, B5, B6, B8, B9, B11, SC1, SC2 and SC5.
10/12/2009	Pumphouses and Treatment System; Installed foam board insulation in door vents and vent fan openings; Turned on all heaters and set thermostats in pumphouses and control panels in building 116; Turned on portable heaters in old chlorine room. Down time: None.
11/30/2009	Pumphouses B1, B3, B8 and B9; Slowed their flow rates to their minimum flow rate. Down time: None.
2/2/2010	Pumphouse B3; Flow rate was too high. Increased the pressure on the ECV to decrease the flow rate, but increased the pressure too much slowing the flow rate below operational minimum. Down time: 1.5 hours.

APPENDIX F-3

MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2010
TGRS, OU2
ARDEN HILLS, MINNESOTA

5/18/2010	Pumphouses; All pumphouses locked. Down time: None.
6/3,10-11/2010	Treatment System and Well Field. Laughlin Electric on Site performing the annual electrical maintenance work. Down time: None.
6/11/2010	Pumphouses B3 and SC5; The indicator lights were flashing on the PLC in Building 116. Reset the PLC and the well pumps restarted normally. Down time: 2 hours at B3 and 7.5 hours at SC5.
6/28-30/2010	Treatment System and Well Field; Turned the TGRS off for forcemain replacement and testing. Down time: 25 hours at B1, B13, B3, B4, B5, B6, B8, B9, B11 and SC5; 31 hours at SC2 and 44 hours at SC1.
8/6/2010	Pumphouses B1, B3, B4, B5 and B9; Adjusted flow rates to maximize well grouping flow rates. Down time: None.

Pumphouse B4

10/1/2009	Treatment System and Well Field; Call out from the auto dialer; Power is off; Xcel Energy contacted and they respond in the morning during day light hours; Two fusible switches were open. Down time: 17 hours at B1, B13, B3, B4, B5, B6, B8, B9, B11, SC1, SC2 and SC5.
10/12/2009	Pumphouses and Treatment System; Installed foam board insulation in door vents and vent fan openings; Turned on all heaters and set thermostats in pumphouses and control panels in building 116; Turned on portable heaters in old chlorine room. Down time: None.
5/18/2010	Pumphouses; All pumphouses locked. Down time: None.
6/3,10-11/2010	Treatment System and Well Field. Laughlin Electric on Site performing the annual electrical maintenance work. Down time: None.

APPENDIX F-3

MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2010
TGRS, OU2
ARDEN HILLS, MINNESOTA

6/28-30/2010	Treatment System and Well Field; Turned the TGRS off for forcemain replacement and testing. Down time: 25 hours at B1, B13, B3, B4, B5, B6, B8, B9, B11 and SC5; 31 hours at SC2 and 44 hours at SC1.
7/9/2010	Pumphouses B4 and SC5; Reduced their flow rates to their target rates. Down time: None.
8/6/2010	Pumphouses B1, B3, B4, B5 and B9; Adjusted flow rates to maximize well grouping flow rates. Down time: None.
8/10-12/2010	Pumphouse B4; Storm last night blew the submersible pump motor. T. L. Stevens replaced the motor with a new one. Restarted the pump and normal operation observed. Down time: 59 hours.

Pumphouse B5

10/1/2009	Treatment System and Well Field; Call out from the auto dialer; Power is off; Xcel Energy contacted and they respond in the morning during day light hours; Two fusible switches were open. Down time: 17 hours at B1, B13, B3, B4, B5, B6, B8, B9, B11, SC1, SC2 and SC5.
10/12/2009	Pumphouses and Treatment System; Installed foam board insulation in door vents and vent fan openings; Turned on all heaters and set thermostats in pumphouses and control panels in building 116; Turned on portable heaters in old chlorine room. Down time: None.
10/30-31/2009	Pumphouse B5; The light was flashing on the PLC in Building 116; Reset the PLC but the light continued to flash; At the pumphouse, the ECV will not open; Locked the valve in the full open position until the control piping can be repaired. Down time: 22.5 hours.
11/12/2009	Pumphouse B5; ECV will not open at pump startup; Adjust ECV control valves until the ECV opens and schedule solenoid valve replacement. Down time: None.
12/2/2009	Pumphouse B5; Changed out pump and motor; The motor was new and the pump was from B1 and was cleaned and reused. Down time: 9.5 hours.

APPENDIX F-3

MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2010
TGRS, OU2
ARDEN HILLS, MINNESOTA

12/2/2009	Pumphouse B5; Changed out the old solenoid valve and installed a new solenoid valve. Down time: None.
2/12/2010	Pumphouse B5; Pilot will not hold pressure. Replaced old pilot with a rebuilt from inventory. Down time: None.
5/18/2010	Pumphouses; All pumphouses locked. Down time: None.
6/3,10-11/2010	Treatment System and Well Field. Laughlin Electric on Site performing the annual electrical maintenance work. Down time: None.
6/28-30/2010	Treatment System and Well Field; Turned the TGRS off for forcemain replacement and testing. Down time: 25 hours at B1, B13, B3, B4, B5, B6, B8, B9, B11 and SC5; 31 hours at SC2 and 44 hours at SC1.
7/7/2010	Pumphouses B1 and B5; Reduced their flow rates to their target rates. Down time: None.
8/6/2010	Pumphouses B1, B3, B4, B5 and B9; Adjusted flow rates to maximize well grouping flow rates. Down time: None.

Pumphouse B6

10/1/2009	Treatment System and Well Field; Call out from the auto dialer; Power is off; Xcel Energy contacted and they respond in the morning during day light hours; Two fusible switches were open. Down time: 17 hours at B1, B13, B3, B4, B5, B6, B8, B9, B11, SC1, SC2 and SC5.
10/8/2009	Pumphouse B6; Starter coil was buzzing loudly; Reset the starter and normal operation resumed. Down time: None.

APPENDIX F-3

MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2010
TGRS, OU2
ARDEN HILLS, MINNESOTA

10/12/2009	Pumphouses and Treatment System; Installed foam board insulation in door vents and vent fan openings; Turned on all heaters and set thermostats in pumphouses and control panels in building 116; Turned on portable heaters in old chlorine room. Down time: None.
2/11/2010	Pumphouse B6; Changed out the leaky ball valves with new ones. Down time: None.
3/25/2010	Pumphouses B6 and B9. Check the data line protectors to ensure they are not blown. Down time: None.
3/29/2010	Pumphouse B6. Relocated the breaker switch inside the control panel to a safer location. LOTO performed prior to initiating work. Down time: None.
5/18/2010	Pumphouses; All pumphouses locked. Down time: None.
6/3,10-11/2010	Treatment System and Well Field. Laughlin Electric on Site performing the annual electrical maintenance work. Down time: None.
6/8/2010	Pumphouse B6; Adjusted the pilot which slowed the flow rate overnight. Down time: 4.5 hours.
6/24/2010	Pumphouses B1, B6, B8, B11 and SC1. The B1 and B6 lights were flashing and the B8, B11 and SC1 lights were off on the PLC. There was an electrical storm last night that likely knocked out power to the pumps. Reset the PLC and pumps B1 and B6 restarted normally. The lights for B8, B11 and SC1 remained off. Further troubleshooting shows the electrical storm knocked out the disconnect box on the power pole outside the B11 pumphouse. The communication lines for B11, B8 and SC1 are paired together so all 3 of the pumps turned off. Laughlin Electric on Site to replace the breaker box on the power pole outside the B11 pumphouse and the pumps restart normally. Down time: 9 hours at B1 and B6. Four hours at SC1 and 18 hours at B11.

APPENDIX F-3

MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2010
TGRS, OU2
ARDEN HILLS, MINNESOTA

6/26/2010	Pumphouses B6, B8, B11, SC1 and SC5; The B6 and SC5 lights were flashing and the B8, B11 and SC1 lights were off on the PLC. There was another electrical storm last night that again likely knocked out power to the pumps. Reset the PLC and B6 and SC5 restarted normally. Troubleshooting at the B11 pumphouse shows the power switch was tripped inside the control cabinet. Reset the power switch and normal operation resumed for B8, B11 and SC1. Down time: 2 hours at B6 and SC5 and 10.5 hours at B11. The SC1 downtime is already noted due to the relay mentioned above.
6/28-30/2010	Treatment System and Well Field; Turned the TGRS off for forcemain replacement and testing. Down time: 25 hours at B1, B13, B3, B4, B5, B6, B8, B9, B11 and SC5; 31 hours at SC2 and 44 hours at SC1.
7/21/2010	Pumphouse B6; The pumping water level is activating the low level probe causing the pump to turn on and off. Reduced the flow rate so the pumping water level remains above the low level probe. Down time: None.
8/11/2010	Pumphouses B6, B8, SC2 and SC5; Lights flashing on well field panel. Electrical storm last night interrupted power to the pumphouses. Reset the well field panel and all pumphouses restarted normally. Down time: 16 hours at B6, B8 and SC5; 27 hours at SC2.
8/23-27/2010	Pumphouse B6; Turned the pump off to redevelop the well. Thein well on site to jett, airlift, add chemicals and surge block the well. Down time: 93 hours.

Pumphouse B7

5/18/2010	Pumphouses; All pumphouses locked. Down time: None.
6/3,10-11/2010	Treatment System and Well Field. Laughlin Electric on Site performing the annual electrical maintenance work. Down time: None.

APPENDIX F-3

MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2010
TGRS, OU2
ARDEN HILLS, MINNESOTA

Pumphouse B8

10/1/2009	Treatment System and Well Field; Call out from the auto dialer; Power is off; Xcel Energy contacted and they respond in the morning during day light hours; Two fusible switches were open. Down time: 17 hours at B1, B13, B3, B4, B5, B6, B8, B9, B11, SC1, SC2 and SC5.
10/12/2009	Pumphouses and Treatment System; Installed foam board insulation in door vents and vent fan openings; Turned on all heaters and set thermostats in pumphouses and control panels in building 116; Turned on portable heaters in old chlorine room. Down time: None.
11/30/2009	Pumphouses B1, B3, B8 and B9; Slowed their flow rates to their minimum flow rate. Down time: None.
5/9/2010	Pumphouse B8; Pinhole leak on one of the side plugs of the ECV; Turned the pump off and repaired the side plug. Down time: 14 hours.
5/18/2010	Pumphouses; All pumphouses locked. Down time: None.
6/3,10-11/2010	Treatment System and Well Field. Laughlin Electric on Site performing the annual electrical maintenance work. Down time: None.
6/24/2010	Pumphouses B1, B6, B8, B11 and SC1. The B1 and B6 lights were flashing and the B8, B11 and SC1 lights were off on the PLC. There was an electrical storm last night that likely knocked out power to the pumps. Reset the PLC and pumps B1 and B6 restarted normally. The lights for B8, B11 and SC1 remained off. Further troubleshooting shows the electrical storm knocked out the disconnect box on the power pole outside the B11 pumphouse. The communication lines for B11, B8 and SC1 are paired together so all 3 of the pumps turned off. Laughlin Electric on Site to replace the breaker box on the power pole outside the B11 pumphouse and the pumps restart normally. Down time: 9 hours at B1 and B6. Four hours at SC1 and 18 hours at B11.

APPENDIX F-3

MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2010
TGRS, OU2
ARDEN HILLS, MINNESOTA

6/26/2010	Pumphouses B6, B8, B11, SC1 and SC5; The B6 and SC5 lights were flashing and the B8, B11 and SC1 lights were off on the PLC. There was another electrical storm last night that again likely knocked out power to the pumps. Reset the PLC and B6 and SC5 restarted normally. Troubleshooting at the B11 pumphouse shows the power switch was tripped inside the control cabinet. Reset the power switch and normal operation resumed for B8, B11 and SC1. Down time: 2 hours at B6 and SC5 and 10.5 hours at B11. The SC1 downtime is already noted due to the relay mentioned above.
6/28-30/2010	Treatment System and Well Field; Turned the TGRS off for forcemain replacement and testing. Down time: 25 hours at B1, B13, B3, B4, B5, B6, B8, B9, B11 and SC5; 31 hours at SC2 and 44 hours at SC1.
8/11/2010	Pumphouses B6, B8, SC2 and SC5; Lights flashing on well field panel. Electrical storm last night interrupted power to the pumphouses. Reset the well field panel and all pumphouses restarted normally. Down time: 16 hours at B6, B8 and SC5; 27 hours at SC2.

Pumphouse B9

10/1/2009	Treatment System and Well Field; Call out from the auto dialer; Power is off; Xcel Energy contacted and they respond in the morning during day light hours; Two fusible switches were open. Down time: 17 hours at B1, B13, B3, B4, B5, B6, B8, B9, B11, SC1, SC2 and SC5.
10/12/2009	Pumphouses and Treatment System; Installed foam board insulation in door vents and vent fan openings; Turned on all heaters and set thermostats in pumphouses and control panels in building 116; Turned on portable heaters in old chlorine room. Down time: None.
11/30/2009	Pumphouses B1, B3, B8 and B9; Slowed their flow rates to their minimum flow rate. Down time: None.
3/25/2010	Pumphouses B6 and B9. Check the data line protectors to ensure they are not blown. Down time: None.
5/18/2010	Pumphouses; All pumphouses locked. Down time: None.

APPENDIX F-3

MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2010
TGRS, OU2
ARDEN HILLS, MINNESOTA

6/3,10-11/2010	Treatment System and Well Field. Laughlin Electric on Site performing the annual electrical maintenance work. Down time: None.
6/7-9/2010	Pumphouse B9; Upon entering the pumphouse, there was a burning electrical like odor. Turned the pump off and called Laughlin Electric. Laughlin Electric determined that the "hot" lead had a poor connection at the well head. Re-connected the hot lead and observed normal operation. Down time: 43.5 hours.
6/28-30/2010	Treatment System and Well Field; Turned the TGRS off for forcemain replacement and testing. Down time: 25 hours at B1, B13, B3, B4, B5, B6, B8, B9, B11 and SC5; 31 hours at SC2 and 44 hours at SC1.
8/6/2010	Pumphouses B1, B3, B4, B5 and B9; Adjusted flow rates to maximize well grouping flow rates. Down time: None.

Pumphouse B10

5/18/2010	Pumphouses; All pumphouses locked. Down time: None.
6/3,10-11/2010	Treatment System and Well Field. Laughlin Electric on Site performing the annual electrical maintenance work. Down time: None.

Pumphouse B11

10/1/2009	Treatment System and Well Field; Call out from the auto dialer; Power is off; Xcel Energy contacted and they respond in the morning during day light hours; Two fusible switches were open. Down time: 17 hours at B1, B13, B3, B4, B5, B6, B8, B9, B11, SC1, SC2 and SC5.
10/12/2009	Pumphouses and Treatment System; Installed foam board insulation in door vents and vent fan openings; Turned on all heaters and set thermostats in pumphouses and control panels in building 116; Turned on portable heaters in old chlorine room. Down time: None.

APPENDIX F-3

MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2010
TGRS, OU2
ARDEN HILLS, MINNESOTA

12/16/2009	Pumphouse B11; Removed and cleaned the flow meter; Re-installed the cleaned flow meter and observed normal operation. Down time: None.
5/18/2010	Pumphouses; All pumphouses locked. Down time: None.
6/3,10-11/2010	Treatment System and Well Field. Laughlin Electric on Site performing the annual electrical maintenance work. Down time: None.
6/24/2010	Pumphouses B1, B6, B8, B11 and SC1. The B1 and B6 lights were flashing and the B8, B11 and SC1 lights were off on the PLC. There was an electrical storm last night that likely knocked out power to the pumps. Reset the PLC and pumps B1 and B6 restarted normally. The lights for B8, B11 and SC1 remained off. Further troubleshooting shows the electrical storm knocked out the disconnect box on the power pole outside the B11 pumphouse. The communication lines for B11, B8 and SC1 are paired together so all 3 of the pumps turned off. Laughlin Electric on Site to replace the breaker box on the power pole outside the B11 pumphouse and the pumps restart normally. Down time: 9 hours at B1 and B6. Four hours at SC1 and 18 hours at B11.
6/26/2010	Pumphouses B6, B8, B11, SC1 and SC5; The B6 and SC5 lights were flashing and the B8, B11 and SC1 lights were off on the PLC. There was another electrical storm last night that again likely knocked out power to the pumps. Reset the PLC and B6 and SC5 restarted normally. Troubleshooting at the B11 pumphouse shows the power switch was tripped inside the control cabinet. Reset the power switch and normal operation resumed for B8, B11 and SC1. Down time: 2 hours at B6 and SC5 and 10.5 hours at B11. The SC1 downtime is already noted due to the relay mentioned above.
6/28-30/2010	Treatment System and Well Field; Turned the TGRS off for forcemain replacement and testing. Down time: 25 hours at B1, B13, B3, B4, B5, B6, B8, B9, B11 and SC5; 31 hours at SC2 and 44 hours at SC1.
7/22/2010	Pumphouse B11; The light is flashing on the PLC; Last nights storm knocked out power to the communication card; Reset the PLC and the pump restarted normally. Down time: 31 hours.

APPENDIX F-3

MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2010
TGRS, OU2
ARDEN HILLS, MINNESOTA

7/26/2010	Pumphouse B11; The coil on the solenoid valve is buzzing loudly. The output card was only putting out 88 volts to the solenoid valve. Replaced the output card and the observed normal operation of the coil. Down time: None.
7/29/2010	Well 03U003/B11; Installed a pump in well 03U003 and plumbed it into the B11 pumphouse. The meter reading of the flow meter prior to start up was 30594200. Turned the pump on at 16:25. Down time: None.
8/2/2010	Pumphouse B11; Light is flashing on well field panel. Electrical storm last night likely knocked out power to the pump. Reset the well field and B11 restarted normally. Down time: None.
9/10/2010	Pumphouse B11; The ECV closed slightly which slowed the flow rate overnight. Flushed the control piping and decreased the pressure on the pilot and normal flow rate resumed. Down time: 10 hours.

Pumphouse B12

5/18/2010	Pumphouses; All pumphouses locked. Down time: None.
6/3,10-11/2010	Treatment System and Well Field. Laughlin Electric on Site performing the annual electrical maintenance work. Down time: None.

Pumphouse B13

10/1/2009	Treatment System and Well Field; Call out from the auto dialer; Power is off; Xcel Energy contacted and they respond in the morning during day light hours; Two fusible switches were open. Down time: 17 hours at B1, B13, B3, B4, B5, B6, B8, B9, B11, SC1, SC2 and SC5.
10/12/2009	Pumphouses and Treatment System; Installed foam board insulation in door vents and vent fan openings; Turned on all heaters and set thermostats in pumphouses and control panels in building 116; Turned on portable heaters in old chlorine room. Down time: None.

APPENDIX F-3

MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2010
TGRS, OU2
ARDEN HILLS, MINNESOTA

12/16/2009	Pumphouse B13; Removed and cleaned the flow meter; Re-installed the cleaned flow meter and observed normal operation. Down time: None.
5/18/2010	Pumphouses; All pumphouses locked. Down time: None.
6/3,10-11/2010	Treatment System and Well Field. Laughlin Electric on Site performing the annual electrical maintenance work. Down time: None.
6/28-30/2010	Treatment System and Well Field; Turned the TGRS off for forcemain replacement and testing. Down time: 25 hours at B1, B13, B3, B4, B5, B6, B8, B9, B11 and SC5; 31 hours at SC2 and 44 hours at SC1.

Well 03U003

10/30/2009	Well 03U003; Turned the pump off at meter reading 2551900; Sampled the well for VOCs prior to shut down. Down time: None.
7/29/2010	Well 03U003/B11; Installed a pump in well 03U003 and plumbed it into the B11 pumphouse. The meter reading of the flow meter prior to start up was 30594200. Turned the pump on at 16:25. Down time: None.
8/2/2010	Well 03U003; The temporary forcemain line from 03U003 to B11 became separated at the union. Repaired the connection and restarted the pump. The pump restarted normally however the flow meter is not turning. Removed some sand and restarted the pump. Normal operation observed. Down time: None.
9/10-14/2010	Well 03U003; Turned the pump off at 1630 because the flow meter was no longer totaling. Further inspection indicates the pump has become disconnected from the piping down in the well. Remove the pump and piping and re-connect them. Restarted the pump and normal operation resumed. Down time: 115 hours.

APPENDIX F-3

MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2010
TGRS, OU2
ARDEN HILLS, MINNESOTA

Pumphouse SC1

10/1/2009	Treatment System and Well Field; Call out from the auto dialer; Power is off; Xcel Energy contacted and they respond in the morning during day light hours; Two fusible switches were open. Down time: 17 hours at B1, B13, B3, B4, B5, B6, B8, B9, B11, SC1, SC2 and SC5.
10/12/2009	Pumphouses and Treatment System; Installed foam board insulation in door vents and vent fan openings; Turned on all heaters and set thermostats in pumphouses and control panels in building 116; Turned on portable heaters in old chlorine room. Down time: None.
11/30/2009	Pumphouse SC1; The flow meter stopped totaling; Removed the flow meter and cleaned it and replaced it. Down time: The down time is already accounted for above.
3/19/2010	Pumphouse SC1. Removed and cleaned the flow meter. Down time: None.
5/8-10/2010	Pumphouse SC1; Cover off outside electric meter, the breaker box is partially open and the outside power line has been cut near the weather head; Contacted Xcel Energy to repair. Down time: 9 hours.
5/18/2010	Pumphouses; All pumphouses locked. Down time: None.
6/3,10-11/2010	Treatment System and Well Field. Laughlin Electric on Site performing the annual electrical maintenance work. Down time: None.
6/4-7/2010	Pumphouse SC1. Meter not rotating. Removed the flow meter and cleaned 3 pieces of manganese from the inlet. Reinstalled the meter and flow resumed normally. Down time: None. The readings were adjusted as if the meter had been totaling.
6/11-14/2010	Pumphouse SC1; The ball valve was closed on the forcemain line in the pumphouse. Opened the valve and normal flow resumed. Down time: 101 hours.

APPENDIX F-3

MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2010
TGRS, OU2
ARDEN HILLS, MINNESOTA

6/24/2010	Pumphouses B1, B6, B8, B11 and SC1. The B1 and B6 lights were flashing and the B8, B11 and SC1 lights were off on the PLC. There was an electrical storm last night that likely knocked out power to the pumps. Reset the PLC and pumps B1 and B6 restarted normally. The lights for B8, B11 and SC1 remained off. Further troubleshooting shows the electrical storm knocked out the disconnect box on the power pole outside the B11 pumphouse. The communication lines for B11, B8 and SC1 are paired together so all 3 of the pumps turned off. Laughlin Electric on Site to replace the breaker box on the power pole outside the B11 pumphouse and the pumps restart normally. Down time: 9 hours at B1 and B6. Four hours at SC1 and 18 hours at B11.
6/25-28/2010	Pumphouse SC1; There were associated communication problems with the electrical outage at B11. Replaced the relay in the control panel, restared the pump and normal operation resumed. Down time: 88 hours.
6/26/2010	Pumphouses B6, B8, B11, SC1 and SC5; The B6 and SC5 lights were flashing and the B8, B11 and SC1 lights were off on the PLC. There was another electrical storm last night that again likely knocked out power to the pumps. Reset the PLC and B6 and SC5 restarted normally. Troubleshooting at the B11 pumphouse shows the power switch was tripped inside the control cabinet. Reset the power switch and normal operation resumed for B8, B11 and SC1. Down time: 2 hours at B6 and SC5 and 10.5 hours at B11. The SC1 downtime is already noted due to the relay mentioned above.
6/28-30/2010	Treatment System and Well Field; Turned the TGRS off for forcemain replacement and testing. Down time: 25 hours at B1, B13, B3, B4, B5, B6, B8, B9, B11 and SC5; 31 hours at SC2 and 44 hours at SC1.
8/10/2010	Pumphouse SC1; Storm last night blew 2 fuses near SC1. Xcel Energy replaced the 2 fuses and power was restored to the pump. Down time: 20 hours.

Pumphouse SC2

10/1/2009	Treatment System and Well Field; Call out from the auto dialer; Power is off; Xcel Energy contacted and they respond in the morning during day light hours; Two fusible switches were open. Down time: 17 hours at B1, B13, B3, B4, B5, B6, B8, B9, B11, SC1, SC2 and SC5.

APPENDIX F-3

MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2010
TGRS, OU2
ARDEN HILLS, MINNESOTA

10/12/2009	Pumphouses and Treatment System; Installed foam board insulation in door vents and vent fan openings; Turned on all heaters and set thermostats in pumphouses and control panels in building 116; Turned on portable heaters in old chlorine room. Down time: None.
11/2/2009	Pumphouse SC2; Changed out flow meter with new; Old one out at meter reading 58446900 and new one in at meter reading 42657100 at 3:00 PM. Down time: None.
3/29/2010	Pumphouse SC2. Removed and cleaned the flow meter. Down time: None.
4/26/2010	Pumphouse SC2; Increased the valve pressure to slow the flow rate but increased the valve pressure to much. Re-adjusted the valve pressure on 4/27/2010 to the proper setting and observed normal operation. Down time: 5 hours.
5/18/2010	Pumphouses; All pumphouses locked. Down time: None.
6/3,10-11/2010	Treatment System and Well Field. Laughlin Electric on Site performing the annual electrical maintenance work. Down time: None.
6/28-30/2010	Treatment System and Well Field; Turned the TGRS off for forcemain replacement and testing. Down time: 25 hours at B1, B13, B3, B4, B5, B6, B8, B9, B11 and SC5; 31 hours at SC2 and 44 hours at SC1.
8/11/2010	Pumphouses B6, B8, SC2 and SC5; Lights flashing on well field panel. Electrical storm last night interrupted power to the pumphouses. Reset the well field panel and all pumphouses restarted normally. Down time: 16 hours at B6, B8 and SC5; 27 hours at SC2.

Pumphouse SC3

5/18/2010	Pumphouses; All pumphouses locked. Down time: None.

APPENDIX F-3

MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2010
TGRS, OU2
ARDEN HILLS, MINNESOTA

6/3,10-11/2010	Treatment System and Well Field. Laughlin Electric on Site performing the annual electrical maintenance work. Down time: None.

Pumphouse SC4

5/18/2010	Pumphouses; All pumphouses locked. Down time: None.
6/3,10-11/2010	Treatment System and Well Field. Laughlin Electric on Site performing the annual electrical maintenance work. Down time: None.

Pumphouse SC5

10/1/2009	Treatment System and Well Field; Call out from the auto dialer; Power is off; Xcel Energy contacted and they respond in the morning during day light hours; Two fusible switches were open. Down time: 17 hours at B1, B13, B3, B4, B5, B6, B8, B9, B11, SC1, SC2 and SC5.
10/12/2009	Pumphouses and Treatment System; Installed foam board insulation in door vents and vent fan openings; Turned on all heaters and set thermostats in pumphouses and control panels in building 116; Turned on portable heaters in old chlorine room. Down time: None.
12/31/2009	Pumphouse SC5; The ECV is fluctuating slightly; Cleaned the strainer screen and adjusted the opening and closing speed control needles. Down time: 2 hours.
3/29-4/2/2010	Pumphouse SC5. Turned the pump off and re-developed the well with jetting and chemicals. Down time: 95 hours.
5/18/2010	Pumphouses; All pumphouses locked. Down time: None.
6/3,10-11/2010	Treatment System and Well Field. Laughlin Electric on Site performing the annual electrical maintenance work. Down time: None.

APPENDIX F-3

MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2010
TGRS, OU2
ARDEN HILLS, MINNESOTA

6/11/2010	Pumphouses B3 and SC5; The indicator lights were flashing on the PLC in Building 116. Reset the PLC and the well pumps restarted normally. Down time: 2 hours at B3 and 7.5 hours at SC5.
6/26/2010	Pumphouses B6, B8, B11, SC1 and SC5; The B6 and SC5 lights were flashing and the B8, B11 and SC1 lights were off on the PLC. There was another electrical storm last night that again likely knocked out power to the pumps. Reset the PLC and B6 and SC5 restarted normally. Troubleshooting at the B11 pumphouse shows the power switch was tripped inside the control cabinet. Reset the power switch and normal operation resumed for B8, B11 and SC1. Down time: 2 hours at B6 and SC5 and 10.5 hours at B11. The SC1 downtime is already noted due to the relay mentioned above.
6/28-30/2010	Treatment System and Well Field; Turned the TGRS off for forcemain replacement and testing. Down time: 25 hours at B1, B13, B3, B4, B5, B6, B8, B9, B11 and SC5; 31 hours at SC2 and 44 hours at SC1.
7/9/2010	Pumphouses B4 and SC5; Reduced their flow rates to their target rates. Down time: None.
7/18/2010	Pumphouse SC5; Light flashing on the PLC. Last nights storm knocked out power to the communication card. Reset the PLC and SC5 restarted normally. Down time: 14.5 hours.
7/24/2010	Pumphouse SC5; Light flashing on the PLC. Last nights storm knocked out power to the communication card. Reset the PLC and SC5 restarted normally. Down time: 9 hours.
8/3/2010	Pumphouse SC5; The light is flashing on the well field panel and not able to reset at the PLC. There was an electrical storm last night. At pumphouse there is an adapter fault and the active lights were flashing back and forth. Cycled power to the controls and reset the power switch. Restarted the pump and the pump restarted normally. Down time: 23 hours.
8/11/2010	Pumphouses B6, B8, SC2 and SC5; Lights flashing on well field panel. Electrical storm last night interrupted power to the pumphouses. Reset the well field panel and all pumphouses restarted normally. Down time: 16 hours at B6, B8 and SC5; 27 hours at SC2.

APPENDIX F-3

MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2010
TGRS, OU2
ARDEN HILLS, MINNESOTA

8/13/2010	Pumphouse SC5; Light is flashing on the well field panel. Storm last night interrupted power to the pumphouse. Reset the well field panel and the pump restarted normally. Down time: 6 hours.
9/2/2010	Pumphouse SC5; There was a storm last night and the SC5 light is flashing on the PLC. Reset the PLC and the pump restarted normally. Down time: 5 hours.

TREATMENT SYSTEM

10/1/2009	Treatment System and Well Field; Call out from the auto dialer; Power is off; Xcel Energy contacted and they respond in the morning during day light hours; Two fusible switches were open. Down time: 17 hours at B1, B13, B3, B4, B5, B6, B8, B9, B11, SC1, SC2 and SC5.
10/8/2009	Treatment System; Ball valve was closed on ECV #4 operating solenoid valve; Opened the ball valve and observed normal valve operation. Down time: None.
10/12/2009	Pumphouses and Treatment System; Installed foam board insulation in door vents and vent fan openings; Turned on all heaters and set thermostats in pumphouses and control panels in building 116; Turned on portable heaters in old chlorine room. Down time: None.
11/30/2009	Treatment System; Pump 1 in the treatment center would not turn on in "auto", causing the well field to cycle; Troubleshooting indicates a failed pump stop float; Replaced the failed pump stop float with a new one and the pump worked in "auto" normally. Down time: 5 hours at B13, B3, B4, B6, SC1 and SC5 each.
12/1/2009	Treatment System; Replaced the "pump stop" float in wet well 1 on 11/30/2009; Well field cycled during work. Down time: 1.5 hours at B3, B9 and SC5; 3 hours at SC1; 4 hours at B5.
12/2/2009	Treatment System and Well Field; Pump 1 failed to open; Exercised control valves, flushed control piping and cycled the valve several times; normal operation observed. Down time: None.
12/27/2009	Treatment System; PDU indicates an opening fault at ECV 3; Acknowledged the fault and exercised the control valves; Cycled the valve and observed normal operation. Down time: None.

APPENDIX F-3

MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2010
TGRS, OU2
ARDEN HILLS, MINNESOTA

12/28/2009	Treatment System; Another opening fault at ECV 3; Change the filter, adjust the opening and closing speed valves and flush the control piping; Cycle the valve and observed normal operation. Down time: None.
12/29/2009	Treatment System; Control piping on ECV 4 is leaking; Install new bushing, nipple and union. Down time: 1 hour at B9; 2 hours at SC1 .
1/12-13/2010	Treatment System; Several opening faults at ECV 3; Acknowledged PDU faults and exercised control piping valves; Lessened the pressure on the back pressure sustaining pilot; Valve now opens and closes normally. Down time: None.
1/14/2010	Treatment System; Control piping leaking at downstream valve port on ECV 4; Disassemble control piping and reinstall new hex bushing and nipple; Restart pump 4 and observe no leaks. Down time: None.
1/19/2010	Treatment System and Well Field; Shut down the treatment system and well field as part of the quarterly preventive maintenance work. Down time: 2 hours each at B1, B13, B5, B6 and SC1.
1/24/2010	Treatment System; Opening fault on the PDU; ECV 3 failed to open 4 times; Acknowledged faults and adjusted ECV control valves; Cycled valve several times and observed normal operation. Down time: None.
1/25/2010	Treatment System; Opening fault on PDU; ECV 3 failed to open 12 times; Acknowledged faults and adjusted ECV control valves; Cycled valve several times and observed normal operation. Down time: None.
1/27/2010	Treatment System; With the system off to repair the forcemain leaks, outside cold air blew in through the blower vents and froze the water in the base of towers 2, 3 and 4 not allowing water to flow to the wet wells upon system start up; Thawed the ice and removed the water from the base of the towers. Down time: None, the system was already down to repair the forcemain leaks.
2/9/2010	Treatment System; Changed the oil in Pump 4 turbine motor. Down time: None.

APPENDIX F-3

MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2010
TGRS, OU2
ARDEN HILLS, MINNESOTA

2/16/2010	Treatment System; Installed a new pressure gauge on the influent sampling port. The new pressure gauge reads approximately 10 psi higher than the previous pressure gauge. Down time: None.
2/16/2010	Treatment System; Leaking spigot on the influent forcemain line in the treatment center. Turned the system off and replaced the leaky spigot with a new one. Down time: None.
2/23/2010	Treatment System; Installed new larger diameter (1/2") control piping and changed out the pressure sustaining valve and the 3-way normally open solenoid valve on the ECV 3 control piping harness. Down time: None.
3/14/2010	Treatment System and Well Field. Well field down on arrival. Wet well pump 4 is not running. The lead to the starter coil is broken off. Lockout power to MCC #4, stripped and relanded lead to coil. Reset pump director, cycled pump and observed normal operation. Down time: 7 hours at B5 and B13; 10 hours at B3, B8 and SC1; 6 hours at B6; 3 hours at
3/25/2010	Treatment System. The high level float switch in wet well 3 has failed. Replaced it with a new float switch. Down time: None.
3/26/2010	Treatment System and Well Field. The well field is cycling on arrival. The drain valve on the ECV 4 control piping was left in the open position causing the valve to close partially. Opened the valve and observed normal ECV operation. Down time: 5 hours at B13, B6 and B8; 7 hours at B3 and SC1 and 2 hours at B4.
4/8/2010	Treatment System and Well Field; Turned the system off as part of the required quarterly operation and maintenance work. Down time: 1 hour at B13 and 1 hour at B4.
6/3,10-11/2010	Treatment System and Well Field. Laughlin Electric on Site performing the annual electrical maintenance work. Down time: None.
6/16/2010	Treatment System; Call out from autodialer-TGRS fail; Pump 1 failed to turn on because the breaker was tripped; Reset the breaker and restarted the pump; Normal operation observed. Down time: None.

APPENDIX F-3

MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2010
TGRS, OU2
ARDEN HILLS, MINNESOTA

6/21/2010	Treatment System and Well Field; Turned the system off during the forcercemain replacement and excavation work. Down time: 2 hours at B1, B13, B8, and B9. 3 hours at B3, B4 and B6.
6/28-30/2010	Treatment System and Well Field; Turned the TGRS off for forcemain replacement and testing. Down time: 25 hours at B1, B13, B3, B4, B5, B6, B8, B9, B11 and SC5; 31 hours at SC2 and 44 hours at SC1.
7/12/2010	Treatment System; Reset the airflow meter at blower 1. Down time: None.
7/13/2010	Treatment System and Well Field; Turned the TGRS off and drained the forcemain so SDE could install a saddle tap and drain valve on the influent forcemain in the treatment center. Down time: 2 hours at B1, B5, B8 and SC5. Three hours at B13 and B3.
8/10/2010	Treatment System; Well field cycling. Pressure switch for pump 1 failed. Removed the pressure switch, cleaned out the piping and reinstalled the pressure switch. Cycled the pump and observed normal operation. Down time: 1.5 hours at B1 and B3; 11 hours at B13, B4 and B8.
8/24/2010	Treatment System; Call from Time Communication. TGRS fail. ECV 1 failed to open. Adjusted the opening and closing speed valves, flushed the control piping and cycled the valve. Normal operation observed. Down time: None.

FORCEMAIN

1/25-30/2010	Forcemain; Forcemain break with water ponding on ground surface approximately 400 feet south of Building 116; Turned the treatment system and well field off; Set up a utility meet and an excavation contractor (SDE); Repaired 3 different holes in the forcemain with repair clamps; Backfilled the excavation and restarted the TGRS. Down time: 95 hours each at B1, B5, B8 and B11; 100 hours each at B13, B3, B4, B6, B9, SC1, SC2 and SC5.
6/28-30/2010	Treatment System and Well Field; Turned the TGRS off for forcemain replacement and testing. Down time: 25 hours at B1, B13, B3, B4, B5, B6, B8, B9, B11 and SC5; 31 hours at SC2 and 44 hours at SC1.

APPENDIX F-3

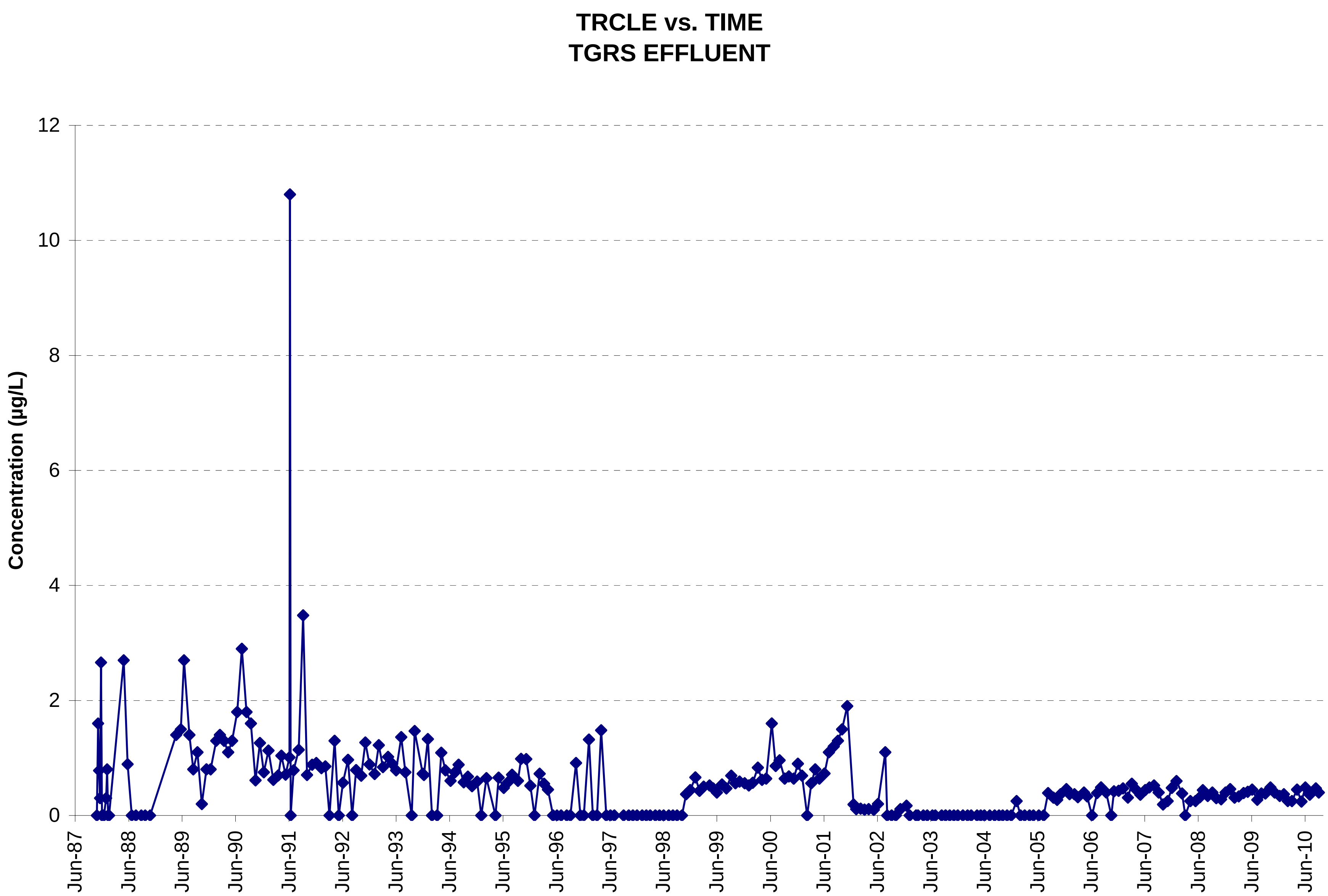
MAINTENANCE ACTIVITIES BY LOCATION
FISCAL YEAR 2010
TGRS, OU2
ARDEN HILLS, MINNESOTA

7/13/2010 Treatment System and Well Field; Turned the TGRS off and drained the forcemain so SDE could install a saddle tap and drain valve on the influent forcemain in the treatment center.
Down time: 2 hours at B1, B5, B8 and SC5. Three hours at B13 and B3.

Appendix G

TGRS Chemical Data

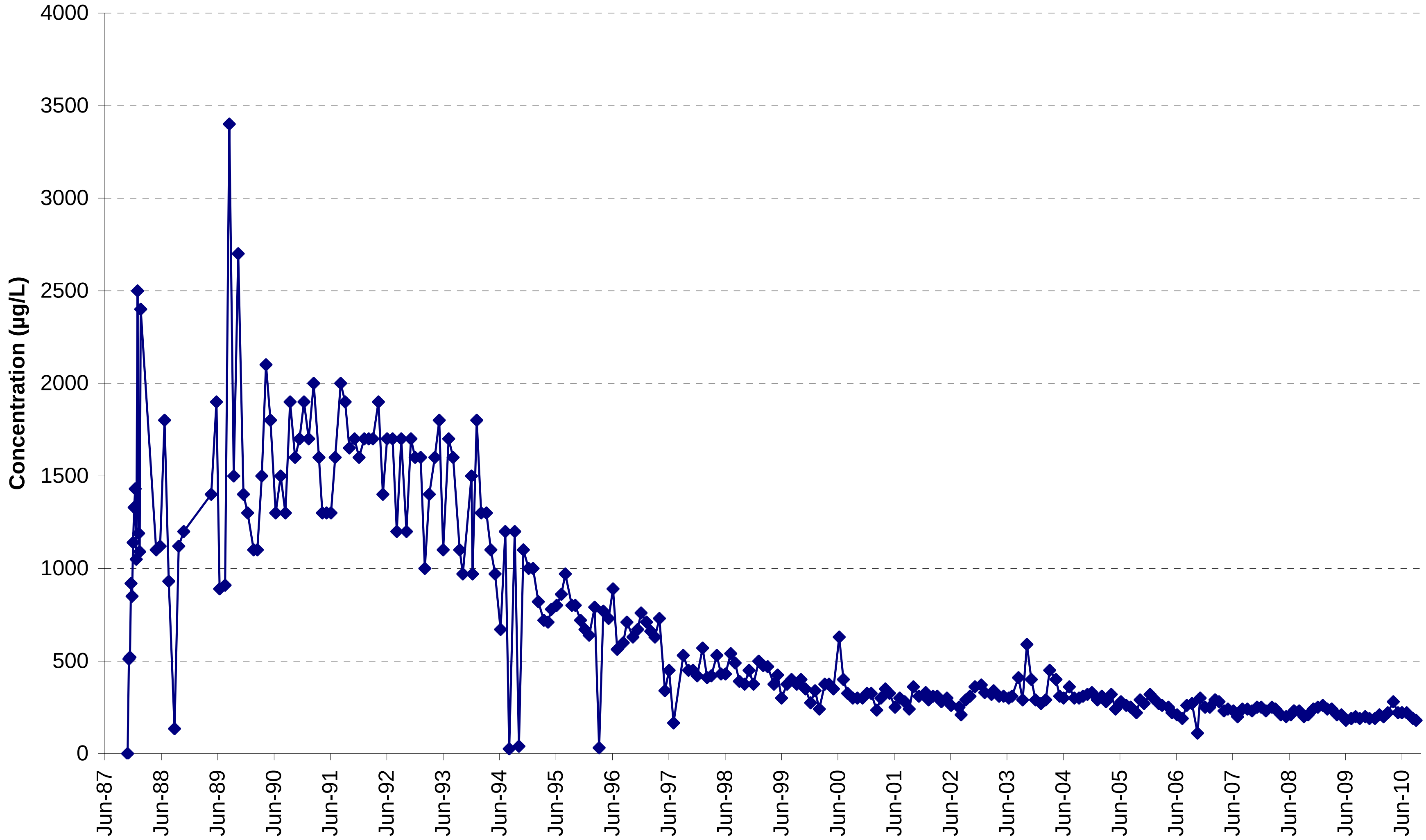
G.1 TGRS Extraction Wells – TRCLE Versus Time



TRCLE vs. TIME
TGRS EFFLUENT
Concentration (µg/L)
12
10
8
6
4
2
0
Jun-87
Jun-88
Jun-89
Jun-90
Jun-91
Jun-92
Jun-93
Jun-94
Jun-95
Jun-96
Jun-97
Jun-98
Jun-99
Jun-00
Jun-01
Jun-02
Jun-03
Jun-04
Jun-05
Jun-06
Jun-07
Jun-08
Jun-09
Jun-10

CRA 072315 (1)

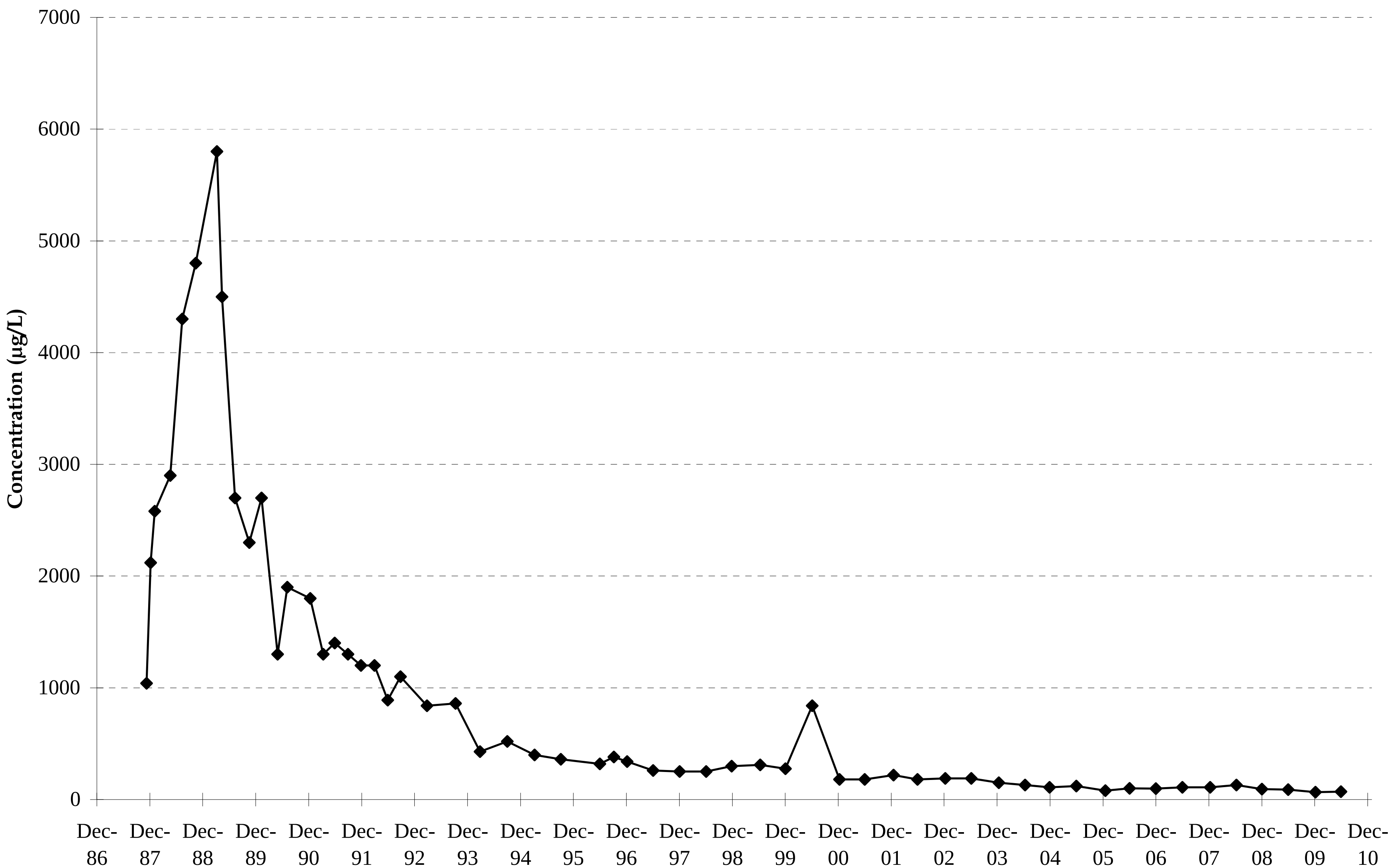
TRCLE vs. TIME
TGRS INFLUENT



CRA 072315 (1)

APPENDIX G-1

EXTRACTION WELL B1 - TRCLE VS.TIME

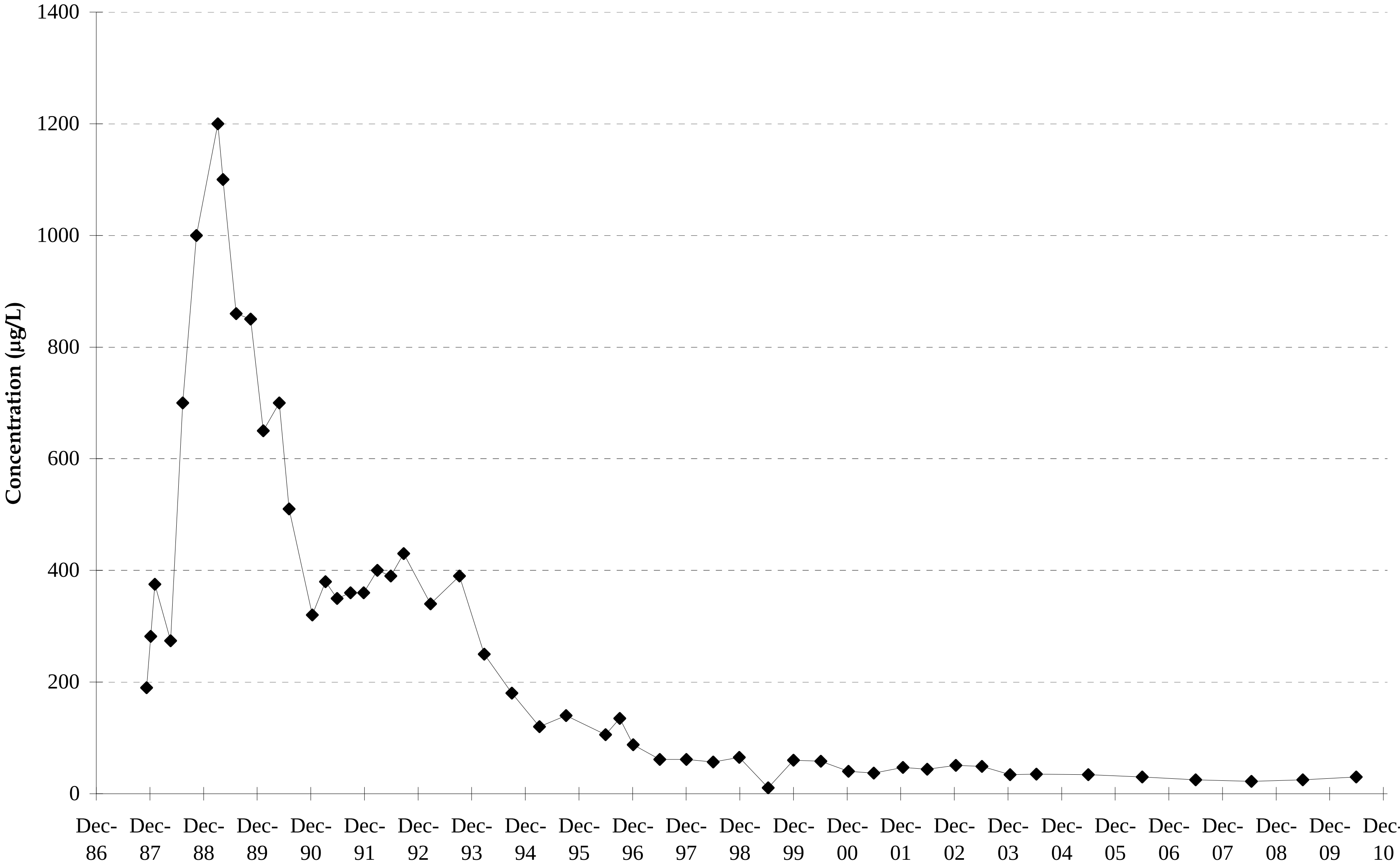


Note: Samples reporting concentrations less than the detection limit were plotted as zero.

CRA 072315 (1)

APPENDIX G-1

EXTRACTION WELL B2 - TRCLE VS. TIME

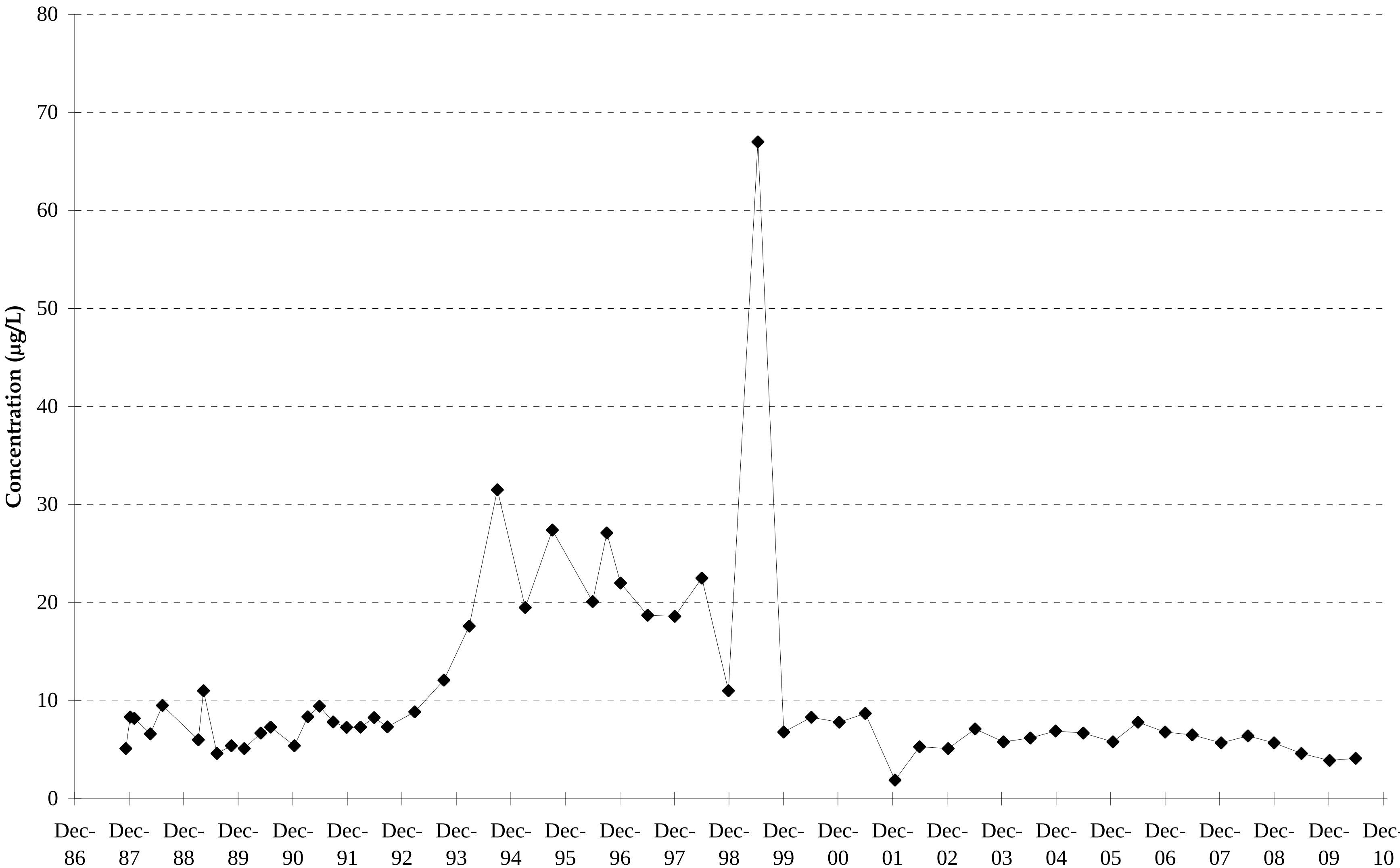


Note: Samples reporting concentrations less than the detection limit were plotted as zero.

CRA 072315 (1)

APPENDIX G-1

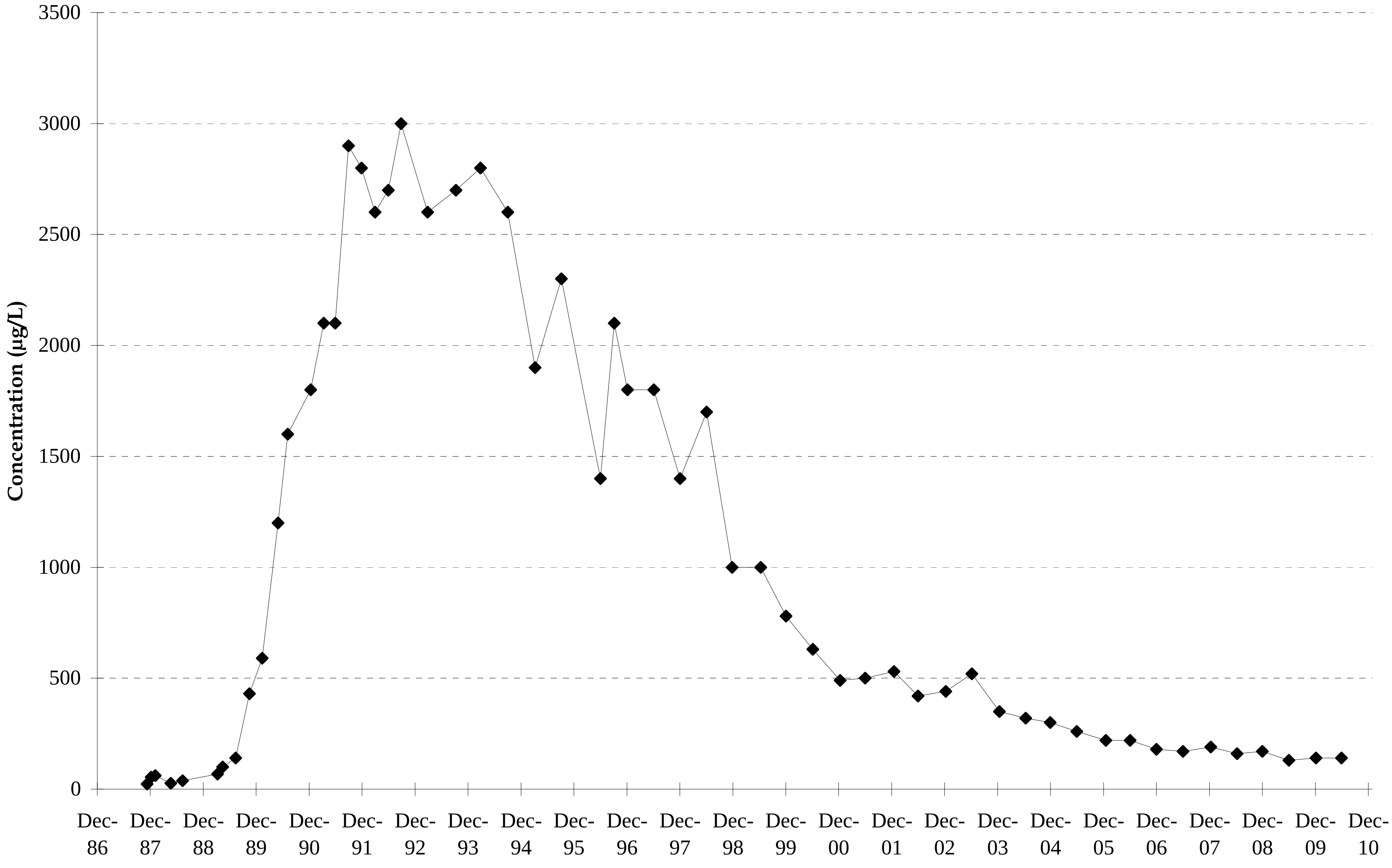
EXTRACTION WELL B3 - TRCLE VS. TIME



Note: Samples reporting concentrations less than the detection limit were plotted as zero.

APPENDIX G-1

EXTRACTION WELL B4 - TRCLE VS. TIME

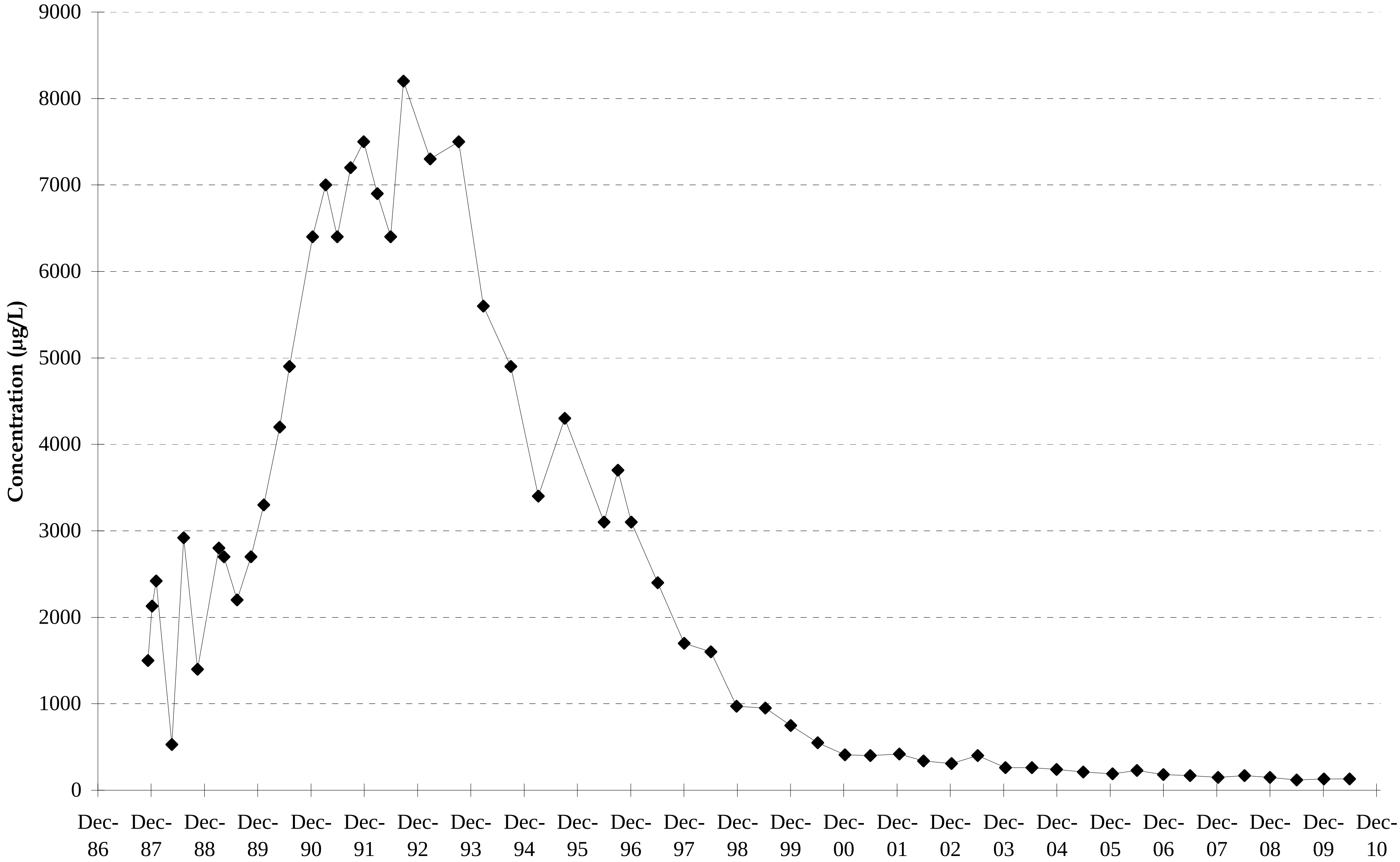


Note: Samples reporting concentrations less than the detection limit were plotted as zero.

CRA 072315 (1)

APPENDIX G-1

EXTRACTION WELL B5 - TRCLE VS. TIME

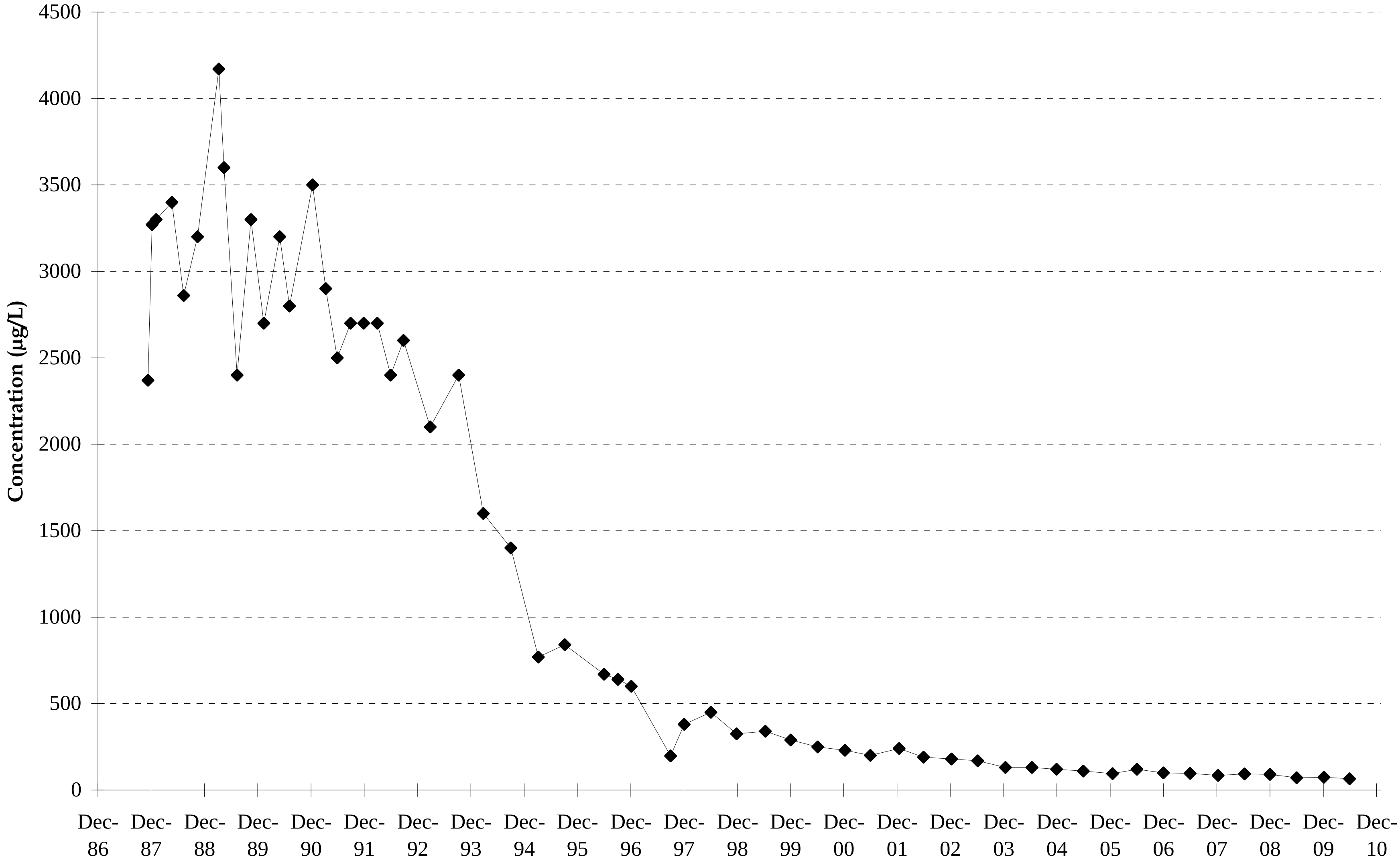


Note: Samples reporting concentrations less than the detection limit were plotted as zero.

CRA 072315 (1)

APPENDIX G-1

EXTRACTION WELL B6 - TRCLE VS. TIME

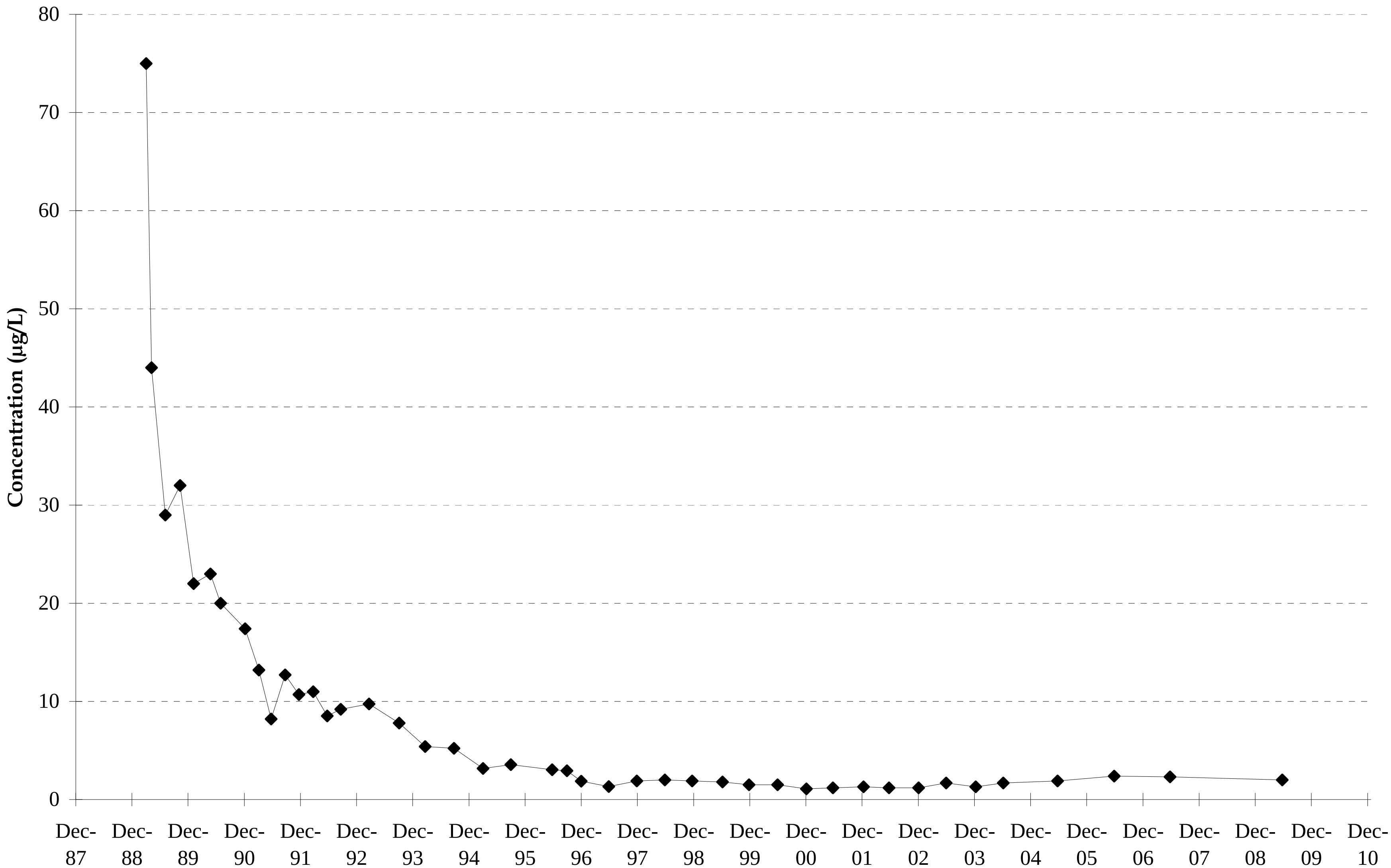


Note: Samples reporting concentrations less than the detection limit were plotted as zero.

CRA 072315 (1)

APPENDIX G-1

EXTRACTION WELL B7 - TRCLE VS. TIME

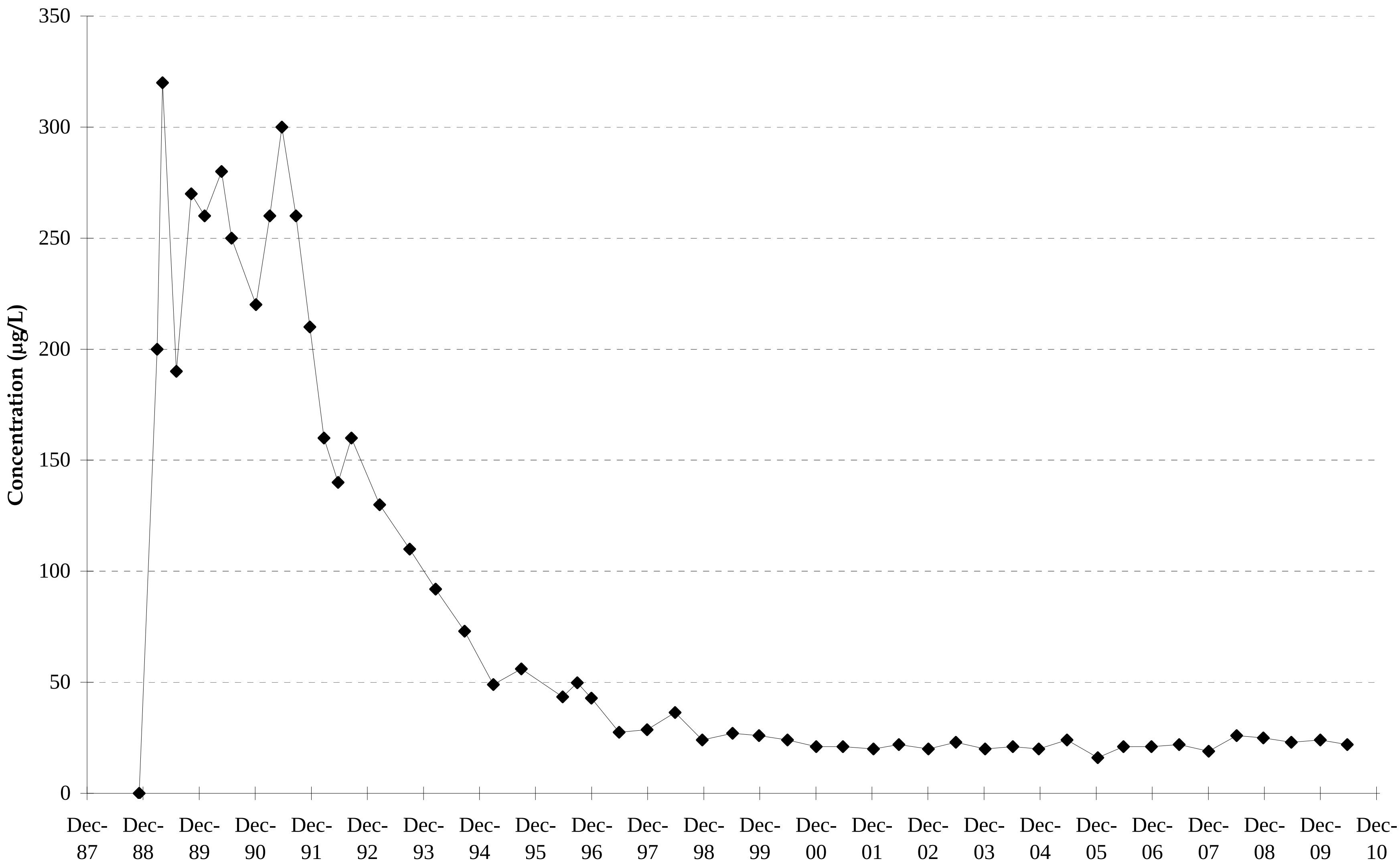


Note: Samples reporting concentrations less than the detection limit were plotted as zero.

CRA 072315 (1)

APPENDIX G-1

EXTRACTION WELL B8 - TRCLE VS. TIME

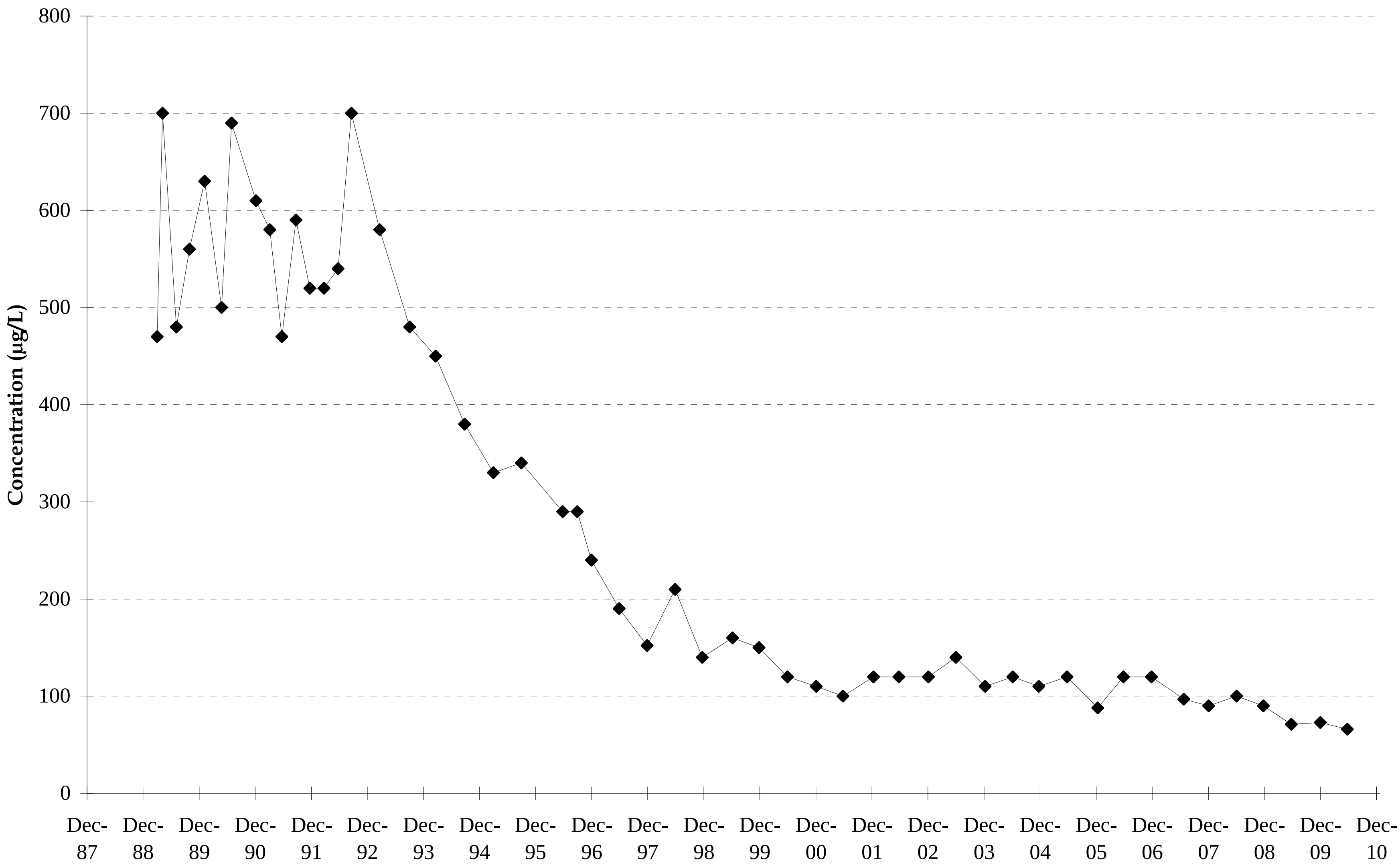


Note: Samples reporting concentrations less than the detection limit were plotted as zero.

CRA 072315 (1)

APPENDIX G-1

EXTRACTION WELL B9 - TRCLE VS. TIME

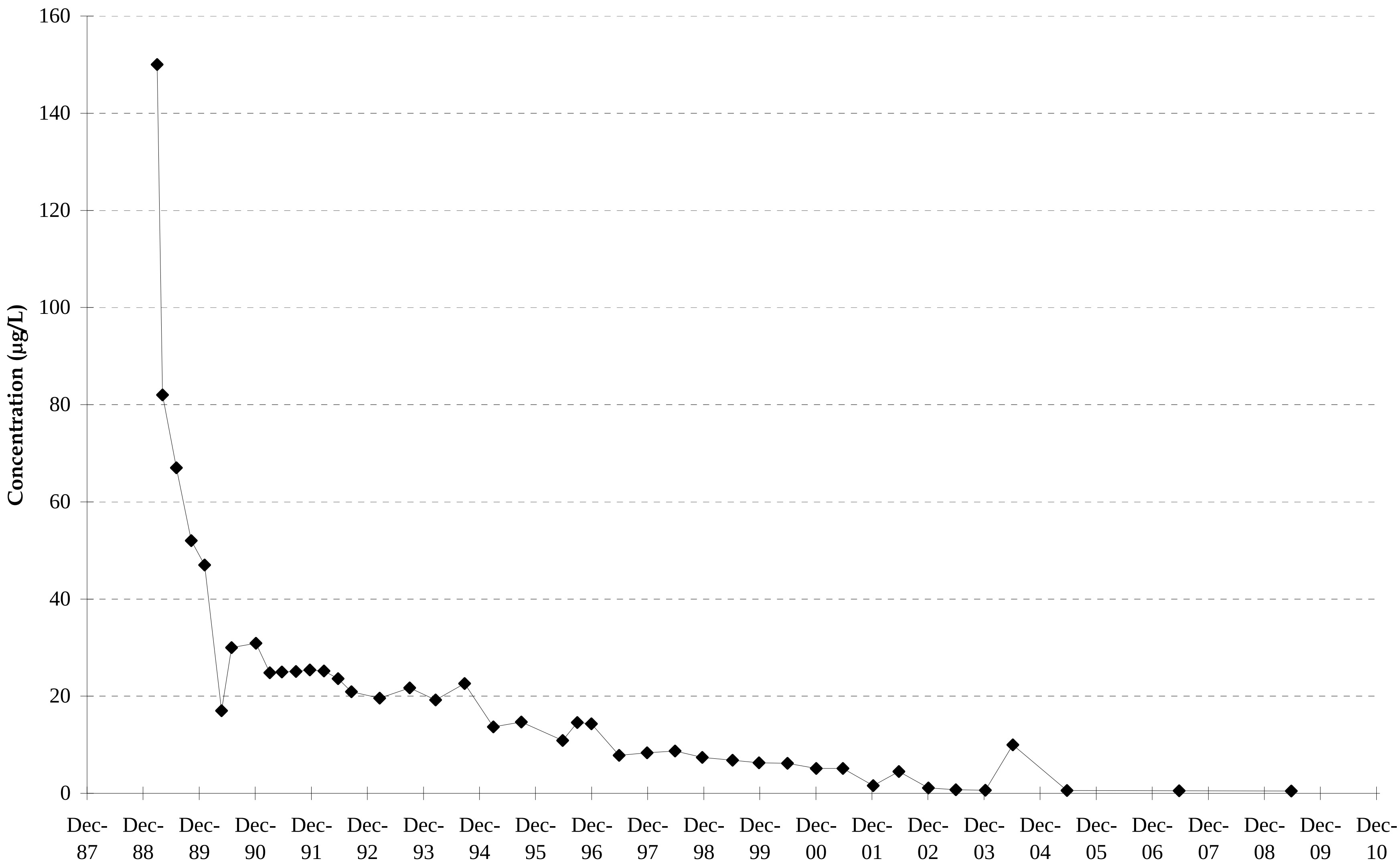


Note: Samples reporting concentrations less than the detection limit were plotted as zero.

CRA 072315 (1)

APPENDIX G-1

EXTRACTION WELL B10 - TRCLE VS. TIME

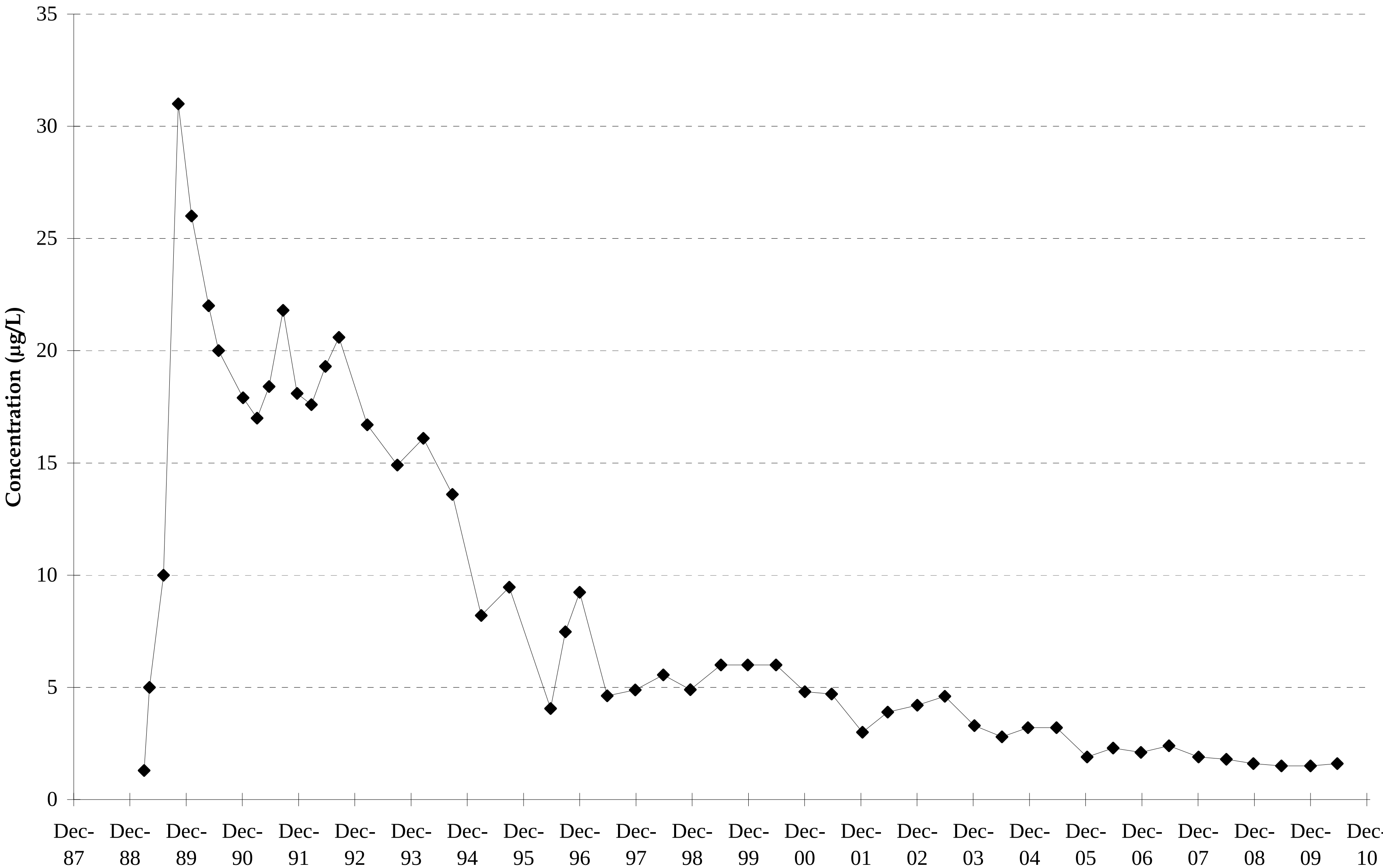


Note: Samples reporting concentrations less than the detection limit were plotted as zero.

CRA 072315 (1)

APPENDIX G-1

EXTRACTION WELL B11 - TRCLE VS. TIME

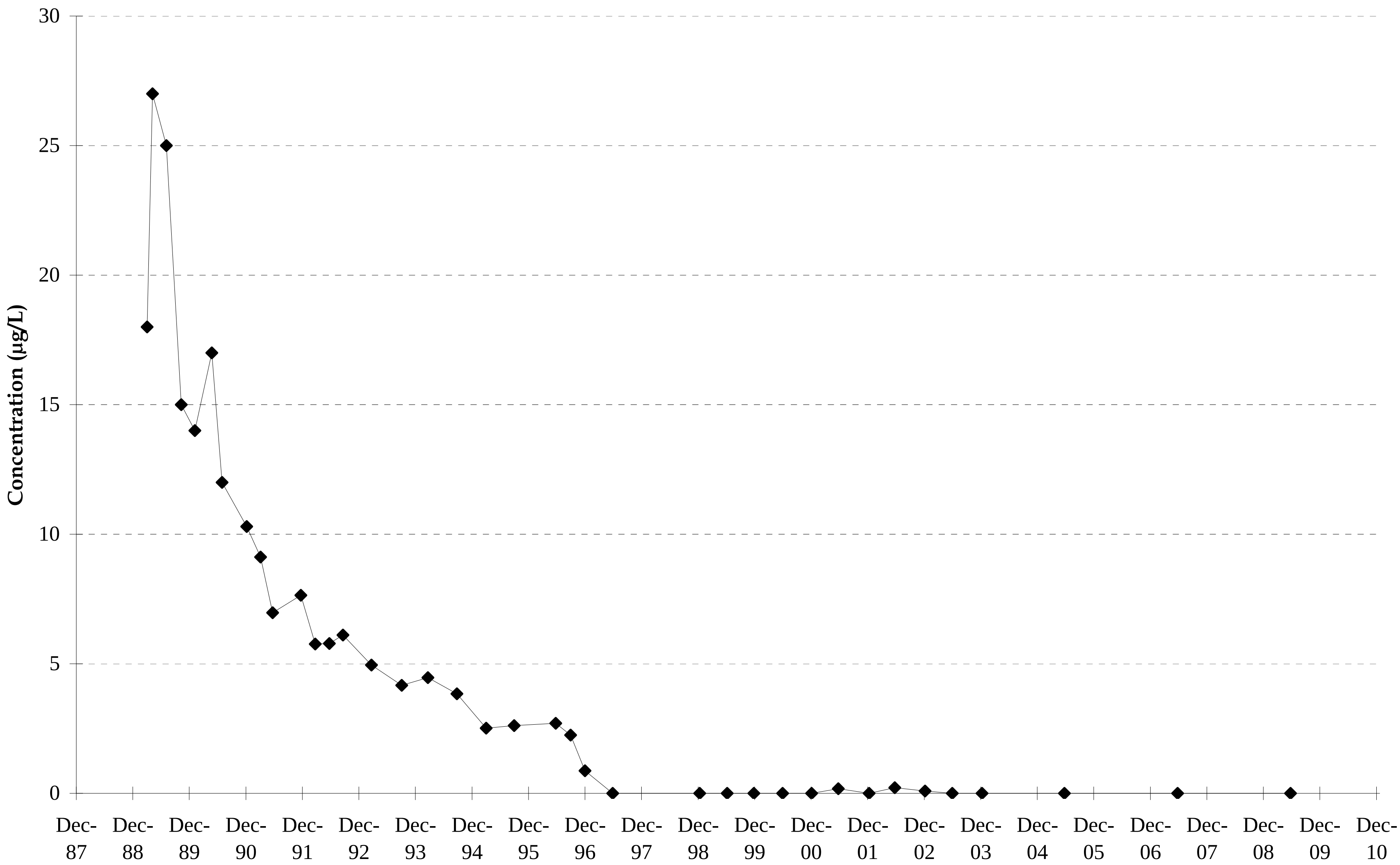


Note: Samples reporting concentrations less than the detection limit were plotted as zero.

CRA 072315 (1)

APPENDIX G-1

EXTRACTION WELL B12 - TRCLE VS. TIME

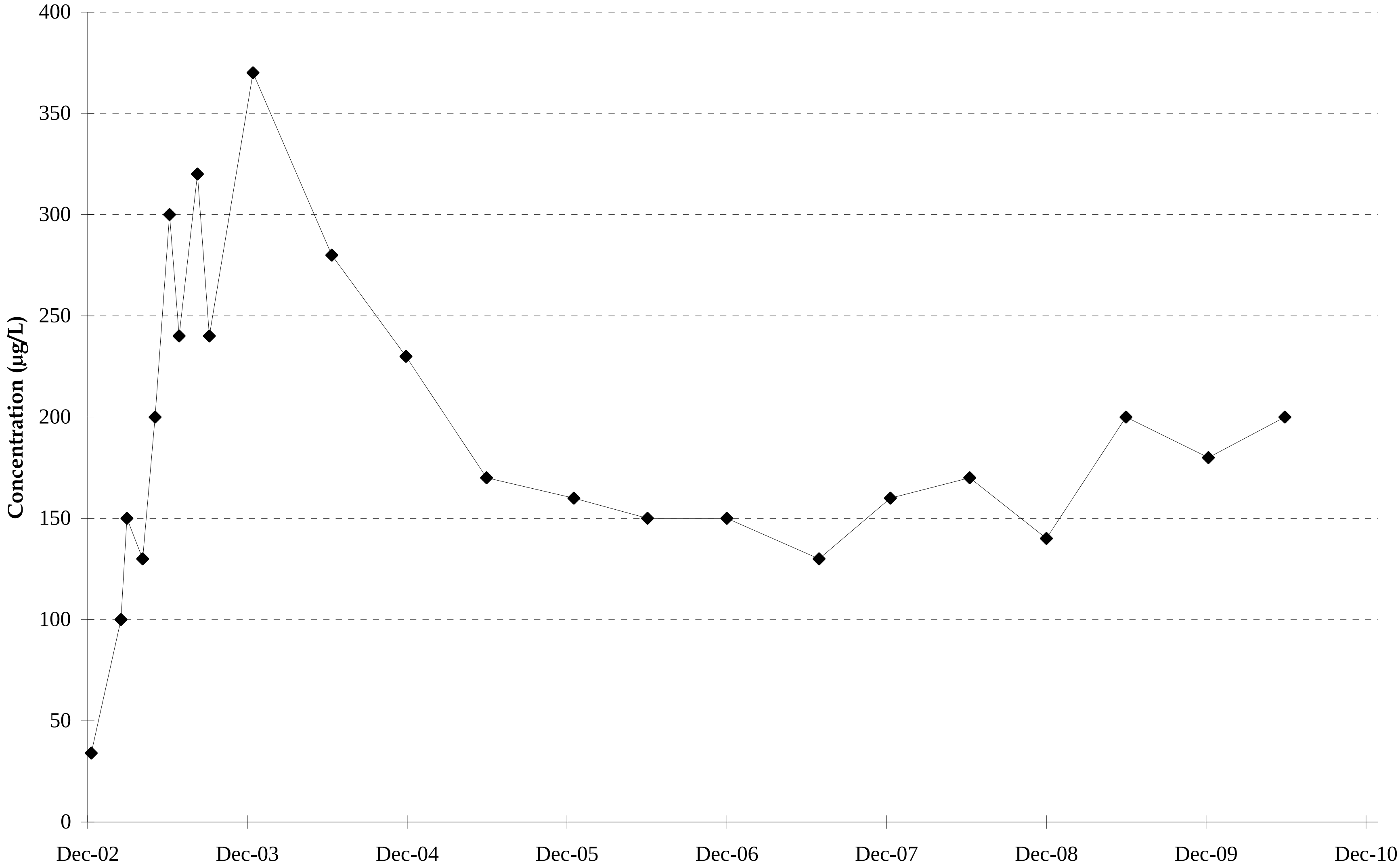


Note: Samples reporting concentrations less than the detection limit were plotted as zero.

CRA 072315 (1)

APPENDIX G-1

EXTRACTION WELL B13 - TRCLE VS. TIME

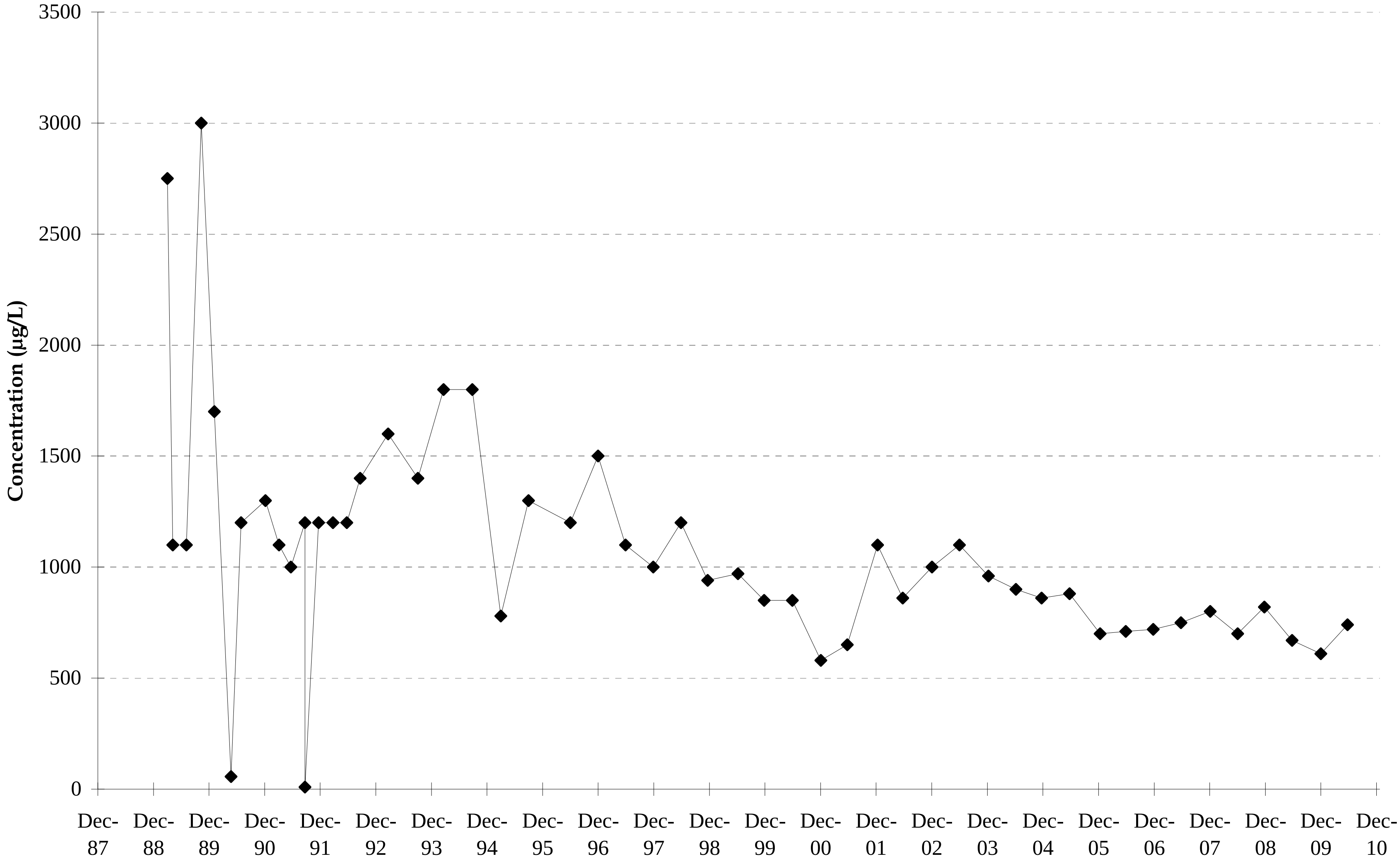


Note: Samples reporting concentrations less than the detection limit were plotted as zero.

CRA 072315 (1)

APPENDIX G-1

EXTRACTION WELL SC1 - TRCLE VS. TIME

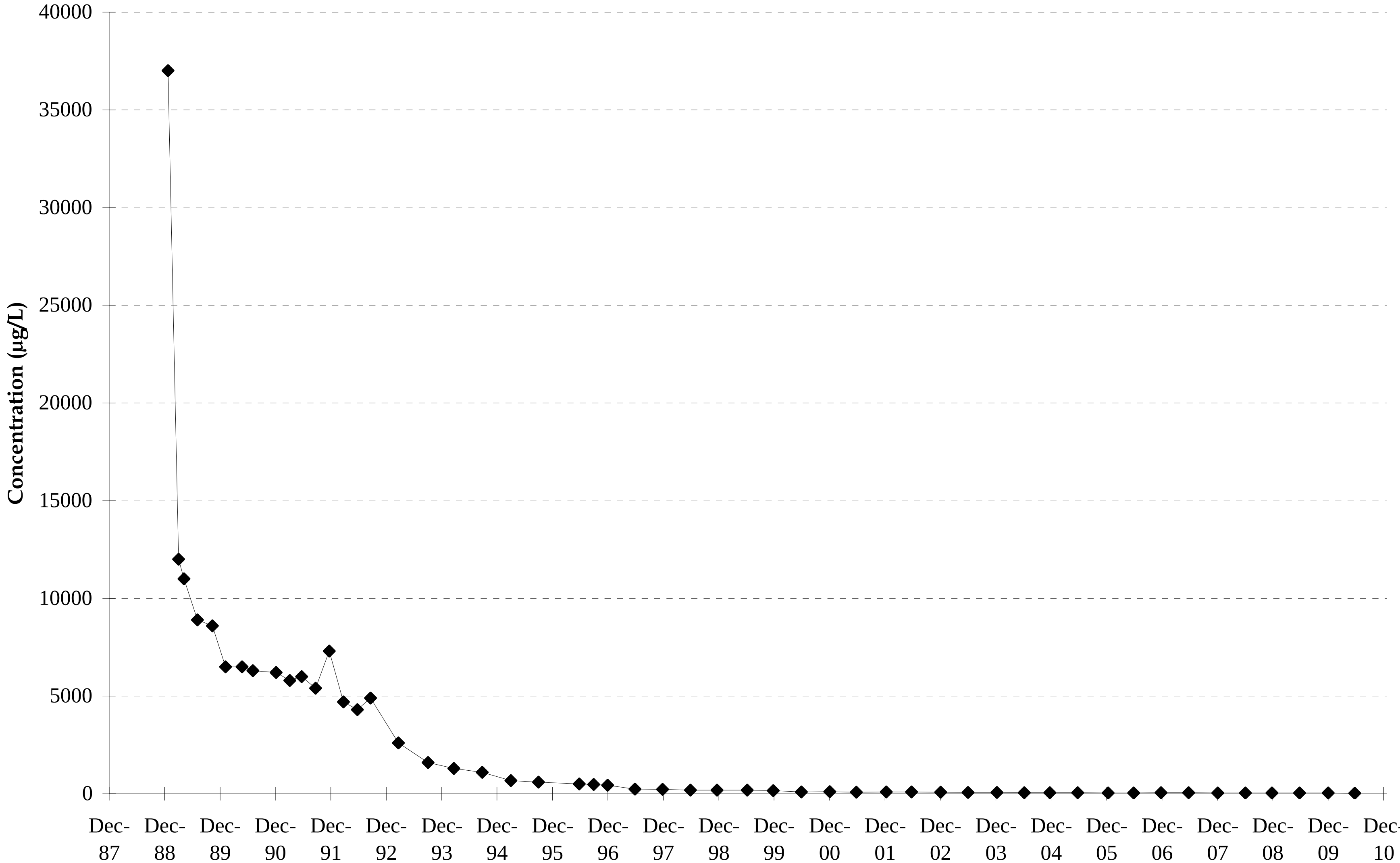


Note: Samples reporting concentrations less than the detection limit were plotted as zero.

CRA 072315 (1)

APPENDIX G-1

EXTRACTION WELL SC2 - TRCLE VS. TIME

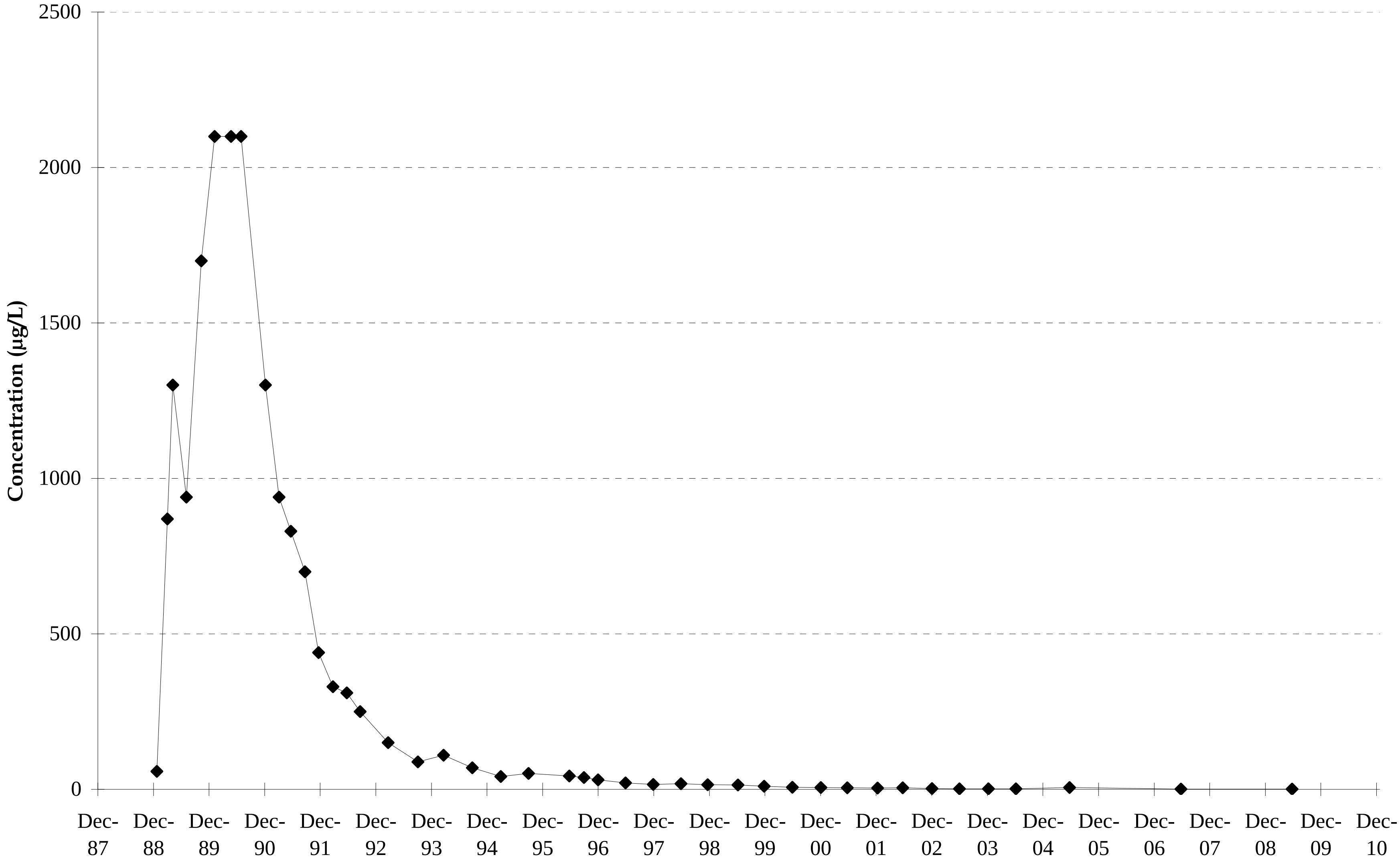


Note: Samples reporting concentrations less than the detection limit were plotted as zero.

CRA 072315 (1)

APPENDIX G-1

EXTRACTION WELL SC3 - TRCLE VS. TIME

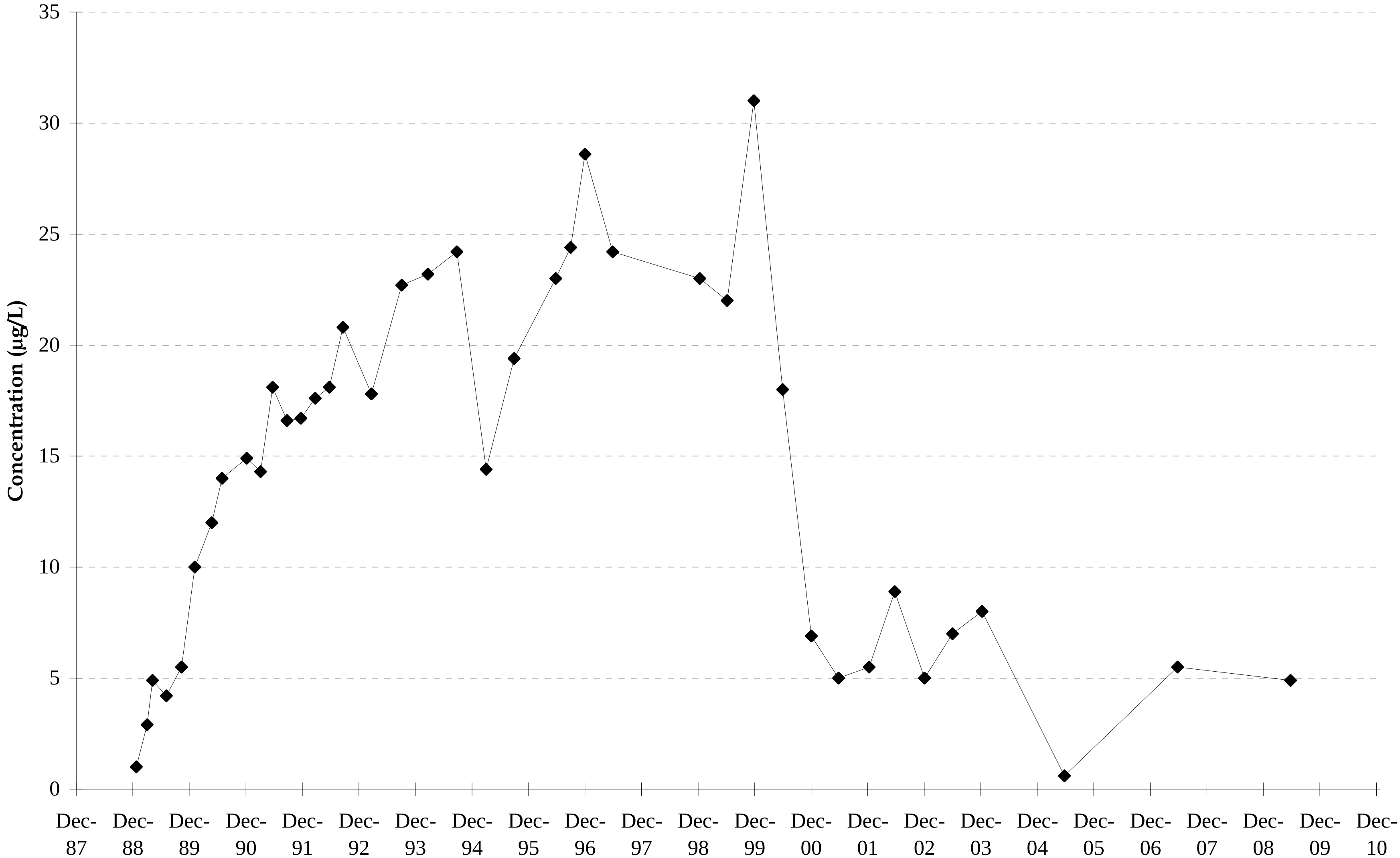


Note: Samples reporting concentrations less than the detection limit were plotted as zero.

CRA 072315 (1)

APPENDIX G-1

EXTRACTION WELL SC4 - TRCLE VS. TIME

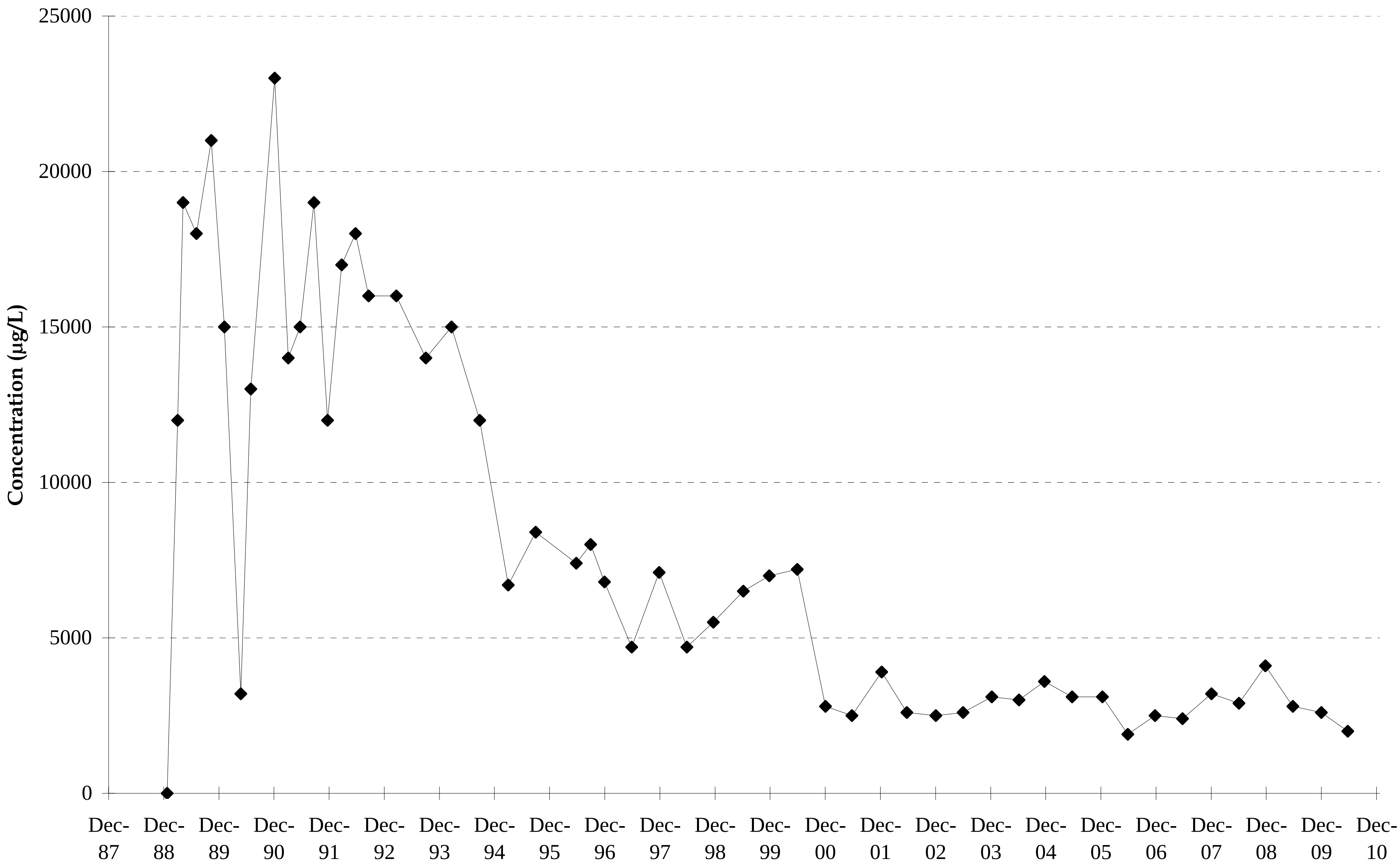


Note: Samples reporting concentrations less than the detection limit were plotted as zero.

CRA 072315 (1)

APPENDIX G-1

EXTRACTION WELL SC5 - TRCLE VS. TIME



Note: Samples reporting concentrations less than the detection limit were plotted as zero.

CRA 072315 (1)

G.2 Influent/Effluent Database (µg/L), Fiscal Year 2010, TGRS, OU2

APPENDIX G-2

INFLUENT/EFFLUENT DATABASE (µg/L)
FISCAL YEAR 2010
TGRS, OU2
ARDEN HILLS, MINNESOTA

			1,1,1-Trichloroethane	*1,1-Dichloroethane*	*1,1-Dichloroethene*	*1,2-Dichloroethane*	*cis-1,2-Dichloroethene*	*Tetrachloroethene*	*Trichloroethene*
TGRS Cleanup Level [1]			*200*	*70*	*6*	*4*	*70*	*5*	*5*
Location	*Date*		*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*
TGRSE	10/6/09		< 1	< 1	< 1	< 1	< 1	< 1	0.49 JP
TGRSE	11/3/09		< 1	< 1	< 1	< 1	< 1	< 1	0.31 JP
TGRSE	11/3/09	D	< 1	< 1	< 1	< 1	< 1	< 1	0.4 JP
TGRSE	12/8/09		< 1	< 1	< 1	< 1	< 1	< 1	0.29 JP
TGRSE	12/8/09	D	< 1	< 1	< 1	< 1	< 1	< 1	0.34 JP
TGRSE	1/6/10		< 1	< 1	< 1	< 1	< 1	< 1	0.37 JP
TGRSE	1/6/10	D	< 1	< 1	< 1	< 1	< 1	< 1	0.37 JP
TGRSE	2/2/10		< 1	< 1	< 1	< 1	< 1	< 1	0.25 JP
TGRSE	3/2/10		< 1	< 1	< 1	< 1	< 1	< 1	0.25 JP
TGRSE	3/2/10	D	< 1	< 1	< 1	< 1	< 1	< 1	0.25 JP
TGRSE	4/6/10		< 1	< 1	< 1	< 1	< 1	< 1	0.45 JP
TGRSE	4/6/10	D	< 1	< 1	< 1	< 1	< 1	< 1	0.42 JP
TGRSE	5/6/10		< 1	< 1	< 1	< 1	< 1	< 1	< 1
TGRSE	5/6/10	D	< 1	< 1	< 1	< 1	< 1	< 1	0.24 JP
TGRSE	6/1/10		< 1	< 1	< 1	< 1	< 1	< 1	0.49 JP
TGRSE	7/2/10		< 1	< 1	< 1	< 1	< 1	< 1	0.36 JP
TGRSE	7/2/10	D	< 1	< 1	< 1	< 1	< 1	< 1	0.34 JP
TGRSE	8/12/10		< 1	< 1	< 1	< 1	< 1	< 1	0.45 JP
TGRSE	8/12/10	D	< 1	< 1	< 1	< 1	< 1	< 1	0.47 JP
TGRSE	9/1/10		< 1	< 1	< 1	< 1	< 1	< 1	0.4 JP
TGRSE	9/1/10	D	< 1	< 1	< 1	< 1	< 1	< 1	0.37 JP

APPENDIX G-2

INFLUENT/EFFLUENT DATABASE (µg/L)
FISCAL YEAR 2010
TGRS, OU2
ARDEN HILLS, MINNESOTA

			1,1,1-Trichloroethane	*1,1-Dichloroethane*	*1,1-Dichloroethene*		*1,2-Dichloroethane*	*cis-1,2-Dichloroethene*	*Tetrachloroethene*	*Trichloroethene*
TGRS Cleanup Level (1)			**200**	**70**	**6**		**4**	**70**	**5**	**5**
Location	*Date*		*µg/L*	*µg/L*	*µg/L*		*µg/L*	*µg/L*	*µg/L*	*µg/L*
TGRSI	10/6/09		42	3.4	4.5	<	1	2.9	1.4	200
TGRSI	10/6/09	D	39	3.5	4	<	1	2.9	1.3	200
TGRSI	11/3/09		39	3	3.8	<	1	2.5	1.6	190
TGRSI	12/8/09		41	3.4	4.5	<	1	2.4	1.5	190
TGRSI	1/6/10		48	3.4	4.4	<	1	2.3	1.4	210
TGRSI	2/2/10		45	3.3	4.5	<	1	2.4	1.6	200
TGRSI	2/2/10	D	43	3.3	4.2	<	1	2.3	1.5	200
TGRSI	3/2/10		50	3.7	4.2	<	1	2.2	1.3	220
TGRSI	4/6/10		71	4.2	5.9		0.16 JP	2.3	1.8	280
TGRSI	5/6/10		52	3.6	4	<	1	2.3	1.7	220
TGRSI	6/1/10		49	3.7	4.4	<	1	2.4	1.7	220
TGRSI	6/1/10	D	50	3.8	4.3	<	1	2.3	1.5	210
TGRSI	7/2/10		48	3.4	3.9	<	1	2.5	1.2	220
TGRSI	8/12/10		49	3.3	5	<	1	2.5	1.8	190
TGRSI	9/1/10		35	2.6	3.3	<	1	2.1	1.2	180

Notes:

(1) Cleanup levels for TGRS are from the OU2 ROD.

D - Field Duplicate

JP - Result is qualified as estimated since the detection is below the laboratory quantitation limit.

Appendix H

Operable Unit 3 Statistical Analysis

TABLE H.1

MAROS DECISION MATRIX

Kendall S	*Confidence*	*Coefficient of Varience*	*Trend*
S > 0	> 95%	NA	Definitely Increasing
S > 0	90-95%	NA	Probably Increasing
S > 0	< 90%	NA	No Trend
S</= 0	< 90%	>/= 1	No Trend
S </= 0	< 90%	< 1	Stable
S < 0	90-95%	NA	Probably Decreasing
S < 0	>95%	NA	Definitely Decreasing

TABLE H.2

CONFIDENCE VALUES FOR SIX DATA PAIRS

Kendall S	*Confidence*
1	50.00%
3	64.00%
5	76.50%
7	86.40%
9	93.20%
11	97.20%
13	99.17%
15	99.86%

Appendix I

Annual Site Inspection Checklist for Land Use Controls

ANNUAL SITE INSPECTION CHECKLIST FOR LAND USE CONTROLS

Operable Unit 2, New Brighton/Arden Hills Superfund Site

Date: July 14, 2010 Inspected By: Mike Fix (TCAAP), Mary Lee (Nat'l Guard), Dave Hamernick (Nat'l Guard), Keith Beaker (Wenck)

Sites:	A	C	D	E	G	H	I	K
Site is located on property controlled by:	N.G.	BRAC	N.G.	N.G.	N.G.	N.G.	BRAC	BRAC
Is the current land use consistent with the exposure assumptions upon which the soil cleanup levels were based?	Yes	Yes	Yes	Yes	Yes	Yes	Note (1)	Yes
Has there been any excavation or other man-made soil disturbance at the site?	No	No	No	No	No	No	No	No
If excavation or soil disturbance has occurred, was prior approval given by BRAC or National Guard?	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
If excavation or soil disturbance was authorized, was the work done in accordance with the approved plan?	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Have any new structures or facilities (including new wells) been constructed on the site?	No	No	No	No	No	No	No	No
If new facilities or structures were constructed, was prior approval given by BRAC or National Guard?	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
If new facilities or structures were authorized, was constuction in accordance with the approved plan?	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
If a protective soil cover is present, is adequate vegetation present throughout the soil cover area?	N/A	Yes	Yes	Yes	Yes	Yes	N/A	N/A
If the soil cover has a permeability requirement, is there any woody vegetation > 2" diameter present?	N/A	N/A	N/A	N/A	No	N/A	N/A	N/A
If a protective soil cover is present, are run-on/runoff controls in good condition (swales, berms, riprap, etc.)?	N/A	Yes	Yes	Yes	Yes	Yes	N/A	N/A
If a protective soil cover is present, are signs marking the edge of the soil cover present and in good condition?	N/A	Yes	Yes	Yes	Yes	Yes	N/A	N/A
Are there any water supply wells constructed into the portion of the aquifer with concentrations above cleanup levels?	No	No	N/A	N/A	N/A	N/A	No	No
Has there been any damage to or removal/modification of groundwater remediation and/or monitoring systems?	No	No	N/A	N/A	N/A	N/A	No	No
If such systems were removed or modified, was prior approval given by BRAC or National Guard?	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
If system removal/modification was authorized, was removal/modification in accordance with approved plan?	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Comments (Attach additional pages as necessary):

(1) Soil contamination is known to exist, but cleanup levels have not yet been established through a Decision Document for this site.

ANNUAL SITE INSPECTION CHECKLIST FOR LAND USE CONTROLS

Operable Unit 2, New Brighton/Arden Hills Superfund Site

Sites:	129-3	129-5	129-15	Grenade Range	Outdoor Firing Rng	Bldg 135 P/T Area	Bldg 535 P/T Area	Bldg 102	Deep GW (TGRS)
Site is located on property controlled by:	N.G.	N.G.	N.G.	N.G.	N.G.	BRAC	N.G.	BRAC	BRAC/N.G.
Is the current land use consistent with the exposure assumptions upon which the soil cleanup levels were based?	Yes	Yes	Yes	Yes	Yes	Note (2)	Yes	N/A	N/A
Has there been any excavation or other man-made soil disturbance at the site?	No	No	No	No	No	No	Yes (3)	N/A	N/A
If excavation or soil disturbance has occurred, was prior approval given by BRAC or National Guard?	N/A	N/A	N/A	N/A	N/A	N/A	Yes	N/A	N/A
If excavation or soil disturbance was authorized, was the work done in accordance with the approved plan?	N/A	N/A	N/A	N/A	N/A	N/A	Yes	N/A	N/A
Have any new structures or facilities (including new wells) been constructed on the site?	No	No	No	No	No	No	Yes (3)	N/A	N/A
If new facilities or structures were constructed, was prior approval given by BRAC or National Guard?	N/A	N/A	N/A	N/A	N/A	N/A	Yes	N/A	N/A
If new facilities or structures were authorized, was constuction in accordance with the approved plan?	N/A	N/A	N/A	N/A	N/A	N/A	Yes	N/A	N/A
If a protective soil cover is present, is adequate vegetation present throughout the soil cover area?	N/A	N/A	Yes	N/A	Yes	N/A	N/A	N/A	N/A
If the soil cover has a permeability requirement, is there any woody vegetation > 2" diameter present?	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
If a protective soil cover is present, are run-on/runoff controls in good condition (swales, berms, riprap, etc.)?	N/A	N/A	Yes	N/A	Yes	N/A	N/A	N/A	N/A
If a protective soil cover is present, are signs marking the edge of the soil cover present and in good condition?	N/A	N/A	Yes	N/A	Yes	N/A	N/A	N/A	N/A
Are there any water supply wells constructed into the portion of the aquifer with concentrations above cleanup levels?	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	No
Has there been any damage to or removal/modification of groundwater remediation and/or monitoring systems?	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No	Yes (4)
If such systems were removed or modified, was prior approval given by BRAC or National Guard?	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Yes
If system removal/modification was authorized, was removal/modification in accordance with approved plan?	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Yes

Comments (Attach additional pages as necessary):

(2) Soil contamination is known to exist, but cleanup levels have not yet been established through a Decision Document for this site.

(3) Soil remediation work was performed at two areas of concern in fall 2009. Building 535 is slated for demolition later in 2010. South of the areas of concern, a new Readiness Center is being constructed.

(4) A section of the forcemain was replaced in June 2010.

Area Outside of the Individual Sites on Property Controlled by:	BRAC	N.G.	Army Reserve
Is the current land use consistent with the exposure assumptions upon which the land use controls were based?	Yes	Yes	Yes
Has there been any excavation or other man-made soil disturbance within the subject area?	No	Yes (5)	Yes (6)
If excavation or soil disturbance has occurred, was prior approval given by BRAC or National Guard or Army Reserve?	N/A	Yes	Yes
If excavation or soil disturbance was authorized, was the work done in accordance with the approved plan?	N/A	Yes	Yes
Have any new structures or facilities (including new wells) been constructed within the subject area?	No	Yes (5)	Yes (6)
If new facilities or structures were constructed, was prior approval given by BRAC or National Guard or Army Reserve?	N/A	Yes	Yes
If new facilities or structures were authorized, was constuction in accordance with the approved plan?	N/A	Yes	Yes
If a protective soil cover is present, is adequate vegetation present throughout the soil cover area?	N/A	N/A	N/A
If the soil cover has a permeability requirement, is there any woody vegetation > 2" diameter present?	N/A	N/A	N/A
If a protective soil cover is present, are run-on/runoff controls in good condition (swales, berms, riprap, etc.)?	N/A	N/A	N/A
If a protective soil cover is present, are signs marking the edge of the soil cover present and in good condition?	N/A	N/A	N/A
Are there any water supply wells constructed into the portion of the aquifer with concentrations above cleanup levels?	N/A	N/A	N/A
Has there been any damage to or removal/modification of groundwater remediation and/or monitoring systems?	N/A	N/A	N/A
If such systems were removed or modified, was prior approval given by BRAC or National Guard?	N/A	N/A	N/A
If system removal/modification was authorized, was removal/modification in accordance with approved plan?	N/A	N/A	N/A

Comments (Attach additional pages as necessary):

(5) Construction is underway for a new Readiness Center.

(6) Construction is underway for an expansion to the Army Reserve Center.