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FINAL COMPREHENSIVE FOURTH FIVE YEAR REVIEW NIROP ROCKET CENTER WV

(PUBLIC DOCUMENT)

8/1/2013

CH2M HILL

Final

Comprehensive Fourth Five-Year Review

Allegany Ballistics Laboratory
Rocket Center, West Virginia

Contract Task Order CTO-WE13

August 2013

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Mid-Atlantic

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CH2MHILL®

Virginia Beach, Virginia

Comprehensive Fourth Five-Year Review

For

Allegany Ballistics Laboratory
Mineral County, West Virginia

March 2013

This report documents the Five-Year Review for the following Operable Units (OUs) and sites with a Record of Decision (ROD) for taking action: Site 1 (OU-3, Groundwater, Surface Water, and Sediment), Site 5 (OU-1, Landfill Contents, and Surface soil), Site 5 (OU-2, Groundwater, Surface Water, and Sediment), Site 10 (OU-5, Groundwater), Site 11 (OU-11, Groundwater), and Site 12 (OU-8, Groundwater) at Allegany Ballistics Laboratory (ABL) in Mineral County, West Virginia, as required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), in accordance with CERCLA §121(c), as amended, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), Part 300.430(f)(4)(ii) of the Code of Federal Regulations (CFR).

The Five-Year Review evaluated the implementation and performance of the site remedy for each OU in order to determine if the remedy is or will be protective of human health and the environment in accordance with the requirements set forth in the RODs. This evaluation was accomplished through a review of various reports and documents pertaining to post-remedy implementation activities, analytical data, and findings, as well as through interviews, site visits, and inspections.

The findings of the 2013 Five-Year Review indicated that the remedy for Site 5 is currently protective of human health and the environment. Protectiveness was deferred for Sites 1, 10, 11, and 12 until additional vapor intrusion investigations can be completed. Issues regarding the future protectiveness of the site remedies were identified for Sites 1 and 10. Conducting optimization analysis (such as time of remediation [TOR] analysis) to determine time frame and practicability of reaching maximum contaminant levels (MCLs) and for evaluation of the need for additional remedial action (RA) will ensure continued protectiveness of each remedy.

United States Department of the Navy

By: | Louis J. Williams | Date: | 28 AUGUST 2013

Louis J. Williams
Naval Sea Systems Command Technical Representative
By direction of Commander
Naval Sea Systems Command

Executive Summary

The Department of the Navy (Navy) conducted this Five-Year Review for Allegany Ballistics Laboratory (ABL) in Mineral County, West Virginia, as required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), in accordance with CERCLA §121(c), as amended, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), Part 300.430(f)(4)(ii) of the *Code of Federal Regulations* (CFR). The report has been prepared in accordance with the United States Environmental Protection Agency (USEPA) Comprehensive Five-Year Review Guidance (USEPA, 2001a) and Navy Policy on Five-Year Reviews (Chief of Naval Operations, 2011). It summarizes the evaluation of remedies and remedial actions (RAs) that resulted in hazardous substances, pollutants, or contaminants remaining at sites above levels that allow for unlimited use and unrestricted exposure, and for which there is a Record of Decision (ROD) or Decision Document in place. This document presents the Fourth Five-Year Review Report for ABL, and has been conducted on RAs completed at the following five sites:

- Site 1 – Northern Riverside Waste Disposal Area
  - Operable Unit (OU)-3 (Groundwater, Surface Water, and Sediment)
- Site 5 – Inert Landfill
  - OU-1 (Landfill Contents and Surface Soil)
  - OU-2 (Groundwater, Surface Water, and Sediment)
- Site 10 – Former Trichloroethene (TCE) Still at Building 157
  - OU-5 (Groundwater)
- Site 11 – Production Well “F”
  - OU-11 (Groundwater)
- Site 12 – Building 167 Solid Waste Management Units (SWMUs)
  - OU-8 (Groundwater)

The review was conducted between September 11, 2008, and September 10, 2013. The First, Second, and Third Five-Year Review Reports were signed on July 10, 2002, September 15, 2003, and September 10, 2008, respectively. The triggering action for this statutory review presented herein is September 10, 2008, the Navy signature date on the Third Five-Year Review Report.

The objective of the Five-Year Review is to evaluate the effectiveness of the remedies to determine whether they continue to be protective of human health and the environment in accordance with the requirements set forth in the RODs. This evaluation was accomplished through a review of various reports and documents pertaining to post-remedy implementation activities, analytical data, through interviews, site visits, and inspections. The community was notified of the review process through public notices in local newspapers published on September 1, 2012, in the Cumberland Times-News and the Mineral Daily. The Five-Year Review Report identifies any circumstance that may prevent a particular remedy from functioning as designed or providing sufficient protection of human health and the environment. The overall evaluation of the effectiveness of each remedy is presented as a protectiveness statement developed for each site as follows.

As outlined in this Five-Year Review, the remedy for Site 5 is currently protective of human health and the environment. Protectiveness was deferred for Sites 1, 10, 11, and 12 until additional vapor intrusion investigations can be completed. A summary of the remedial actions completed for each site and the technical performance assessment, issues and recommendations, and protectiveness statements based on this Five-Year Review are provided as follows.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Allegany Ballistics Laboratory		
EPA ID: WV0170023691		
Region: 3	**State:** WV	**City/County:** Rocket Center/Mineral County

SITE STATUS	
NPL Status: Final	
Multiple OUs? Yes	**Has the site achieved construction completion?** No

REVIEW STATUS
Lead agency: Other Federal Agency **If "Other Federal Agency" was selected above, enter Agency name:** United States Navy
Author name (Federal or State Project Manager): Naval Facilities Engineering Command
Author affiliation: United States Navy
Review period: September 11, 2008 – September 10, 2013
Date of site inspection: October 23, 2012
Type of review: Statutory
Review number: 4
Triggering action date: September 10, 2008
Due date *(five years after triggering action date)*: September 10, 2013

Five-Year Review Summary Form (continued)

The table below is for the purpose of the summary form and associated data entry and does not replace the two tables required in Section VIII and IX by the FYR guidance. Instead, data entry in this section should match information in Section VII and IX of the FYR report.

OU(s) without Issues/Recommendations Identified in the Five-Year Review: None				
Issues/Recommendations				
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	Federal Facility	EPA/State	June 2014
OU(s): OU-3 (Site 1)	**Issue Category: Institutional Controls**			
	Issue: Land use restrictions (property use and access restrictions) to prohibit the onsite use of untreated groundwater have not been formally documented.			
	Recommendation A formal LUC plan covering all media at Site 1 consisting of OU-3 and OU-4 will be completed upon finalization of the ROD for Site 1 soil (OU-4).			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	No	Federal Facility	EPA/State	September 2016
OU(s): OU-3 (Site 1)	**Issue Category: Monitoring**			
	Issue: The expected timeframe for remedial action as described in the ROD was 30 years. Once the soil source areas are mitigated or removed, it is anticipated that the contaminant mass in groundwater will be reduced.			
	Recommendation: Following these actions, the groundwater remedial approach and associated timeframes will be assessed.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	Federal Facility	EPA/State	June 2014 (Sampling in March 2014)
OU(s): OU-3 (Site 1)	**Issue Category: Remedy Performance**			
	Issue: RSL established for 1,4-dioxane. Historical data shows no detections; however, detection limit exceeds current RSL.			
	Recommendation: Evaluate the presence or absence of 1,4-dioxane in groundwater and treatment plant effluent using low concentration analytical method.			

Five-Year Review Summary Form (continued)

Affect Current Protectiveness	Affect Future Protectiveness	Implementing Party	Oversight Party	Milestone Date
No	Yes	Federal Facility	EPA/State	March 2014
OU(s): OU-3 (Site 1)	**Issue Category: Monitoring**			
	Issue: Risk from chemicals associated with explosives has historically not been evaluated for groundwater; however RDX and perchlorate have recently been detected in groundwater as part of RCRA sampling.			
	Recommendation: Modify CERCLA LTM program to include analysis of perchlorate and RDX. Establish a discharge limit for RDX and, if necessary, evaluate upgrades to treatment plant to address RDX. Continue perchlorate treatment already installed.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	Federal Facility	EPA/State	March 2014
OU(s): OU-3 (Site 1)	**Issue Category: Changed Site Conditions**			
	Issue: Uncertainty exists associated with alluvial and bedrock plume extent and contaminant concentrations.			
	Recommendation: Revise the FYR monitoring well network to include appropriate wells that could provide additional insight into the plume extent and contaminant concentrations.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	Federal Facility	EPA/State	September 2018 implementation (establish framework by December 2014)**
OU(s): OU-3 (Site 1)	**Issue Category: Monitoring**			
	Issue: Compliance with chemical specific ARARs (MCLs) for groundwater is not likely to occur within the assumed project life in the ROD.			
	Recommendation: Conduct optimization analysis to determine time frame and practicability of reaching MCLs. Develop method for utilizing groundwater data to evaluate the potential risks to receptors in the river during partial capture loss.			

Five-Year Review Summary Form (continued)

Affect Current Protectiveness	Affect Future Protectiveness	Implementing Party	Oversight Party	Milestone Date
No	Yes	Federal Facility	EPA/State	April 2014
OU(s): OU-3 (Site 1)	**Issue Category: Operations and Maintenance**			
	Issue: COCs were not specifically identified in the 1997 ROD			
	Recommendation: Develop a COC list based on Remedial Investigation results and optimize the COC list and sampling approach based on LTM results. Document revised COCs in Memo to Site File or ESD, as appropriate.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
Yes	Yes	Federal Facility	EPA/State	December 2014
OU(s): OU-3 (Site 1)	**Issue Category: Changed Site Conditions**			
	Issue: The vapor intrusion pathway was not evaluated for Site 1 (OU-3), as part of the RI/FS for this Site. Since there are potentially occupied buildings within 100 feet of the TCE plume in groundwater at Site 1, further evaluation of the vapor intrusion pathway to assess whether this pathway generates potentially unacceptable risk should be performed in accordance with current vapor intrusion guidance.			
	Recommendation Basewide vapor intrusion assessment currently underway.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	Federal Facility	EPA/State	December 2016
OU(s): OU-3 (Site 1)	**Issue Category: Monitoring**			
	Issue: The data collected during the LTM program indicate that there is a potential negative influence on ecological receptors in the sediment of the river adjacent to Site 1. It is believed that these potential impacts are due to contaminants in Site 1 soil (OU-4) transported to the river by stormwater.			
	Recommendation The LTM program will be modified to better assess ecological risk following the forthcoming remedial action for Site 1 soil.			

Five-Year Review Summary Form (continued)

Affect Current Protectiveness	Affect Future Protectiveness	Implementing Party	Oversight Party	Milestone Date
No	Yes	Federal Facility	EPA/State	April 2014
OU(s): OU-2 (Site 5)	**Issue Category: Remedy Performance**			
	Issue: Additional data may be needed to determine the contributions of MNA, the effectiveness of the PRB, and to evaluate why TCE is being detected at 5GW18.			
	Recommendation: Collect additional data including chemical analyses and geochemical parameters from monitoring wells and/or the PRB. Discuss the path forward in a future scoping session.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	Federal Facility	EPA/State	April 2014
OU(s): OU-2 (Site 5)	**Issue Category: Monitoring**			
	Issue: Confirm that groundwater concentrations discharging to the river do not pose an unacceptable risk to human health and the environment.			
	Recommendation: Conduct periodic data evaluation of groundwater LTM data in comparison to human health and ecological screening values to assess effect on river media. Discuss path forward in a future scoping session.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	Federal Facility	EPA/State	June 2014
OU(s): OU-2 (Site 5)	**Issue Category: Changed Site Conditions**			
	Issue: The 2005 ROD estimates that the remedy will restore the aquifers at Site 5 to beneficial use in 16 years.			
	Recommendation: The remedy construction was completed in 2006, Considering that the remedy has been operating for nearly 50% of the projected duration, a TOR analysis is recommended to refine the remedy life cycle and determine if the existing substrate will continue to operate until the RAO is achieved.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	Federal Facility	EPA/State	June 2014
OU(s): OU-2 (Site 5)	**Issue Category: Monitoring**			
	Issue: TCE concentrations exceeding the PRG may exist to the northeast outside the area of restricted groundwater use			
	Recommendation: Collect additional data northeast of Monitoring Well 5GW22 to refine the TCE plume. Re-evaluate if the shape of the area of restricted groundwater use needs to be changed			

Five-Year Review Summary Form (continued)

Affect Current Protectiveness	Affect Future Protectiveness	Implementing Party	Oversight Party	Milestone Date
Yes	Yes	Federal Facility	EPA/State	December 2014
OU(s): OU-5 (Site 10)	**Issue Category: Changed Site Conditions**			
	Issue: The vapor intrusion pathway was not evaluated as part of the RI/FS for this Site.			
	Recommendation: Basewide vapor intrusion assessment currently underway			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	No	Federal Facility	EPA/State	June 2014
OU(s): OU-5 (Site 10)	**Issue Category: No Issue**			
	Issue: COCs were not specifically identified in the 2005 ROD.			
	Recommendation: Develop a COC list based on Remedial Investigation results and optimize the COC list and sampling approach based on LTM results. Document revised COCs in technical memorandum or ESD, as appropriate.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	Federal Facility	EPA/State	March 2014
OU(s): OU-5 (Site 10)	**Issue Category: Operations and Maintenance**			
	Issue: Uncertainty exists associated with alluvial and bedrock plume extent and contaminant concentrations.			
	Recommendation: Revise the FYR monitoring well network to include appropriate wells that could provide additional insight into the plume extent and contaminant concentrations.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	No	Federal Facility	EPA/State	September 2018 implementation (Establish framework by December 2014)
OU(s): OU-5 (Site 10)	**Issue Category: Monitoring**			
	Issue: Groundwater remedy performance issues. A loss of hydraulic containment in the bedrock aquifer occurs periodically.			
	Recommendation: Conduct optimization analysis, including groundwater sampling and TOR analysis, to determine time frame and practicability of reaching MCLs with the current remediation system.			

Five-Year Review Summary Form (continued)

Affect Current Protectiveness	Affect Future Protectiveness	Implementing Party	Oversight Party	Milestone Date
Yes	Yes	Federal Facility	EPA/State	December 2014
OU(s): 11 (Site 11) and 8 (Site 12)	**Issue Category: Changed Site Conditions**			
	Issue: The vapor intrusion pathway was not evaluated as part of the RI/FS for this Site.			
	Recommendation: Basewide Vapor Intrusion evaluation currently underway.			

Protectiveness Statement(s)
Include each individual OU protectiveness determination and statement. If you need to add more protectiveness determinations and statements for additional OUs, copy and paste the table below as many times as necessary to complete for each OU evaluated in the FYR report.

Operable Unit:	*Protectiveness Determination:*	*Addendum Due Date:*
OU-3 (Site 1)	Protectiveness Deferred	December 2014
Protectiveness Statement: A protectiveness determination of the remedy at Site 1 (OU-3) consisting of containment (through groundwater extraction and treatment) with land-use controls cannot be made at this time until further information regarding the vapor intrusion pathway is obtained. All other exposure pathways that could result in an unacceptable risk are being controlled through a combination of the groundwater extraction system, engineered LUCs (such as site security, fencing, and signage) and ICs. It is expected that the vapor intrusion assessment will be completed by December 2014, at which time a protectiveness determination will be made.		
Operable Unit:	*Protectiveness Determination:*	
OU-1 (Site 5: Landfill Contents and Surface Soil)	Protective	*Addendum Due Date:* Not Applicable
Protectiveness Statement: The landfill and soil remedy at Site 5 (OU-1) is protective of human health and the environment. The landfill cap prevents direct contact with landfill contents and surface soil. Supporting inspection information and groundwater monitoring data indicate that infiltration is being minimized and surface water run-off is being controlled. The landfill cap is in good condition and as a result, no repairs are recommended as part of this Five-Year Review. There have been no changes in the physical conditions of the Site that would affect the protectiveness of the remedy. Finally, exposure pathways that could result in an unacceptable risk are being controlled by the landfill cap and LUCs (such as site security and signage) (CH2M HILL, 2013a).		
Operable Unit:	*Protectiveness Determination:*	
OU-2 (Site 5: Groundwater, Surface Water, and Sediment)	Short-term Protective	*Addendum Due Date:* Not Applicable
Protectiveness Statement: The groundwater remedy at Site 5 (OU-2) is currently protective of human health and the environment. The PRB consists of a vertical zone of reactive media (zero-valent iron) that was installed in June 2006. The PRB is designed to reduce chlorinated compounds as alluvial groundwater passes through the reactive media under a natural gradient. The monitoring data indicate that the PRB continues to foster the reducing conditions that enhance TCE reduction. In addition, the TCE concentrations at wells further downgradient from the PRB either continue to be below the PRG or have exhibited downward trends, due to MNA and the PRB, since the last Five-Year Review. Exposure pathways that could result in an unacceptable risk are currently being controlled by the landfill cap and LUCs (such as site security and signage) (CH2M HILL, 2013a). However, in order for the OU-2 remedy to be protective in the long-term the following actions need to be taken to ensure protectiveness: 1) Collect additional data including chemical analyses and geochemical parameters from monitoring wells and/or the PRB to determine the contributions of MNA, the effectiveness of		

the PRB, and to evaluate the TCE plume configuration; 2) Conduct periodic data evaluation of groundwater LTM data in comparison to human health and ecological screening values to assess effect on river media. 3) Perform a time of remediation analysis to refine the remedy life cycle and determine if the existing substrate will continue to operate until the RAO is achieved; and 4) Modify the LUC boundary based on the current TCE plume configuration.		
Operable Unit: OU-5 (Site 10)	*Protectiveness Determination:* Protectiveness Deferred	*Addendum Due Date:* December 2014
Protectiveness Statement: A protectiveness determination of the remedy at Site 10 (OU-5) consisting of the existing groundwater extraction and treatment system cannot be made at this time until further information regarding the vapor intrusion pathway is obtained. All other exposure pathways that could result in an unacceptable risk are being controlled through a combination of the groundwater extraction system, engineered LUCs (such as site security, fencing, and signage) and ICs. It is expected that the vapor intrusion assessment will be completed by June 2015, at which time a protectiveness determination will be made.		
Operable Unit: 11 (Site 11) and 8 (Site 12)	*Protectiveness Determination:* Protectiveness Deferred	*Addendum Due Date :* December 2014
Protectiveness Statement: A protectiveness determination of the remedy at Sites 11 and 12 cannot be made at this time until further information regarding the vapor intrusion pathway is obtained. All other exposure pathways that could result in an unacceptable risk will be addressed through the ICs (such as excavation restrictions, groundwater use restrictions, and LTM of groundwater). It is expected that the vapor intrusion assessment will be completed by December 2014, at which time a protectiveness determination will be made.		

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6-6 Bedrock Aquifer Site 10 TCE Plume - September 2012
6-7 Annual O&M and LTM Costs

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7-3 Site 11 Conceptual Site Model
7-4 Site 12 Conceptual Site Model
7-5 Alluvial Aquifer Sites 11 and 12 TCE Plume - Historic
7-6 Alluvial Aquifer Sites 11 and 12 VC Plume - Historic
7-7 Alluvial Aquifer Sites 11 and 12 TCE Plume – June 2012
7-8 Bedrock Aquifer Sites 11 and 12 TCE Plume – Historic
7-9 Bedrock Aquifer Sites 11 and 12 MC Plume – Historic

Acronyms and Abbreviations

°F	degree(s) Fahrenheit
µg/kg	microgram(s) per kilogram
µg/L	microgram(s) per liter
µg/m^3	microgram(s) per cubic meter
ABG	Active Burning Ground
ABL	Allegany Ballistics Laboratory
amsl	above mean sea level
AOC	Area of Concern
ARAR	Applicable or Relevant and Appropriate Requirement
AST	aboveground storage tank
ATK	ATK Tactical Systems Company, LLC
AVS/SEM	acid volatile sulfide/simultaneously extracted metals
BERA	Baseline Ecological Risk Assessment
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	*Code of Federal Regulations*
CLEAN	Comprehensive Long-term Environmental Action—Navy
CO	Consent Order
COC	contaminant of concern
COPC	contaminant of potential concern
CS	Confirmation Study
CSF	carcinogenic slope factor
CSM	conceptual site model
CTE	central tendency exposure
CTO	Contract Task Order
DBCP	1,2-dibromo-3-chloropropane
DCE	dichloroethene
DNAPL	dense non-aqueous phase liquid
EAB	Enhanced Anaerobic Bioremediation
EEQ	environmental effects quotient
ELCR	estimated lifetime cancer risk
EPC	exposure point concentration
ERA	Ecological Risk Assessment
ERD	enhanced reductive dechlorination
ES&E	Environmental Science and Engineering
ESD	Explanation of Significant Differences
FDP	former disposal pit
FFS	Focused Feasibility Study
FS	Feasibility Study
FY	fiscal year
GWTP	groundwater treatment plant
HHRA	Human Health Risk Assessment
HI	hazard index
HMX	octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine

IAS	Initial Assessment Study
IC	institutional control
IR	Installation Restoration
IRP	Installation Restoration Program
ISCO	*in situ* chemical oxidation
LNAPL	light non-aqueous phase liquid
LOAEL	Lowest Observed Adverse Effect Level
LTM	long-term monitoring
LUC	land use control
MC	methylene chloride
MCL	maximum contaminant level
mg/kg	milligram(s) per kilogram
MNA	monitored natural attenuation
NA	not applicable
NACIP	Navy Assessment and Control of Installation Pollutants Program
NAVFAC	Naval Facilities Engineering Command
NAVSEA	Naval Sea Systems Command
Navy	Department of the Navy
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEESA	Naval Energy and Environment Support Activity
NERP	Navy Environmental Restoration Program
NOAEL	No Observed Adverse Effect Level
NPL	National Priorities List
NTCRA	Non-time-critical Removal Action
O&M	operation and maintenance
OABG	Outside Active Burning Ground
OHM	OHM Remediation Services, Inc.
ORP	oxidation-reduction potential
OU	operable unit
P/E	propellant and explosive
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
PRAP	Proposed Remedial Action Plan
PRB	Permeable Reactive Barrier
RA	remedial action
RAB	Restoration Advisory Board
RAC	Remedial Action Contractor
RAO	remedial action objective
RBC	risk-based concentration
RBP	Rapid Bioassessment Protocol
RCRA	Resource Conservation and Recovery Act
RD	remedial design
RDX	hexahydro-1,2,5-trinitro-1,3,5-triazine
RFA	Resource Conservation and Recovery Act Facility Assessment
RfD	reference dose
RI	Remedial Investigation
RME	reasonable maximum exposure

ROD	Record of Decision
RSL	Regional Screening Level
SAP	Sampling and Analysis Plan
SARA	Superfund Amendments and Reauthorization Act of 1986
SRG	site remediation goal
SVOC	semivolatile organic compound
SWMU	Solid Waste Management Unit
TAL	Target Analyte List
TBC	to be considered
TCA	trichloroethane
TCE	trichloroethene
TOC	total organic carbon
TOR	time of remediation
UFP	Uniform Federal Policy
USEPA	United States Environmental Protection Agency
UU/UE	unlimited use and unrestricted exposure
VC	vinyl chloride
VOC	volatile organic compound
WVDEP	West Virginia Department of Environmental Protection (Division prior to May 2001)

SECTION 1

Introduction

1.1 Purpose

This document presents the results of the Five-Year Review under the Atlantic Division, Naval Facilities Engineering Command (NAVFAC), Comprehensive Long-term Environmental Action—Navy (CLEAN) Program, Contract No. N62470-08-D-1000, Contract Task Order (CTO) WE13, as required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) §121(c), as amended, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), Part 300.430(f)(4)(ii) of the *Code of Federal Regulations* (CFR). CH2M HILL has prepared this Five-Year Review Report on behalf of the Department of the Navy (Navy) for Allegany Ballistics Laboratory (ABL), Mineral County, West Virginia, in accordance with the United States Environmental Protection Agency (USEPA) *Comprehensive Five-Year Review Guidance* (USEPA, 2001a) and in accordance with Navy Policy on Five-Year Reviews (Chief of Naval Operations, 2011).

The purpose of this Five-Year Review is to evaluate the performance of implemented remedies at ABL to verify that the remedies remain protective of human health and the environment as stated in the respective Records of Decision (RODs).

ABL follows Navy policy of conducting an installation-wide Five-Year Review that includes all sites with remedies in place based on the remedy initiation trigger date for the first site. In accordance with the Navy policy, a Five-Year Review is required 5 years from the initiation of the first remedial action (RA) that leaves hazardous substances, pollutants, or contaminants at a site above levels that allow for unlimited use and unrestricted exposure (UU/UE). If a site contains multiple remedies, all are subject to a Five-Year Review when at least one remedy is initiated. On behalf of NAVFAC Mid-Atlantic, CH2M HILL has conducted this Five-Year Review of the RAs implemented at the following six operable units (OUs) at five Installation Restoration (IR) sites at ABL:

- Site 1 – Northern Riverside Waste Disposal Area
  - (OU-3) – Site 1 Groundwater, Surface Water, and Sediment
- Site 5 – Inert Landfill
  - (OU-1) – Landfill Contents and Surface Soil
  - (OU-2) – Groundwater, Surface Water, and Sediment
- Site 10 – Former Trichloroethene (TCE) Still at Building 157 TCE
  - (OU-10) – Groundwater
- Site 11 – Production Well “F”
  - (OU-11) – Groundwater
- Site 12 – Building 167 Solid Waste Management Units (SWMUs)
  - (OU-8) – Groundwater

This Five-Year Review was prepared pursuant to CERCLA §121(c) and the NCP. CERCLA §121(c) states the following:

> *If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each 5 years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106] the President shall take or require such action. The President shall report to the*

> *Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

USEPA interpreted this requirement further in the NCP at 40 CFR §300.430 (f)(4)(ii), which states the following:

> *If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after initiation of the selected remedial action.*

The triggering action for the statutory review process was the initiation of the RA construction (July 10, 1997) for Site 5 (OU-1). This is the fourth Five-Year Review for ABL. The previous Five-Year Review was signed on September 10, 2008, which is the triggering action for this fourth Five-Year Review. Navy policy (Chief of Naval Operations, 2011) states that subsequent Five-Year Review Reports shall be signed by the Navy no later than 5 years after the Navy signature date of the previous Five-Year Review Report consistent with Section 1.2.3 of the *Comprehensive Five-Year Review Guidance* (USEPA, 2001a). This review was accomplished through a review of various reports and documents pertaining to post-remedy implementation activities, analytical data, and findings and through site visits, inspections, and interviews.

SECTION 2

Five-Year Review Process

ABL is a federal facility at which CERCLA activities are funded and implemented by the Navy under the Navy Environmental Restoration Program (NERP). The Navy implements CERCLA at ABL in partnership with USEPA and West Virginia Department of Environmental Protection (WVDEP). The ABL Five-Year Review Team was led by Mr. Walter Bell (NAVFAC Mid-Atlantic) and comprises representatives from Naval Sea Systems Command (NAVSEA) (Mr. Lou Williams and Mr. John Aubert), USEPA Region III (Ms. Sarah Kloss), and WVDEP (Ms. Catherine Guynn). Assistance with the Five-Year Review process was provided by the CLEAN contractor, CH2M HILL. Remedy protectiveness for the six OUs at five IR sites at ABL was evaluated through community involvement, document reviews, site inspections, interviews, and data review activities, as described in the following subsections.

2.1 Community Involvement

In 1992, the Navy established information repositories at two local libraries, and it maintains a site accessible to the public on the Internet at http://go.usa.gov/TsM. The Navy officially started a Restoration Advisory Board (RAB) in 1994. The Navy and the RAB have collaborated on slide shows about the Installation Restoration Program (IRP) at ABL for presentation to community groups.

A public notice (**Appendix A**) for the Five-Year Review for Sites 1, 5, 10, 11, and 12 was published on September 1, 2012, in the Cumberland Times-News and the Mineral Daily. The purpose of the notice was to inform the public that the Five-Year Review was being conducted, to provide information where the RODs under review can be obtained, and how the community can contribute during the review process. No comments or questions were received from the public related to the Five-Year Review. When the Five-Year Review Report has been finalized, a notice will be sent to these newspapers indicating the results and that the final report is available to the public.

2.2 Document Review

The Five-Year Review consisted of a review of site-specific documentation for each OU/site. First, the ROD for each OU was reviewed to identify the potential risks to human health and the environment, remedial action objectives (RAOs), selected remedy, and Applicable or Relevant and Appropriate Requirements (ARARs). Additional review of relevant documents, including operation and maintenance (O&M) records, monitoring data, and other pertinent documents and data, were also reviewed to assess remedy performance and continued protection of human health and the environment. **Appendix B** includes a list of the reviewed documents.

2.3 Site Inspections

Site Inspections for the Five-Year Review were conducted on October 23 and November 2, 2012. The site inspection on October 23 included representatives of the Navy, USEPA, WVDEP, and CH2M HILL, and consisted of inspections of all Five-Year Review sites. Completed Five-Year Review inspections checklists and a photo log of the sites are located in **Appendix C**. The November 2 site inspection was conducted by CH2M HILL and consisted of inspecting the condition of Site 1 monitoring and extraction wells and the groundwater treatment plant (GWTP). The purpose of the inspections was to assess the protectiveness of the remedy and issues identified are listed as follows:

Site 1

Several monitoring wells (1GW34 through 1GW39, 1GW04, and 1GW09) had concrete pads with severe cracks. It was recommended the concrete pads be inspected and repaired, as necessary. The fencing surrounding the site appeared to be in good condition. Routine and non-routine maintenance of the GWTP is ongoing. At the time of the site visit, the CH2M HILL project manager noted the Team was troubleshooting issues with the GWTP transducers and valve equipment. The Project Manager also stated calcification and scaling of the extraction system pipes were an issue and should be addressed. The water tower will undergo cosmetic rehabilitation in the near future.

Site 5

During the site inspection, there were a few locations outside of the landfill cap beyond the drainage ditch that looked like ripples in the soil, which may be an indication of settlement or erosion, possibly caused by animal activity. In addition, some trees on the hillside above the northern landfill cap have been uprooted or blown over, which may contribute to future erosion surrounding the cap. The landfill cover appeared to be in good condition with no trees and the grass was mowed. It is recommended that the quarterly site inspection continue to monitor the settling of the soil. Monitoring wells appeared to be in good condition. The well locks were rusty but in working order. It was noted that silt fencing remains onsite and is recommended for removal.

Site 10

Several monitoring wells (10GW13, 10GW15, 10GW17, 10GW18, 10GW20, and PW A-1) had concrete pads with severe cracks. It was recommended the concrete pads be inspected and repaired, as necessary. PW A-1 also had a missing casing. It is recommended that the casing to PWA-1 be replaced and a new lock be placed on the well.

Sites 11 and 12

There were no significant issues with Sites 11 and 12 observed during the site inspection, except for general maintenance on several monitoring wells, noted as follows. The steel cap on monitoring well 11GW17 was noted to be cracked. It is recommended that the steel cap be replaced and the well identification be placed on or near the cap. The concrete pad on stick-up wells 11GW04 and 11GW07 was cracked. It is recommended the concrete pads be repaired. The bolts on steel caps for monitoring wells 11GW17 and 12GW08 were noted as missing. It is recommended that all the flush-mount monitoring wells be inspected and bolts replaced as necessary.

Quarterly Inspection Summary

Additionally, quarterly inspections are conducted at the sites. During the inspections, a few items were noted as needing repair; however, no significant issues were identified during the 2008 to 2012 Five-Year Review period during the quarterly inspections. A summary of the quarterly inspections is included in **Appendix C**.

As these sites are in a secure area of the facility, these conditions do not affect the performance or integrity of the remedies, and no other issues concerning the protectiveness of the remedies were noted during the site inspections.

2.4 Interviews

Interviews were conducted with the following parties as part of the Five-Year Review process (the date[s] of the interviews are shown in parentheses):

- Mr. Steve Blaisdell, CH2M HILL GWTP Operator (November 2, 2012)
- Ms. Janice Derby, CH2M HILL, Inc., Project Manager (December 3, 2012)
- Mr. Les Mull (ATK Tactical Systems Company, LLC [ATK], representative), Environmental Compliance Manager (January 21, 2013)

Mr. Blaisdell, Ms. Derby, and Mr. Mull are very involved with site O&M. They are not aware of any community concerns regarding the site or its administration and they are not aware of any complaints, violations, or other incidents related to the sites. In summary, the information generated from the interviews did not identify any concerns regarding the protectiveness of the various remedies contained in the RODs (**Appendix D**).

SECTION 3

Background

In support of the Five-Year Review, presentation of background information for ABL is necessary to identify for each OU/site the potential threats posed to human health and the environment at the time of the ROD. This allows for the remedy performance to be compared with the site conditions that the remedy was intended to address. Information presented in this section includes the facility description, physical characteristics of the facility, and other background information.

3.1 Facility Description

ABL is located in Rocket Center, Mineral County, in the northeastern part of West Virginia, approximately 10 miles southwest of Cumberland, Maryland, along the West Virginia and Maryland border (**Figure 3-1**). The facility lies between the North Branch Potomac River, to the north and west, and Knobly Mountain, to the south and east. Several small towns are located near the facility, including Short Gap, West Virginia, to the southeast, and Pinto, Maryland, to the north (**Figure 3-2**). ABL consists of approximately 1,634 acres of land with approximately 350 buildings (**Figure 3-3**). The facility is divided into two distinct operating plants:

- Plant 1, which occupies approximately 1,577 acres (including a large undeveloped area), is owned by the Navy and leased to its operator, ATK. Approximately 400 acres of Plant 1 (the majority of the developed portion of ABL) is in the floodplain of the North Branch Potomac River, where the river has cut into the base of Knobly Mountain.
- Plant 2, which occupies the remaining 57 acres, is both owned and operated by ATK and is not the subject of this Five-Year Review.

ABL was constructed in 1942 as a loading plant for 50-caliber machine gun ammunition for the United States Army. Since 1943, the facility has been used primarily for research, development, production, and testing of solid propellants and motors for ammunition, rockets, and armaments. Currently, the facility is operated as a highly automated production facility for tactical propulsion systems and composite and metal structures, including tactical rocket motors, gas generators, and conventional warheads (CH2M HILL, 2012a).

3.2 Physical Characteristics

3.2.1 Climate

Northeastern West Virginia has a semi-humid continental climate characterized by warm summers and cold winters and an even distribution of precipitation. At Cumberland, Maryland, the closest official meteorological station to ABL, the average annual temperature is 53 degrees Fahrenheit (°F), with an average annual precipitation of 35 inches. However, annual precipitation averages 50 inches along the divide in western Mineral County, where ABL is located. Annual evaporation averages approximately 33 inches in the vicinity of ABL. However, temperature, total precipitation, and evaporation are all variable within the region due to the mountainous topography.

3.2.2 Topography

The most-significant physiographic feature in the vicinity of ABL is Knobly Mountain, which flanks Plant 1 to the south and east. Knobly Mountain is the surface expression of a portion of the Wills Mountain anticlinorium, the anticlinal axis of which trends approximately N30°E and plunges to the southwest. This anticlinal axis is believed to bisect Plant 1.

3.2.3 Surface Water Resources

The predominant hydrologic feature in the vicinity of ABL is the North Branch Potomac River, which bounds the facility to the north and west. The elevation of the river ranges from approximately 655 feet above mean sea level (amsl), in the vicinity of Site 5, to approximately 645 feet amsl at the eastern end of the facility.

3.2.4 Geology and Hydrogeology

ABL is located in the Valley and Ridge Physiographic Province, near its western boundary with the Allegheny Plateau Province. The Valley and Ridge Physiographic Province is typified by more-resistant sandstones underlying ridges, and less-resistant shales and soluble limestones underlying the lowlands. The bedrock underlying ABL consists of shale, limestones, and sandstones. Alluvial deposits overlie the bedrock and make up the soil in the areas adjacent to the North Branch Potomac River.

Groundwater flow within the alluvial and shallow bedrock aquifers at ABL is generally toward the North Branch Potomac River, with no identifiable confining unit separating the two aquifers. Hydraulic data indicate that the North Branch Potomac River is a hydraulic divide and the natural discharge zone for both alluvial and bedrock groundwater.

Therefore, groundwater from ABL is believed to flow toward and discharge into the river, rather than flowing underneath the river. Furthermore, groundwater flow in areas on the other side of the river across from ABL (Maryland side) is indicated to be south toward the river, consistent with the understanding of the North Branch Potomac River as the discharge zone for local alluvial and bedrock groundwater (CH2M HILL, 2012a).

3.3 Surrounding Land and Resource Uses

The land surrounding ABL consists mainly of undeveloped woodland, cropland, and a limestone quarry. There are several residences several thousand feet across the North Branch Potomac River (north of Plant 1, Developed Area) and several residences and small businesses more than a mile west of Plant 1 (**Figure 3-2**).

The North Branch Potomac River is not used as a potable water supply in the vicinity of ABL, but may be used for recreational activities such as boating, fishing, and swimming. Residents across the North Branch Potomac River in Maryland use bedrock groundwater as a potable water source (CH2M HILL, 2012a).

3.4 Regulatory and Environmental Investigation Summary

ABL Plant 1 was identified as a Federal Facility on USEPA's National Priorities List (NPL) on May 11, 1994; Plant 2 is not on the NPL. A Federal Facilities Agreement for ABL was finalized between the Navy, USEPA Region III, and the WVDEP in January 1998. Currently, 10 sites and 13 OUs are defined under the Navy's IRP identified for CERCLA process activities (remedial investigation [RI], feasibility study [FS], and RA) at ABL. These sites and OUs are presented in **Table 3-1** and **Figure 3-3**.

The primary focus of this Five-Year Review Report is on the six OUs undergoing RAs: Site 1 (OU-3), Site 5 (OU-1 and OU-2), Site 10 (OU-5), Site 11 (OU-11), and Site 12 (OU-8). These sites are discussed in further detail in Sections 4, 5, 6, and 7. In addition, RODs requiring no further action (No Further Action) have been issued for five OUs at ABL, as presented in **Table 3-1**.

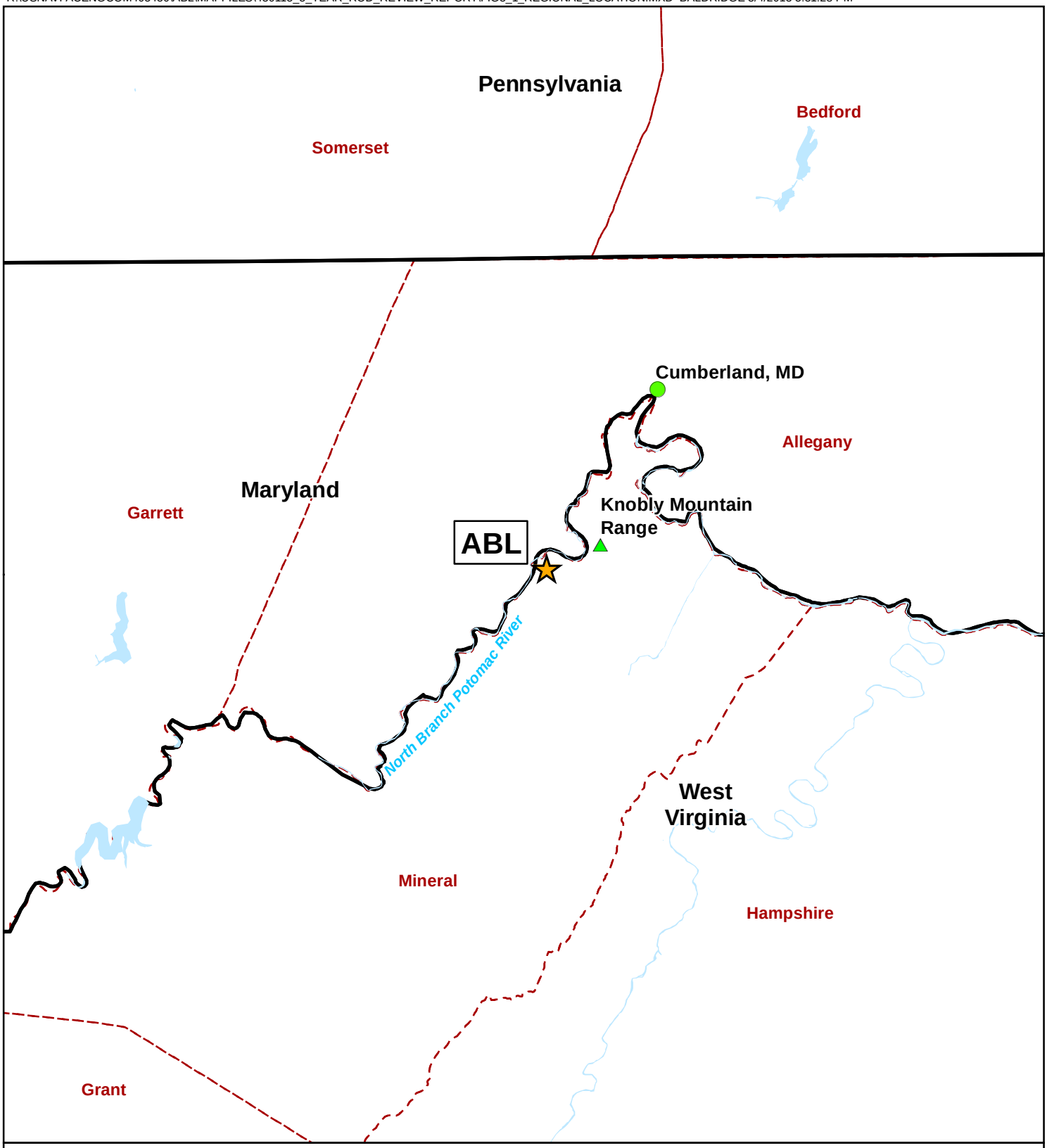
TABLE 3-1
Site and Operable Unit Summary
Allegany Ballistics Laboratory

Site Number	Site Identification	OU Number	OU Description	ROD Status (Yes/No)	
1	Northern Riverside Waste Disposal Area	3	Groundwater, Surface Water, and Sediment	Yes	ROD signed April 1997
		4	Soil	No	RI completed in July 2006. Engineering evaluation/cost analysis completed in 2012. FS is planned for fiscal year (FY) 13.
2	Previous Burning Grounds (1942–1949)	12	Groundwater and Soil	Yes	No Further Action ROD signed in 2008
3	Previous Burning Grounds (1950–1958)	13	Groundwater and Soil	Yes	No Further Action ROD signed in July 2007
4B	Spent Photographic Developing Solution Disposal Site	14	Groundwater and Soil	Yes	No Further Action ROD signed in November 2007
5	Inert Landfill	1	Landfill Contents and Surface Soil	Yes	ROD signed January 1997
		2	Groundwater, Surface Water, and Sediment	Yes	ROD signed December 2005
7	Former Beryllium Landfill	7	Groundwater and Soil	Yes	No Further Action ROD signed in September 2001
10	Former TCE Still at Building 157	5	Groundwater	Yes	ROD signed September 2005
		6	Soil	Yes	No Further Action ROD signed in 2007
11	Production Well “F”	11	Groundwater and Soil	Yes	ROD signed January 2012
12	Building 167 SWMUs (formerly Area of Concern [AOC] N)	8	Groundwater and Soil	Yes	ROD signed January 2012
13	Range Road Area (formerly SWMU 27A)	15	Groundwater	No	RI Underway

Notes:

- For additional information on the sites, OUs, and other areas of interest at ABL, refer to the *Final 2012 Site Management Plan, Allegany Ballistics Laboratory*, (CH2M HILL, 2012a).

R:\USNAVFACENGCOM405450\ABL\MAPFILES\430115_5_YEAR_ROD_REVIEW_REPORT\FIG3_1_REGIONAL_LOCATION.MXD BALDRIDGE 3/4/2013 5:31:28 PM



Legend
- States
- counties
- Water Area

N

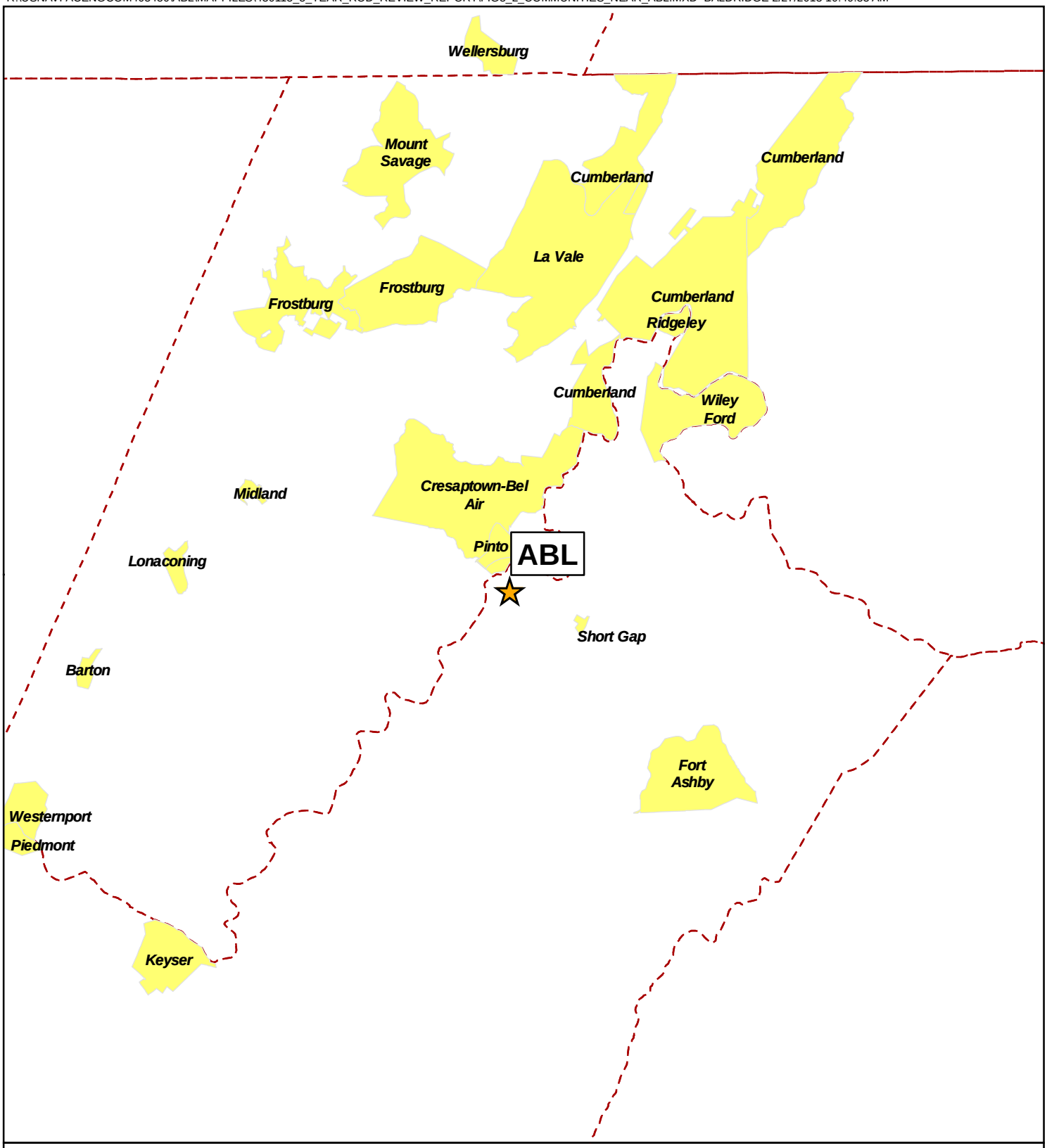
0 2.5 5 Miles

1 in = 5 miles

Figure 3-1
Regional Location Map
5 Year ROD Review Report
Allegany Ballistics Laboratory
Rocket Center, West Virginia

CH2MHILL

R:\USNAVFACENGCOM405450\ABL\MAPFILES\430115_5_YEAR_ROD_REVIEW_REPORT\FIG3_2_COMMUNITIES_NEAR_ABL.MXD BALDRIDGE 2/27/2013 10:49:33 AM



Legend

Counties

Populated Areas

N

0 1.5 3 Miles

1 in = 3 miles

Figure 3-2
Communities Near ABL
5 Year ROD Review Report
Allegany Ballistics Laboratory
Rocket Center, West Virginia

CH2MHILL

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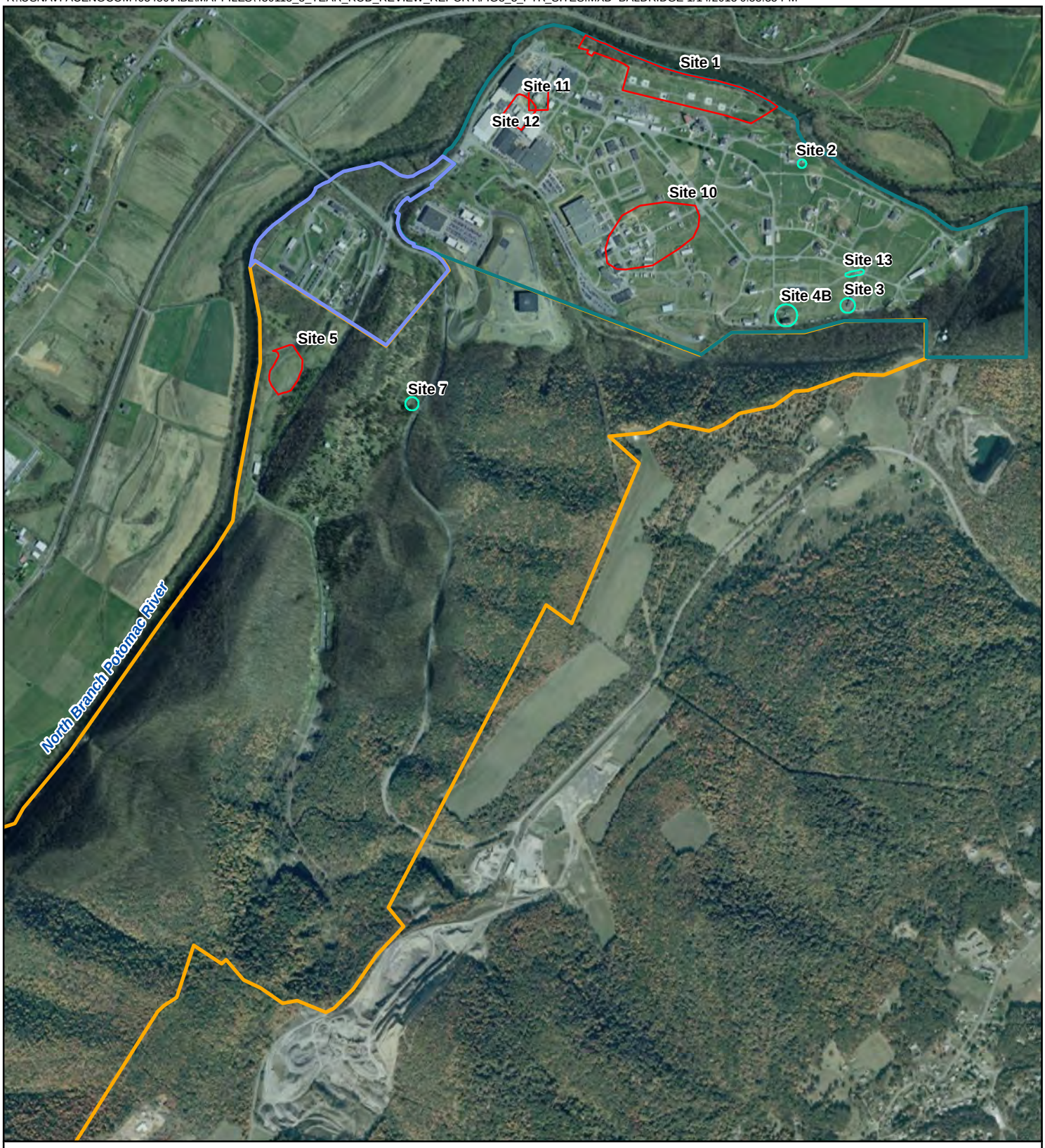


Legend

- Five Year Review IRP Site
- IRP Site
- Plant 1
- Plant 1 - Undeveloped Area
- Plant 2

N

0 800 1,600 Feet

1 inch = 1,600 feet

Figure 3-3
Location of IRP Sites
5 Year ROD Review Report
Allegany Ballistics Laboratory
Rocket Center, West Virginia

CH2MHILL

SECTION 4

Site 1 – Northern Riverside Waste Disposal Area (Operable Unit 3, Groundwater, Surface Water, and Sediment)

4.1 Site Chronology

A chronology of major events for Site 1 (OU-3) is provided as follows:

Date	Event
January 1983	Initial Assessment Study (IAS) (NEESA, 1983)
October 1987	Confirmation Study (CS) (Weston, 1987)
October 1989	Interim RI (Weston, 1989)
August 1995	Focused RI for Site 1 (CH2M HILL, 1995b)
January 1996	RI (CH2M HILL, 1996a)
September 1996	Focused Feasibility Study (FFS) for Site 1 Groundwater, Surface Water and Sediment (CH2M HILL, 1996c)
May 29, 1997	ROD for Site 1 Groundwater, Surface Water and Sediment (OU-3) (Navy, 1997b)
July 1997	Remedial Action Design (CH2M HILL, 1997a)
August 1998	Long-Term Monitoring (LTM) Plan, Site 1 (OU-3) (CH2M HILL, 1998a)
September 14, 1998	Groundwater extraction and treatment system began pumping
August 1999	Draft Addendum to Site 1 LTM Plan, Land Use Control (LUC) Implementation Plan (CH2M HILL, 1999)
March 2000	Contractor Closeout Report for Groundwater Remediation—Site 1 and 10 (OHM Remediation Services, Inc. [OHM], 2000)
July 2002	Construction, Excavation, and Groundwater Use Restriction Plan for IRP Sites (CH2M HILL, 2002c)
September 15, 2003	Navy signature date, Five-Year ROD Review Report, Second Five-Year Review (CH2M HILL, 2003a)
March 2004	LTM Report for Sites 1, 5, and 10 (CH2M HILL, 2004a)
April 2004	LTM Report for Sites 1 and 10 (CH2M HILL, 2004b)
September 2005	Perchlorate Treatment FS Assessment (CH2M HILL, 2005a)
June 2006	LTM Plan for Sites 1, 5, and 10 (CH2M HILL, 2006a)
September 2007	LTM Report for Sites 1, 5, and 10 (JVI AGVIQ/CH2M HILL, 2007b)
January 2008	Ecological Risk Assessment (ERA) – Step 7 Site 1 Surface Water and Sediment – North Branch Potomac River submitted (CH2M HILL, 2008a)
April 2008	*In Situ* Chemical Oxidation (ISCO) Pilot Study at the Solvent Disposal Pit Area of Site 1 (CH2M HILL, 2008b)
July 2008	LTM Plan Addendum for Sites 1, 5, and 10 (CH2M HILL, 2008c)
September 10, 2008	Navy signature date, Five-Year ROD Review Report, Third Five-Year Review (CH2M HILL, 2008d)
June 2010	Sampling and Analysis Plan (SAP), LTM Plan for Sites 1, 5, and 10 (CH2M HILL, 2010b)
June 2010	Construction Work Plan, Sites 1 and 10 GWTP Perchlorate Treatment Upgrade (JVIII AGVIQ/CH2M HILL, 2010)
November 2010	Interim Draft LTM Report for Sites 1, 5, and 10 (SB-RAC AGVIQ/CH2M HILL, 2010b)
April 2011	LTM Report for Sites 1, 5, and 10 (CH2M HILL, 2011a)
April 2011	Construction Completion Report, Sites 1 and 10 GWTP Perchlorate Treatment Upgrade (JV III AGVIQ/ CH2M HILL, 2011)
October 2011	SAP for Sites 1, 5, and 10 (Update 01) (CH2M HILL, 2011b)
May 2012	SAP, Site 1 Former Disposal Pit (FDP) 1 Investigation (SB-RAC AGVIQ/CH2M HILL, 2012a)
July 2012	SAP for Sites 1, 5, and 10 (Update 02) (CH2M HILL, 2012b)
October 2012	Interim CERCLA LTM Report for Sites 1, 5 and 10 (SB-RAC AGVIQ/CH2M HILL, 2012b)

4.2 Background

4.2.1 Description and History

Site 1 comprises approximately 11 acres adjacent to the North Branch Potomac River, along the northern border of the developed portion of Plant 1 (**Figure 3-3**). Site 1 contains several historical disposal units within the 8-acre Active Burning Ground (ABG) (**Figure 4-1**), which is currently permitted under the Resource Conservation and Recovery Act (RCRA) (RCRA Permit: WV0170023691). The remaining 3-acre area of Site 1 is identified as the Outside Active Burning Ground (OABG) area.

The ABG is currently fenced and predominantly covered by mowed grass. An asphalt road spans the east-west length of the fenced area. Six steel burn pans are present on the concrete pads (Burn Pads A through F) within the ABG area and are currently used to burn reactive waste (waste material that, because of its composition, may burn violently or detonate) generated at ABL. Between 1959 and the mid-1990s, eight earthen pads were used to burn solvents and explosive waste generated at the facility. Each burn pad reportedly handled specific types of wastes, including explosive wastes, chemical laboratory wastes, solid propellants, and reactive solvents. When burned, the reactive solvents were typically absorbed into sawdust prior to burning (CH2M HILL, 1996a). Historical disposal of spent acid and solvents also occurred in three FDPs (FDPs 1, 2, and 3) located in the southwestern portion of the ABG area. After materials percolated into the ground, it was reported that the pit was ignited to burn off reactive filtrate. The pits were operated during the 1970s and 1980s and have since been backfilled. Reportedly, TCE was the primary spent solvent that was disposed in the pits. According to facility personnel, approximately 1,000 pounds of TCE per month were disposed of in the pits between 1970 and 1978. Disposal of tetrachloroethene (PCE) and 1,1,1-trichloroethane (TCA) in the pits was less than 5 pounds per year. From 1972 to 1982, waste acids and bases generated by laboratory operations were disposed of by pouring them into the pits that had been lined with limestone. According to facility personnel, approximately 1 gallon of waste acid per month was disposed of in the pits until disposal practices ceased.

The OABG is currently covered in vegetation and not used. Historically the OABG area was used for various waste disposal activities. Based on these historical activities, the OABG was divided into three subareas (East OABG, Central OABG, and West OABG). The East and West OABG areas are former burn and disposal areas located along the river. Ash generated from historical inert burning within the East OABG area was subsequently spread and buried during successive disposal events. The West OABG area consists of a former open burn area, former burn cages, a western drainage ditch, and a drum storage pad. The former open burn area was enclosed behind a chain-link fence where solid wastes were burned. The resulting ash was subsequently spread along the lower floodplain of the West OABG area. Demolition debris, concrete rubble, drums, and rocket casings also were disposed in this area. The western drainage ditch is an earthen drainage culvert that cuts through the disposal area and drains surface/stormwater runoff from various areas inside Plant 1. Debris materials, including ash, are exposed in the walls of this culvert. Surface debris is also present throughout and to the east of the former open burn disposal area. The drum storage pad operated from 1979 to 1981, storing 55-gallon drums containing spent solvents and bottom sludge from solvent recovery stills. The asphalt drum storage pad did not have berms or sumps for containment. The drum storage pad is still present; however, it is no longer used for drum storage. Investigation activities have indicated no evidence of debris from disposal activities within the Central OABG area (CH2M HILL, 2008e).

4.2.2 Physical Characteristics

A conceptual site model (CSM) (**Figure 4-2**) has been developed to summarize the site conditions, contaminant distribution, transport pathways, potential receptors and exposure pathways, and land use data collected during site investigations. Site 1 is located on the alluvial plain above the North Branch Potomac River and has a range in elevation from 648 to 671 feet amsl. A portion of Site 1 is located in the 100-year floodplain of the river. Most of Site 1 is level; however, there is sloping topography and a human-made drainage in the far western portion of Site 1, referred to as the western drainage ditch. The northern edge of the site is moderately steep, sloping toward a lower-level terrace and the river. Site 1 is underlain by the following two distinct lithologies: (1) unconsolidated alluvial deposits of clay, silt, sand, and gravel (alluvial aquifer) and (2) predominantly shale

bedrock (bedrock aquifer). The average depth to bedrock at Site 1 is approximately 26 feet. The average depth to groundwater in the alluvial aquifer is 10 to 12 feet below ground surface (bgs). Depth to groundwater in the bedrock aquifer is approximately 20 feet bgs. Within the alluvial and bedrock aquifers, natural groundwater flow is toward and discharges to the North Branch Potomac River.

4.2.3 Land and Resource Uses

Currently, the ABG area of Site 1 is used to burn reactive waste in designated areas, managed under RCRA. The OABG area is not currently used. Groundwater extracted at Site 1 is treated at the Site 1 GWTP and either used by the facility's steam generation plant as boiler makeup water or discharged to the North Branch Potomac River. Groundwater is not currently used as a potable water supply at Site 1. Current and future land use of the site is not expected to change. LUCs are currently maintained within the area of restricted groundwater use at Site 1 and are inspected on a quarterly basis (**Figure 4-1**) (CH2M HILL, 2002b). The LUCs restrict land use and exposure to groundwater until concentrations of volatile organic compounds (VOCs) are reduced to levels that allow for unlimited use and unrestricted exposure.

The land surrounding ABL consists of undeveloped mountainous woodland to the south and east and several residences and farmland across the North Branch Potomac River to the north and west. In addition, an aeration basin treating wastewater from neighboring Maryland communities is located just west of Pinto, which is located across the river north of Site 1. The aeration basin discharges to the North Branch Potomac River. A limestone quarry and treatment works were formerly located to the northeast of Site 1 across the North Branch Potomac River. The operation has been abandoned for over 65 years. To the northwest of Site 1, a former industrial operation was located on top of the bedrock terrace. Several residences use groundwater wells within 1,000 feet of Site 1 across the river. Data collected in the bedrock aquifer north of the river do not indicate that dense non-aqueous phase liquid (DNAPL) contamination has migrated under the river (CH2M HILL, 1995b) and impacted residential water supplies (CH2M HILL, 1995c). Hydraulic data indicate that the North Branch Potomac River is a hydraulic divide and the natural discharge zone for both alluvial and bedrock groundwater.

4.2.4 History of Contamination

Site 1 contaminants have been detected in OU-3 media (Site 1 groundwater, surface water, and sediment) and OU-4 media (Site 1 soil) during numerous investigations conducted at ABL. The primary contaminants detected in all media at Site 1 are VOCs, with TCE being the most prevalent and detected at the highest concentrations. The ROD indicated that the former solvent disposal pits are considered the prime source of groundwater solvent contamination at Site 1. Additionally, the ROD also recognized that potential DNAPL source areas may be present hydraulically downgradient of the solvent disposal pits. Chlorinated solvents were not detected in soil underlying FDP 2; therefore, FDP 2 is not considered a source of contamination to groundwater, surface water, and sediment. Additionally, elevated TCE concentrations have been detected in unsaturated soil in the East, Central, and West OABG areas, indicating additional potential source areas.

VOCs have been detected in both the alluvial and bedrock aquifers. Groundwater detections include parent products PCE, TCE, and 1,1,1-TCA, as well as breakdown products 1,2-dichloroethene (DCE) (total), methylene chloride (MC), acetone, TCA, and vinyl chloride (VC). Concentrations of VOCs in the alluvial and bedrock aquifers were and continue to be highest in the vicinity of Burn Pads E and F, up to 200 feet downgradient of the FDPs (**Figures 4-3, 4-4, 4-5,** and **4-6**). Detected concentrations in both aquifers indicate the potential for stringers of DNAPL to be adsorbed to clay lenses in the alluvial aquifer and perched at the top of and within the fractures of the bedrock aquifer serving as a continuing source of contamination to groundwater. VOCs have also been detected in surface water and sediment of the North Branch Potomac River, likely resulting from Site 1 groundwater discharge to the river.

In addition to VOCs, metals (arsenic, chromium, lead, and mercury) have also been detected in Site 1 alluvial and bedrock aquifer groundwater. The semivolatile organic compound (SVOC) bis(2-ethylhexyl)phthalate and lead (surface water only) were also historically detected in surface water and sediment.

4.2.4.1. Site Risks

A Human Health Risk Assessment (HHRA) was conducted as part of the 1995 Focused RI to evaluate risks to human health from exposure to soil, groundwater, surface water, and sediment under current and potential future land use scenarios (CH2M HILL, 1995b). An ERA was conducted as part of the 1995 Focused RI to evaluate potential risks to the environment from exposure to soil, surface water, and sediment. Site 1 soil (OU-4) is currently under investigation. The summary of risks associated with groundwater, surface water, and sediment as documented in the ROD for Site 1, OU-3 (Navy, 1997b) is presented in the following subsections.

Human Health Risk

Current exposure scenarios evaluated consisted of current adult/child recreational user exposure to surface water and sediment. Hypothetical future exposure scenarios evaluated consisted of future adult/child resident exposure to groundwater. The exposure pathways evaluated were dermal contact, inhalation, and ingestion of alluvial and bedrock groundwater, and ingestion and dermal contact with surface water and sediment.

Cancer risks and non-cancer hazards associated with reasonable maximum exposure to groundwater were evaluated assuming the following two scenarios:

1. The bedrock aquifer by itself as the most-likely residential water supply (reasonable maximum exposure [RME] estimated using the most-contaminated wells from upper [1GW9] and lower [1GW13] bedrock aquifer)
2. Beneficial use of either the alluvial or bedrock aquifer as a possible water supply (RME estimated using the most-contaminated wells from alluvial [1GW3] and bedrock [1GW9] aquifers)

Cancer risks and non-cancer hazards associated with future potable use of alluvial and bedrock aquifer groundwater were identified for the adult and child resident under both scenarios. The primary contributor to the non-cancer hazard is TCE, and the primary contributors to cancer risk were TCE and VC. Risks were primarily associated with VOCs, particularly TCE. No cancer risks or non-cancer hazards associated with exposure to surface water and sediment were identified. Although not quantitatively evaluated, the ROD states that risks to future construction workers exposed to groundwater would be much lower than the calculated potential future residential risk.

Ecological Risk

A semi-quantitative ERA (Steps 1 and 2 of the ERA process) was completed to evaluate potential risks to ecological receptors through direct exposure to surface water and sediment. A semi-quantitative evaluation of potential risks to aquatic and wildlife receptors was conducted and results are summarized as follows:

- There is no complete pathway for ecological receptor direct exposure to groundwater; therefore, this exposure scenario was not evaluated.
- Organic (VOCs and SVOCs) and inorganic constituents were detected in surface water and sediment above initial screening levels indicative of potential chronic effects.

Although constituents in surface water and sediment exceeded screening levels, benthic macro-invertebrate and fish monitoring data did not indicate differences in the aquatic communities relative to reference area samples collected upstream of Site 1.

4.2.4.2. Initial Response

In August 1981, the State of West Virginia issued ABL a Consent Order (CO) for the improper storage of hazardous wastes at the Drum Storage Pad after reports surfaced of deteriorated drums releasing their contents to the surrounding ground surface. This resulted in a cleanup effort in which the spilled material from the drums was removed from the ground surface and contained in new drums. The drums were then disposed in accordance with RCRA regulations. ABL complied with the terms of the order.

Under the IRP, Site 1 was initially identified in the Initial Assessment Study (NEESA, 1983) as posing significant potential threat to human health or the environment. The IAS recommended Site 1 be further evaluated as part of a Confirmation Study.

A CO (#CO-R6,13,25-95-8) was signed on November 10, 1995, by the State of West Virginia and ABL for open burning of propellant and explosive (P/E) wastes and P/E-contaminated wastes. The CO compliance program required cessation of open burning of P/E-contaminated wastes by May 31, 1996. It also delineated three primary requirements—compliance demonstration, waste minimization and emissions mitigation, and utilization of an open burning management plan. However, the November 1995 CO was superseded by CO-R6, 13, 25-99-35A signed in 1999, under which open burning was allowed to be conducted until 2005. In 2005, a RCRA permit was issued by West Virginia allowing open burning. The permit establishes the maximum mass of P/E waste material allowed at one time for open burning at the ABG area.

4.2.5 Basis for Remedial Action

Based on the results of previous investigations, remedial action is warranted to protect public health, welfare, and the environment from actual or threatened releases of VOCs in groundwater and VOCs, SVOCs, and metals in surface water and sediment at Site 1 (OU-3). Site 1 soil (OU-4) is currently undergoing investigation and will be addressed under a separate action, as warranted.

4.3 Remedial Actions

4.3.1 Selected Remedy

The ROD for Site 1, OU-3 was signed in May 1997 (Navy, 1997b). The ROD summarized the risks to human health and the environment, established RAOs, and defined the selected remedy. The RAOs for Site 1 (OU-3) as stated in the ROD include the following:

- Prevent or minimize exposure of potential future onsite residents and construction workers to contaminated groundwater originating from Site 1
- Prevent or minimize offsite migration of contamination originating from Site

To achieve the RAOs, the selected remedy is comprised of the following components:

- Site-wide groundwater extraction, targeting DNAPLs, to prevent flow of contaminated groundwater into the river, thereby allowing contaminated surface water and sediments to undergo processes of volatilization, degradation, dilution, mixing, and sediment removal or erosion
- An aboveground treatment system, discharging treated groundwater to the North Branch Potomac River with a portion utilized by the facility for steam generation
- O&M of the treatment plant and extraction system
- LTM of sediment, surface water, groundwater, and treatment plant air emissions and water effluent
- LUCs to prohibit onsite use of untreated groundwater

The primary goals for the groundwater portion of the Site 1 (OU-3) remedial action are to hydraulically contain the likely DNAPL zones and to restore the maximum areal extents of the aquifers to beneficial use. Refinement of the extraction system may be necessary to establish more-efficient containment of the DNAPL zone. The primary goals of the sediment and surface water portion of the Site 1 (OU-3) remedial action is to stop the migration and discharge of the contaminated groundwater into the North Branch Potomac River and allow the natural processes of volatilization, degradation, dilution, mixing, and sediment removal or erosion to clean the river.

As outlined in the ROD, performance standards for evaluating the overall performance of the remedy are:

- Minimizing further migration of contaminants from suspected subsurface DNAPL source areas to the surrounding groundwater
- Minimizing further migration of the leading edge of the plume
- Capturing the site groundwater plume and preventing discharge of contaminated groundwater into the river
- Treatment of the extracted groundwater to meet regulatory discharge limits

- Compliance with regulatory emissions limits
- Monitoring surface water and sediment contaminant concentrations
- Comparison of risk from fish ingestion to baseline levels

Groundwater extraction shall be terminated after groundwater concentrations are below the maximum contaminant levels (MCLs), provided residual groundwater contamination does not represent an unacceptable risk to human and ecological receptors in the river. Pumping shall be restarted if concentrations increase above MCLs.

Due to the presence of DNAPLs, contaminant concentrations in the groundwater may not be remediated at or below MCLs across a portion of Site 1 in the anticipated timeframe. The DNAPL zone shall be hydraulically contained with continued groundwater extraction.

Compliance with ARARs includes the following:

- Aquifer contaminant concentrations must be reduced to or below MCLs before stopping the extraction system—this goal is complicated by the possible presence of DNAPLS providing a long-term source of continuing contamination
- Treatment to meet federal and state discharge limits
- Air stripper emissions to comply with federal and state air quality regulations

An institutional control (IC) to prohibit onsite use of untreated groundwater was implemented through the *Final Construction, Excavation, and Groundwater Use Restriction Plan for Installation Restoration Program Sites* (CH2M HILL, 2002c).[1] The IC will be maintained on all land and groundwater within the boundaries of Site 1 until the concentrations of VOCs in soil and groundwater have been reduced to levels that allow for unlimited use and unrestricted exposure. Groundwater, surface water, and sediment LTM and reporting will be completed to assess the progress of the remedy over time. Performance standards and expected outcomes for evaluating the overall performance of the remedy were established in the ROD and are summarized in **Table 4-1.**

4.3.2 Remedy Implementation

4.3.2.1. Groundwater Extraction and Treatment

The implementation of the remedy for Site 1, OU-3 was initiated in September 1997 and included the installation of 27 alluvial and seven bedrock extraction wells to contain potential source areas in both the alluvial and bedrock aquifers and construction of an above ground treatment system utilizing air stripping to treat extracted groundwater prior to discharge back to the North Branch Potomac River or use by the ABL facility boiler plant for steam generation. The alluvial aquifer extraction wells were installed along the downgradient edge of the alluvial aquifer plume within the ABG by the river bank while the bedrock aquifer extraction wells were installed upgradient of the alluvial extraction wells (**Figure 4-7**). The extraction system and treatment plant began continuous operation in September 1998. The Construction Completion Report was finalized in March 2000 (OHM, 2000).

4.3.2.2. Long-Term Monitoring

In accordance with the August 1998 LTM Plan, quarterly groundwater, surface water, and sediment sampling, bi-annual (once every 2 years) biota sampling, monthly hydraulic head monitoring, and monthly treatment plant influent and effluent sampling was initiated in June 1998 (CH2M HILL, 1998a). In January 1999, the groundwater, surface water, and sediment LTM program was optimized and tri-quarterly (every 9 months) sampling for this media was initiated.

In August 2005, a RCRA Part B permit was issued for continued operation of the ABG at ABL. As part of continued LTM optimization efforts, CERCLA groundwater LTM required by the ROD, and RCRA groundwater monitoring required by the Part B permit, were combined into a single program with respect to data collection and reporting. A revised LTM sampling plan was developed and the combined program includes sampling a subset of wells on a tri-quarterly basis, with an expanded set of wells sampled during the event that coincides with each Five-Year Review (CH2M HILL, 2006b). Bi-annual biota sampling, monthly hydraulic head monitoring, and monthly influent and effluent monitoring of the treatment system also continues to be conducted. Recently, in 2012, upon request from WVDEP, the Navy separated monitoring and reporting efforts associated with RCRA from the CERLCA LTM program (CH2M HILL, 2012a).

A Baseline Ecological Risk Assessment (BERA) through Step 7 of the ERA process was completed for surface water and sediment as a part of the soil Focused RI in 2006 (CH2M HILL, 2006c). No unacceptable ecological risks were identified for surface water. Copper, mercury, nickel, silver, zinc, and total polycyclic aromatic hydrocarbons (PAHs) were identified as ecological contaminants of concern (COCs) in sediment. In 2008, a BERA through Step 7 was completed using surface water, sediment, and biota data (benthic invertebrates) collected as part of ongoing LTM at Site 1 (CH2M HILL, 2008c). The results indicated the potential for low-level, chronic toxicity effects to the benthic invertebrate community in some areas of the river adjacent to Site 1, with no unacceptable risks or impacts to fish communities, plant communities, or upper trophic level receptors. The primary COCs were metals and PAHs. Based upon the results of the ERAs, modifications were made to the LTM program in 2006 (inclusion of additional benthic macroinvertebrate sampling methodologies), 2008 (inclusion of seven new surface water, seven new sediment, and two new biota sampling locations), and 2009 (inclusion of pore water sampling). In addition to continually evaluating the effectiveness of the remedy at Site 1, OU-3, an additional objective was included in the expanded LTM program—to assess the need for remedial actions within the river once remedial actions to address floodplain soils have been completed. The 2008 LTM event provided baseline data prior to the implementation of remedial actions for floodplain soils to help determine if impacts in the river are occurring and thus potentially need to be directly addressed, or if remedial actions for the floodplain soils/source areas, in conjunction with the groundwater extraction system, are sufficient to address any unacceptable ecological risks in the river.

4.3.2.3. Operation and Maintenance

Guidelines for conducting O&M activities at Site 1, OU-3 are provided in the *Final Environmental Facility User Manual for Groundwater Remediation – Site 1 Northern Riverside Waste Disposal Area, Volumes 1 through 4* (OHM, 1999). The primary O&M activities consist of the following:

- Maintenance of the treatment plant components and tracking of additional preventive maintenance
- Air stripper emissions calculations based on the VOC content of the GWTP influent and effluent
- Monthly and quarterly sampling and analysis of GWTP influent and effluent (conducted under the LTM Plan)
- Inspection and maintenance of groundwater extraction wells to ensure that they are capable of meeting pumping rates and other required set points

4.3.2.4. DNAPL Targeting

As part of the groundwater extraction system, pump and treat is being conducted to contain source areas, including FDPs 1 and 3, that are suspected to contain DNAPL. In 2005, a post-ROD ISCO pilot study was implemented at FDP 1 to evaluate the use of this technology to reduce contaminant mass in alluvial and bedrock aquifer groundwater. Specifically, the pilot study was designed to determine whether injected chemical oxidation reagents (sodium persulfate in the alluvial aquifer and potassium permanganate in the bedrock aquifer) could significantly shorten the expected duration of pumping by bringing about a sustained reduction in concentrations of VOCs in the source area.

The results of the ISCO pilot study indicated that, both within the alluvial and bedrock aquifers, an initial short-term reduction in chlorinated VOC concentrations did occur in some areas, but not in others. Over the 6 months of post-injection monitoring, there was a rebound of VOC concentrations, presumably due to two factors—DNAPL

remaining within the alluvial and bedrock aquifers and the limitations of obtaining good distribution of the oxidant in the aquifer matrices. Reagent distribution proved to be difficult in the alluvium because of the presence of fine-grained soils and the heterogeneous geology. Reagent distribution proved to be difficult in the bedrock because of the uncertainties related to the location of fractures and potential penetration of VOCs and/or DNAPL in the bedrock matrix. As a result, it was concluded that ISCO (or similar technology dependent on reagent distribution) was unlikely to bring about a significant and sustained reduction in VOC concentrations in a cost-effective manner at Site 1.

4.4 Progress Since Last Review

4.4.1 Follow-up Actions Since Last Five-Year Review

The previous Five-Year Review Report included the following protectiveness statement for Site 1, OU-3:

> *The remedy at Site 1 (OU-3), consisting of the existing groundwater extraction and treatment system, is protective of human health and the environment and is expected to continue to be protective in the future. Exposure pathways that could result in an unacceptable risk are being controlled through a combination of the groundwater extraction system, engineered land use controls (e.g., site security, fencing and signage) and institutional controls. An assessment of vapor intrusion at Site 1 (OU-3) will be performed, as part of an ABL facility-wide vapor intrusion assessment, to verify that there are no unacceptable risks associated with this pathway.*

Although the Five-Year Review concluded that the remedy is functioning as intended and protective of human health and the environment, issues and recommendations for follow-up actions were identified. **Table 4-2** presents the status of these recommendations and follow-up actions.

4.4.2 Results of Implemented Actions

This section is intended to provide a summary of O&M and LTM program activities at Site 1, OU-3, since the last Five-Year Review Report was completed in September 2008. O&M is currently performed in accordance with the *Final Environmental Facility User Manual for Groundwater Remediation – Site 1 Northern Riverside Waste Disposal Area, Volumes 1 through 4* (OHM, 1999). LTM is currently performed in accordance with the *Update 02 Sampling and Analysis Plan, Long-term Monitoring for Sites 1, 5, and 10* (CH2M HILL, 2012b).[2] In order to assess the performance of the remedial action, data and information were reviewed with respect to each of the performance standards identified in the ROD, as presented in **Table 4-1**.

Some of the data and information presented to assist in this Five-Year Review have previously been presented to the USEPA Region III and WVDEP through reports (such as LTM reports) or the ABL Tier 1 Partnering Team web site. The intention of this data review and analysis is to provide sound interpretations based on data previously provided for Site 1 (OU-3), as well as additional data collected but not previously provided. This report is not intended to fully present and document all data gathered. Data not previously provided will be subsequently documented through reports or the ABL Tier 1 Partnering Team web site, as applicable. As the primary COC at Site 1, based on previous investigations and risk assessments previously summarized in Section 4.2.4, TCE is used as the representative contaminant for monitoring historical trends and achievement of performance standards.

4.4.2.1. Groundwater Extraction and Treatment

Hydraulic Containment

To evaluate the effectiveness of hydraulic capture of the groundwater extraction system at Site 1 (OU-3), continuous hydraulic head measurements are collected from the North Branch Potomac River, extractions wells, and select alluvial/bedrock monitoring well pairs via pressure transducers. Additionally, manual hydraulic head measurements are collected on a monthly basis from 69 wells (extraction and monitoring) within Plant 1. Results of hydraulic head monitoring are presented to USEPA and WVDEP monthly via e-mail, including potentiometric surface maps and treatment plant influent/effluent and air emissions data.

[2] The July 2012 LTM Uniform Federal Policy (UFP)-SAP Update supersedes the previous LTM plans for Site 1.

TABLE 4-2
Site 1 Progress Action Items from 2008 Five-Year Review
Allegany Ballistics Laboratory

Issue from Third Five-Year Review Report, September 2008					Affects Protectiveness		Status – December 2012	
Issue No.	**Issue**	**Recommendations and Follow-up Actions**	**Party Responsible**	**Milestone Date**	**Current**	**Future**	**Action Taken and Outcome**	**Date of Action***
1	Land use restrictions (property use and access restrictions) to prohibit the onsite use of untreated groundwater have not been formally documented.	A formal LUC plan covering all media at Site 1 consisting of OU-3 and OU-4 will be completed upon finalization of the ROD for Site 1 soil (OU-4).	Navy USEPA WVDEP	November 2008	No	No	ROD for Site 1 soil (OU-4) is forthcoming. A Non-time-critical Removal Action (NTCRA) is planned to address VOC source area soil at FDPs 1 and 3. The draft Site 1 (OU-3) LUC RD will be finalized prior to completion of the Five-Year Review.	Pending OU-4 ROD signature
2	The data collected during the LTM program indicate that there is a potential negative influence on ecological receptors in the sediment of the river adjacent to Site 1. It is believed that these potential impacts are due to contaminants in Site 1 soil (OU-4) transported to the river by stormwater.	Monitoring of the river will continue and additional surface water, sediment, and biota sample locations will be added to the LTM program. The need for any actions in the river will be reassessed based upon the results of the modified LTM program following the forthcoming remedial action for Site 1 soil.	Navy USEPA WVDEP	December 2008	No	No	Additional surface water, sediment, and biota sampling locations were added to the LTM program per the July 2008 LTM Plan Addendum. Monitoring of the ecological health of the river adjacent to Site 1 is ongoing with samples collected as recent as August 2012. The overall site remedy for soil (OU-4) is currently being evaluated as part of an FS to be completed in FY 2013.	Complete
3	The expected timeframe for remedial action as described in the ROD was 30 years. Once the soil source areas are mitigated or removed, it is anticipated that the contaminant mass in groundwater will be reduced.	Following these actions, the groundwater remedial approach and associated timeframes will be assessed.	Navy USEPA WVDEP	Next Five-Year Review	No	No	Optimization of source area containment through groundwater extraction is ongoing. Action memorandum for NTCRA of source area soil at FDPs 1 and 3 signed in September 2012. Completion of NTCRA is scheduled for fall 2013. The overall site remedy for soil (OU-4) is currently being evaluated as part of an FS to be completed in FY 2013.	Currently underway

TABLE 4-2
Site 1 Progress Action Items from 2008 Five-Year Review
Allegany Ballistics Laboratory

Issue from Third Five-Year Review Report, September 2008					Affects Protectiveness		Status – December 2012	
Issue No.	**Issue**	**Recommendations and Follow-up Actions**	**Party Responsible**	**Milestone Date**	**Current**	**Future**	**Action Taken and Outcome**	**Date of Action***
4	The vapor intrusion pathway was not evaluated for Site 1 (OU-3), as part of the RI/FS for this site. Since there are potentially occupied buildings within 100 feet of the TCE plume in groundwater at Site 1, further evaluation of the vapor intrusion pathway to assess whether this pathway generates potentially unacceptable risk should be performed in accordance with current vapor intrusion guidance.	A vapor intrusion assessment for Site 1 should be performed based on TCE and other VOCs within the groundwater. This assessment will be included as part of an ABL facility-wide vapor intrusion assessment planned.	Navy USEPA WVDEP	Next Five-Year Review	No	No	The ABL facility-wide vapor intrusion assessment is ongoing. Preliminary buildings of interest have been identified and building surveys were conducted in December 2012. The initial building survey indicates that based upon building construction and current building use there are limited current potential vapor intrusion pathways at Site 1 although there is some uncertainty in the current plume configuration (see Section 4.5.2 for additional discussion). Results of the vapor intrusion assessment will be documented in a future vapor intrusion investigation report.	Ongoing
5	During a site inspection in March 2008 rubber seals on several extraction well vault lids were noted as falling off or appeared damaged, cracks were noted on several concrete well pads, and several wells were not properly locked.	All the rubber seals on the extraction well vault lids and concrete pads will be inspected and repaired as necessary. Extraction well locks will be inspected and damaged or rusted locks will be replaced. All extractions wells will remain locked at all times.	Navy	January 2009	No	No	Seals, vault lids, and concrete pads have undergone repairs since the last Five-Year Review, how deteriorations have been noted again. Extraction and monitoring well rehabilitation and equipment upkeep has been incorporated into annual O&M activities.	Complete

Ongoing items have been carried through to Table 4-6 and new milestone dates established.

To represent natural, non-pumping flow conditions in the alluvial and bedrock aquifers, aquifer contour maps from July 2001 during system shutdown are presented as **Figures 4-8** and **4-9**. Non-pumping groundwater flow conditions in the alluvial and bedrock aquifers from July 2001 indicate the predominant non-pumping groundwater flow direction at Site 1 is north-northeast in both aquifers toward the North Branch Potomac River.

To demonstrate the results of hydraulic capture monitoring, alluvial and bedrock aquifer contour maps were selected from each year inside the Five-Year Review period to represent seasonal variations and correspond with groundwater LTM events conducted in January 2008, October 2008, July 2009, April 2010, January 2011, October 2011, and August 2012 (**Figures 4-10** through **4-23**). The hydraulic capture in the alluvial aquifer is seen on **Figures 4-10**, **4-12**, **4-14**, **4-16**, **4-18, 4-20**, and **4-22**. The cone of depression generated from the line of extraction wells in January 2008, October 2008, and January 2011 results in a predominant bidirectional flow component across Site 1 toward the extraction wells, with water level elevations in the river above water levels in adjacent alluvial aquifer monitoring wells. Consequently, the major component of flow adjacent to the river during these times is south toward the extraction wells, rather than the natural, non-pumping flow direction north-northeast to the river. Results from the July 2009, April 2010, and October 2011 monitoring events show a cone of depression generated from the line of extraction wells; however, select downgradient monitoring wells (1GW34, 1GW37, and/or 1GW38) indicate groundwater elevations above the river elevation indicating some discharge of groundwater to the river in these locations. Of the VOCs detected in these locations PCE, TCE, 1,1-DCE, cis-1,2-DCE, and VC exceed the MCL. Although concentrations of VOCs in groundwater potentially discharged to the river may exceed the MCL, criteria for determining the impacts of periodic discharge on potential receptors in the river are not established. It is recommended that these criteria be established for future evaluation of remedy protectiveness.

The hydraulic capture in the bedrock aquifer is seen on **Figures 4-11**, **4-13**, **4-15**, **4-17**, **4-19**, **4-21**, and **4-23**. The cone of depression generated from the line of extraction wells in January 2008 and January 2011 results in a predominant flow component across Site 1 toward the extraction wells, with water level elevations in the river above water levels in adjacent bedrock aquifer monitoring wells. Consequently, the major component of flow adjacent to the river during these times is south toward the extraction wells, rather than the natural, non-pumping flow direction north-northeast to the river. Results from the October 2008, July 2009, April 2010, and October 2011 monitoring events show a cone of depression generated from the line of extraction wells; however, select downgradient monitoring wells (1GW04 and 1GW12) indicate groundwater elevations above the river elevation indicating some discharge of groundwater to the river in these locations. Of the VOCs detected at 1GW04, PCE and TCE exceed the MCL. Monitoring well 1GW12 is not sampled as part of the groundwater LTM; however, of the VOCs detected in adjacent bedrock aquifer monitoring well 1GW02, only TCE exceeds the MCL. Previous investigations in the area surrounding 1GW12 indicate this area may be subject to potential bedrock groundwater upwelling, which may create a hydraulic divide between the contaminated groundwater being extracted and flow of the river. Although concentrations of VOCs in groundwater potentially discharged to the river may exceed the MCL, criteria for determining the impacts of periodic discharge on potential receptors in the river are not established. It is recommended that these criteria be established for future evaluation of remedy protectiveness.

Groundwater Treatment

- Influent and effluent discharge monitoring for the GWTP is conducted monthly in order to ensure that (1) the effluent does not exceed permitted discharge requirements to the river and (2) the air emissions from the air stripper do not exceed the permitted yearly release value for VOCs. Influent and effluent samples are analyzed for VOCs and dissolved metals. Effluent samples are analyzed every 3 months for acute and chronic toxicity.

Discharge monitoring reports reviewed from January 2008 through July 2012 indicated no exceedances of effluent discharge limits and no observed toxicity effects for acute toxicity tests. Therefore, treatment of extracted groundwater has met the appropriate discharge limits, as identified in the performance standard.

Total VOCs emissions from the air stripper employed to remove VOCs from extracted groundwater are required to be less than 52,560 pounds per year (144 pounds per day). VOCs emissions calculations, which are presented within monthly discharge monitoring reports, were reviewed for the period from January 2008 through July 2012. These data indicated no exceedances of the 52,560 pounds per year value. The mass of VOCs removed for a 12-month period was typically around 500 pounds, well below the 52,560-pound-per-year threshold requirement. Monthly emissions since startup of the system are depicted on **Figure 4-24**.

4.4.2.2. Long-Term Monitoring

Since the last Five-Year Review, pore water sampling has been added to the LTM program. The major components of LTM at Site 1, OU-3 consist of the following items:

- **Groundwater Sampling –** Measurement of groundwater quality in the alluvial and bedrock aquifers to assess whether the groundwater extraction and treatment system is reducing contaminant concentrations to levels that would allow terminating groundwater extraction and treatment. Groundwater sampling is performed on a tri-quarterly (that is, every 9 months) basis at 10 monitoring wells (five in the alluvial aquifer and five in the bedrock aquifer). Additional monitoring/extraction wells (nine alluvial and five bedrock) are sampled every 5 years in support of the Five-Year Review. Groundwater samples are analyzed for VOCs.[3]
- **Surface Water and Sediment Monitoring** – Surface water and sediment sampling is performed at 10 locations in the North Branch Potomac River (five locations near the shoreline and five at mid-stream) to verify that contaminated groundwater is not discharging to the river. Sampling is performed on a tri-quarterly (that is, every 9 months) basis. Surface water samples are analyzed for VOCs, Target Analyte List (TAL) metals, including cyanide while sediment samples are analyzed for VOCs, SVOCs, TAL metals, including cyanide, acid volatile sulfide/simultaneously extracted metals (AVS/SEM), total organic carbon (TOC), pH, and grain size.
- **Pore Water Monitoring** – Pore water sampling is performed at seven locations in the North Branch Potomac River to verify that contaminated groundwater is not discharging to the river. Sampling is performed on a tri-quarterly (every 9 months) basis. Pore water samples are analyzed for VOCs.
- **Biota Monitoring** – Two types of biota sampling (fish tissue and benthic macroinvertabrates) are performed within the North Branch Potomac River to evaluate changes in the biota potentially due to contaminated groundwater discharge from Site 1 and evaluate potential risks to human health due to fish ingestion. Sampling is performed every 2 years. Benthic macroinvertabrate sampling is performed at eight locations in the river while the fish tissue sampling is performed from seven locations using a composite sampling approach to represent different reaches of the river relative to Site 1. Fish tissue samples are analyzed for VOCs, SVOCs, and TAL metals including cyanide.

4.4.2.3. Groundwater Sampling

To assess the achievement of performance standards in groundwater at Site 1 (OU-3), TCE concentrations in groundwater were reviewed from June 1998 (baseline sampling event prior to groundwater extraction) through August 2012. **Figures 4-3** and **4-4** present the baseline, pre-pumping, alluvial, and bedrock aquifer TCE plume configurations. **Figures 4-5** and **4-6** present the alluvial and bedrock TCE plume configurations as represented by a combination of data collected in March, June, and August 2012. Sampling events in 2012 were combined to provide for a larger data set for plume interpretation. Additionally, noted on **Figures 4-5** and **4-6** are the time-series TCE concentrations for the downgradient monitoring wells.

Concentrations of TCE remain above the MCL in the alluvial aquifer; however, concentrations of TCE in the alluvial aquifer, downgradient of the FDPs, have decreased since startup of the groundwater extraction system. Plume behavior within suspected source areas (including FDPs 1 and 3) is not assessed as part of the ongoing LTM program. Spatially, the size of the TCE plume (in exceedance of the MCL) has remained relatively similar to

[3] Groundwater samples are analyzed for VOCs as part of the CERCLA program. In addition, groundwater samples are also analyzed for explosives constituents and TAL metals in order to comply with the RCRA Part B permit groundwater monitoring requirements for the operation of burning grounds at Site 1. This alignment of the CERCLA and RCRA groundwater monitoring activities for Site 1 is discussed in more detail in Section 4.3.2.2.

baseline conditions (approximately 13 acres in 1998 and 10.5 acres in 2012). During the baseline sampling event, three notable hot-spot areas were detected on the western side of the plume. Since system startup, these hot spots have been reduced in size and relative concentration and now appear as only one remaining hot spot in the vicinity of Burn Pads E and F, downgradient of FDP 1. The maximum detected concentration of TCE has decreased from 153,200 micrograms per liter (µg/L) at 1EW14 during baseline sampling in 1998 to 33,300 µg/L at 1EW18 during the August 2012 LTM sampling event. As noted on **Figure 4-5**, TCE concentrations along the northern edge of the plume have generally decreased since baseline conditions, indicative of the extraction system's effectiveness in minimizing the overall discharge of contaminants to the river. Within the eastern side of the plume, some increases in TCE concentrations have been noted, including along the northern edge. These increases are not likely a result of contaminant migration from the western side of the plume or ineffectiveness of the extraction system; however, they may be reflective of groundwater flow reversal generated by the extraction system influencing transport from source areas (including VOCs detected in soils in the Eastern OABG).

Concentrations of TCE remain above the MCL in the bedrock aquifer; however, concentrations of TCE in the bedrock aquifer, in the vicinity of Burn Pads E and F, up to 200 feet downgradient of the FDPs, have decreased since startup of the groundwater extraction system. Plume behavior within suspected source areas (including beneath FDPs 1 and 3) is not assessed as part of the ongoing LTM program. Spatially, the size of the TCE plumes (in exceedance of the MCL) has remained similar to baseline conditions (11 acres in both 1998 and 2012). During the baseline sampling event, two distinct plumes were detected with a notable hot spot detected within the western plume in the vicinity of Burn Pad F up to 200 feet downgradient of FDP 1. Since system startup, TCE concentrations in the bedrock aquifer monitoring well 1EW29, located just downgradient of FDP1, have decreased from 56,700 µg/L at 1EW29 in 1998 to 4,290 µg/L at 1EW29 during the August 2012 LTM sampling event. During the 1998 baseline sampling event, the maximum detected concentration of TCE was bedrock monitoring well 1GW03, located downgradient of 1EW29; however, this monitoring well has not been sampled since the November 1999 event. The TCE concentrations in 1GW03 decreased from 72,300 J µg/L to 47,600 D µg/L in that time. As noted on **Figure 4-6**, TCE concentrations along the northern edge of the plume in the vicinity of Burn Pads E and F, up to 200 feet downgradient of the FDPs, have generally decreased since baseline conditions, indicative of the extraction system's effectiveness in minimizing the overall discharge of contaminants to the river. Within the eastern plume, some increases in TCE concentrations from baseline have been noted, particularly in the area of bedrock extraction well 1EW33. These increases may be reflective of groundwater flow reversal generated by the extraction system influencing transport from source areas (including VOCs detected in soils in the Eastern OABG).

Although not identified as COCs during the 1995 Focused RI, explosives including octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX), nitroglycerin, perchlorate and hexahydro-1,2,5-trinitro-1,3,5-triazine (RDX), have been detected in Site 1 alluvial and bedrock aquifer groundwater above human health risk-based screening criteria during RCRA LTM. The highest detected concentrations are generally noted in 1EW16 downgradient of existing Burn Pad E. Explosives were not detected and/or not analyzed for in groundwater prior to the ROD.

4.4.2.4. Pore Water, Surface Water, and Sediment Sampling

To assess the effectiveness of the extraction system in preventing or minimizing off site migration of contamination originating from Site 1 to the North Branch Potomac River, TCE concentrations in surface water and sediment were reviewed from June 1998 through August 2012, with the exception of pore water, which was initiated in September 2009. **Figure 4-7** presents the Site 1 surface water, sediment, and pore water sampling locations.

Pore Water Evaluation

TCE and its breakdown products have been detected in all pore water locations with the exception of 1PW05 and 1PW08. Maximum detected concentrations of VOCs were noted on the eastern end of the plume at 1PW02 in April 2010. Detected concentrations of VOCs at 1PW02 in April 2010 are in exceedance of those detected in nearby alluvial and bedrock aquifer monitoring wells at the same time, suggesting there may be a source of VOCs (i.e. VOCs in soil) present between the downgradient monitoring wells and the river at the eastern end of the

plume. VOCs have not been detected at this location during subsequent sampling events. Pore water does not exhibit any discernible trends over time (**Figure 4-25**); however, data indicate there are some detectable contaminant concentrations that may be transported through sediment pore water discharging to surface water. To determine if VOCs discharging through sediment pore water have the potential to adversely affect aquatic life in the river, concentrations of VOCs detected in pore water samples were compared to surface water literature-based screening values (**Table 4-3**). With the exception of cis-1,2-DCE in 2010 at 1PW02, all detected concentrations of VOCs in pore water were below screening values. Therefore, although some groundwater discharge to the river may periodically occur, data indicate impacts to the river are minimal.

As noted in Section 4.4.2.1, site-specific criteria for determining the impacts to potential receptors in the river from groundwater discharge are not established. It is recommended that these criteria be established for future evaluation of remedy protectiveness.

Surface Water Evaluation

TCE was detected in surface water prior to system startup; however, with the exception of two samples (SW02 at 0.35J in April 2004 and SW09 at 0.437J in April 2010), TCE has not been detected in surface water following initiation of the extraction system. Although TCE has been detected in pore water, its absence in surface water indicates VOCs periodically being discharged through sediment pore water to surface water are volatilizing, indicating impacts of periodic discharge to surface water are minimal. Additionally, metals concentrations noted in surface water are generally similar over time and consistent with upstream conditions. Surface water data suggests the groundwater extraction system is effective in addressing risk to the river that would potentially exist without the active containment of contaminated groundwater.

Sediment Evaluation

TCE has been detected in all sediment samples with the exception of 1SD1 and 1SD7A. The most-frequent and highest detections are generally noted adjacent to Site 1, closest to the ABG. Maximum concentrations of TCE were detected both before (1998) and immediately following (1999) startup of the groundwater extraction system, with the exception of the detected concentration of 10,000 micrograms per kilogram (µg/kg) at 1SD7 in October 2011 (**Figure 4-26**). All detections were below their respective baseline conditions in August 2012. With the exception of MC in October 2008, no VOCs have been detected in the upstream sample. SVOCs have been detected in all sediment sample locations, including the upstream sample. During the August 2012 sampling event, SVOCs were detected at 1SD2, 1SD2A, 1SD3, and 1SD7, adjacent to and downstream of the western drainage ditch. Data collected as part of the Focused RI for soil at Site 1 indicate that surface runoff from the former burn disposal area adjacent to the western drainage ditch is a transport pathway for SVOCs detected in soil to sediment (CH2M HILL, 2006c). Detected concentrations at sample locations 1SD2 were below baseline conditions. One SVOC was detected at sample location 1SD2A in August 2012 above baseline conditions; however, all other SVOCs previously detected were non-detect in 2012. SVOCs detected at sample location 1SD3 in August 2012 were above baseline conditions during which SVOCs were not detected at this sample location; however, they are generally similar to or below concentrations detected throughout LTM. Detected concentrations at 1SD7 are generally similar to or below concentrations detected in 2008, when this sample location was added to the LTM program. Metals concentrations in sediment are generally similar over time and consistent with upstream conditions. Sediment data suggests the groundwater extraction system is effective in reducing risk to the river that would potentially exist without the active containment of contaminated groundwater.

4.4.2.5. Biota Monitoring

Fish Tissue Evaluation

An HHRA, presented in **Appendix F**, was conducted using fish tissue data collected in 2010 and 2012 to evaluate potential risks associated with ingestion of free-swimming and bottom dwelling fish. Fish tissue sample locations are presented on **Figure 4-7**. Evaluations were conducted separately for each sampling event to assess potential risks associated with ingestion of fish from the North Branch Potomac River near Site 1 by local residents (children and adults). It was conservatively assumed that fish from the North Branch Potomac River are the primary source

of recreational fish that these local residents ingest (29 fish meals per year weighing ¼ pound each for child residents and 40 fish meals per year weighing ½ pound each for adult residents).

The fish ingestion values used for the risk calculations are the same as those used for previous HHRAs to allow for comparison of the results over time. The adult fish ingestion rate is the 95th percentile recreational freshwater anglers fish ingestion rate from the 1997 Exposure Factors Handbook. The mean range of recreational fish ingestion rates presented in the document is 5 to 51 grams/day, and the mean range of fish ingestion from rivers only in the document is 20 to 70 g/day. The value used for ABL falls within these ranges. The 95th percentile freshwater/estuarine fish ingestion rate for a 3- to <6-year-old child from the Child-specific Exposures Factors Handbook (USEPA, 2008) Table 10-1 is 12 grams/day. However, this is not only for recreationally caught fish. There are no values available for fish ingestion of recreationally caught fish by children in the Child-specific Exposure Factors Handbook or the 1997 Exposure Factors Handbook.

Data collected in 2010 indicate ingestion of free-swimming and bottom dwelling fish from the North Branch Potomac River adjacent to and downstream of Site 1 may result in unacceptable non-carcinogenic hazard and carcinogenic risk for local residents who exclusively use this area of the North Branch Potomac River as their only recreational fishing area. Risks are associated with constituents not related to historic Site 1 activities, including arsenic, chromium, thallium, vanadium, and benzo(a)pyrene, with thallium as the largest contributor. One sample (BIOTA1/5SD1) collected approximately 3,000 feet upstream of the State Route 956 bridge and just upstream of Site 5, located above all known influences from the ABL site, serves as the reference for the samples collected adjacent to and downstream of Site 1. Similar non-carcinogenic hazard and carcinogenic risk was identified for the upstream sample. Risks in the upstream sample are associated with arsenic, chromium, cobalt, thallium, and vanadium, with thallium as the largest contributor. The detected concentration of thallium in the upstream sample (1.7 J milligram per kilogram [mg/kg]) exceeded that of the only detection adjacent to or downgradient of Site 1 (1.1 J mg/kg at 1SD5).

Data collected in 2012 indicate ingestion of free-swimming and bottom-dwelling fish does not result in unacceptable non-carcinogenic hazards or carcinogenic risks. Although the hazard index (HI) for both the child and adult residential receptors who ingest free-swimming (child HI = 5, adult HI = 3) and the child who ingests bottom-dwelling fish (HI = 2) exceed USEPA's threshold value of 1, there were no target organ or target effect HIs that exceeded 1. The calculated excess lifetime cancer risk (ELCR) for both the child and adult are within USEPA's acceptable risk range. Calculated HIs and cancer risk values for upstream samples were below USEPA acceptable levels. Currently there is a state-wide fish advisory for West Virginia, associated with polychlorinated biphenyls (PCBs), mercury, selenium, and dioxin (http://www.wvdhhr.org/fish/Current_Advisories.asp), which are unrelated to Site 1 GW COCs.

Benthic Macroinvertebrate Evaluation

An ecological evaluation, presented in **Appendix G**, was conducted using benthic macroinvertebrate data collected in 2010 and 2012 to evaluate changes in river biota that may occur in response to containment of contaminated groundwater. Benthic macroinvertebrate data is collected using two methods—Hester-Dendy multi-plate sampling and kick net/jab sampling. Sampling methods are further detailed in **Appendix G**. Sample locations are presented on **Figure 4-7**. Both sample types are identified to the lowest practical taxonomic unit. Hester-Dendy samples are then quantitatively evaluated using Rapid Bioassessment Protocol (RBP) III methods and metrics (Plafkin et al., 1989). As part of the RBP assessment, habitat and bioassessment scores are calculated for each sampling station and compared against the scores for the upstream reference location (BIOTA 1) to assess habitat comparability and benthic community impairment. Results of the 2010 and 2012 assessments indicate that downstream habitats are comparable (score ≥95 percent of reference score) or supporting (score between 75 and 89 percent of reference score) when compared to upstream conditions. Bioassessment scores show slight to moderate impairment at four stations in 2010 and slight to moderate impairment at three stations in 2012. Data for 2010 and 2012 indicate a slight increase in benthic community impairment from baseline (1998) and previous assessment (2008) conditions. Community impairment is generally focused in the area adjacent to the center of the site (BIOTA 3A through BIOTA 4A). Kick net/jab samples are qualitatively evaluated using

selected metrics (i.e. total organisms and taxa richness) from Blocksom and Flotemersch (2005). Kick-net data do not indicate any community impairment adjacent to Site 1 in comparison to upstream community conditions. Jab data suggests slight impairment, reflected in lower totals and diversity of pollutant intolerant taxa, particularly BIOTA 4 and BIOTA 4A.

Results of the 2010 and 2012 benthic invertebrate evaluation indicate slight impairment of the benthic community in the vicinity of Site 1, particularly at BIOTA 4 and BIOTA 4A. However, analytical results do not indicate a correlation between constituent concentrations in bulk sediment and benthic community conditions. The lack of correlation may be due to temporal factors with sediment concentrations representing point estimates of exposure (both time and space) and benthic community data representing integrated exposures over long periods of time. As noted in the pore water evaluation presented in Section 4.4.2.4, with the exception of cis-1,2-DCE in 2010, VOCs detected in pore water do not exceed surface water screening levels and therefore impacts to the benthic community from this exposure pathway appear to be minimal. However, this pathway needs to be evaluated further using site-specific criteria to ensure long-term protectiveness. The variability noted in the condition of the benthic community over time is likely a reflection of the highly dynamic system characterized by periods of very high flow at irregular intervals throughout the year. These changes in flow conditions impact the biota that inhabit the river and the spatial and temporal aspects of the benthic invertebrate community observed.

4.4.2.6. Operation and Maintenance

In order to assess the overall functionality of the groundwater treatment system, regular O&M is performed as discussed in Section 4.3.2.3. To address reduced production rates resulting from bacterial buildup and increased maintenance requirements, well rehabilitation was conducted from April through May 2000 during which all of the alluvial wells at Site 1 were chemically treated and redeveloped and the extraction pumps and well-bore piping were removed, cleaned, and repaired or replaced. In January 2007, a new acid-feed system was installed as a preventive measure against future calcium carbonate scaling. In addition, two sections of effluent piping were replaced due to calcium scale accumulations within the piping that were affecting flow capacity. A new computer system and software were installed at the GWTP in 2007. Header line cleaning has been conducted in 2008, 2009, 2010, 2011, and 2012. In 2008, needed repairs to the treatment plant resulting from a lightning strike were conducted. In December 2010, two ion exchange resin vessels were installed in the treatment plant to treat perchlorate in groundwater detected during RCRA sampling; the granulated active carbon filter was taken out of commission during this upgrade. During O&M activities conducted in 2011 and 2012, pump rehabilitation/ replacement, flow meter replacement, and pressure transducer replacement was completed to address flow capacity and period capture loss of the system. Additionally, one main treatment plant pump was replaced.

4.4.3 Costs Associated with Site Operations and O&M Modifications

Costs associated with installation and startup of the groundwater extraction system were $5,460,834 (OHM, 2000), which is within the capital cost range estimated in the ROD. **Table 4-4** and **Figure 4-27** presents annual total O&M and LTM costs for Site 1 (OU-3).

TABLE 4-4
Estimated Annual O&M and LTM Costs for Site 1 (OU-3)
Allegany Ballistics Laboratory

Year	O&M Cost (Rounded to the Nearest $500)	LTM Cost (Rounded to the Nearest $500)	Total O&M and LTM Cost (Rounded to the Nearest $500)
1998 (Sept. – Dec.)	$143,500 *	--	$143,500 *
1999	$350,500 *	--	$350,500 *
2000	$485,000 *	--	$485,000 *
2001	$478,000 *	--	$478,000 *
2002	$586,000 *	--	$586,000 *
2003	$244,000	$92,000	$336,000
2004	$259,000	$174,000	$433,000
2005	$273,000	$101,000	$374,000

TABLE 4-4
Estimated Annual O&M and LTM Costs for Site 1 (OU-3)
Allegany Ballistics Laboratory

Year	O&M Cost (Rounded to the Nearest $500)	LTM Cost (Rounded to the Nearest $500)	Total O&M and LTM Cost (Rounded to the Nearest $500)
1998 (Sept. – Dec.)	$143,500 *	--	$143,500 *
2006	$274,000	$102,000	$376,000
2007	$630,000	$121,000	$751,000
2008	$287,500	$103,000	$390,500
2009	$268,500	$72,000	$340,500
2010	$1,417,000	$134,500	$1,551,500
2011	$363,500	$155,000	$518,500
2012	$180,500	$82,500	$263,000

Note: O&M Costs from 1998 to 2002 reflect the total of both O&M and LTM costs.

The annual O&M and LTM costs for this Five-Year Review period (from 2008 through 2012) are generally similar to the previous Five-Year Review period, but include the following major modifications:

- Treatment plant upgrade to address perchlorate in groundwater in 2010
- Alluvial well cleaning and extraction well rehabilitation, including electrical system and extraction pump replacement, contracted to address the loss of hydraulic containment in 2011

Costs in 2012 reflect efficiencies that were carried over from contract actions in previous years.

As discussed in more detail within the earlier Five-Year Review Reports, some of the major modifications contributing to the annual O&M and LTM costs in the earlier years included the following:

- Extraction well rehabilitation in 2000
- Leak detection sump evaluations in 2001 and 2002
- Installation of an acid wash system for the air stripper in 2001
- Installation of a new acid-feed system and piping replacement in 2007

With the exception of 2010, O&M costs for this Five-Year Review period track within the range of $250,000 to $550,000 per year estimated in the ROD.

4.5 Technical Assessment

This section presents the answers to the three questions defined for the Technical Assessment for Site 1 (OU-3) based primarily on information presented in Section 4.4.

4.5.1 Question A - Is the Remedy Functioning as Designed?

4.5.1.1. Remedial Action Performance

The remedial action at Site 1 (OU-3) is operating and functioning to meet the RAOs established in the ROD. Although some loss of capture is recognized, concentrations of VOCs, specifically TCE, in the downgradient edge of the plume have been reduced from baseline conditions, with the exception of the eastern edge of the plume. Increases in concentrations observed on the eastern edge of the plume may be reflective of groundwater flow reversal generated by the extraction system influencing transport from source areas (including VOCs detected in soils in the Eastern OABG). The remedial action is meeting those performance standards established in the ROD with the exception of capturing the site groundwater plume and preventing discharge of contaminated groundwater into the river. The remedy's effectiveness in meeting this performance standard cannot be fully evaluated because criteria for determining the impacts of periodic groundwater discharge on potential receptors in the river are not established. It is recommended that these criteria be established for future evaluation of remedy protectiveness. Although some loss of capture is periodically occurring, pore water data indicate that

current impacts to the river are minimal. Potential future impacts to the river will be evaluated upon completion of the soils remedial action.

Concentrations of contaminants in groundwater remain above the performance standards (MCLs) for the alluvial and bedrock aquifers at Site 1 (OU-3); therefore, operation of the extraction system for continued containment of the potential source areas is required. The dimension and shape of the alluvial and bedrock aquifer TCE plumes is generally similar to baseline conditions from June 1998; however, concentrations of TCE in the alluvial and bedrock aquifers, in the vicinity of Burn Pads E and F up to 200 feet downgradient of the FDPs, have decreased since startup of the groundwater extraction system.

4.5.1.2. System Operations and O&M

Current O&M procedures, as implemented, will maintain the effectiveness of the remedial action, specifically related to the containment of contaminated groundwater in the alluvial and bedrock aquifers. Annual O&M costs have tracked within the range of $250,000 to $550,000 per year estimated in the ROD, with the exception of 2010 when the treatment plant was modified to address perchlorate in groundwater.

4.5.1.3. Opportunities for Optimization

In 2011 and 2012, an FDP 1 investigation was conducted to refine the CSM and assess possible alternatives for optimizing the existing remedy. Soil investigation activities suggest multiple potential source areas within a heterogeneous geology, such as bedrock fractures, shallow clay lenses, and presence of a silt clay layer above bedrock. Results of the investigation baseline groundwater sampling indicate that the core of the TCE plume in the area of FDP1 is approximately 20 feet north of the northern boundary of FDP 1.

Alluvial aquifer pumping tests were conducted within FDP 1 to better understand the hydraulic characteristics of both the alluvial and bedrock aquifers for evaluation of optimization alternatives to the existing Site 1 groundwater extraction and treatment system. Results of the pump tests indicate groundwater extraction in the alluvium results in drawdown in both the alluvial and bedrock aquifers in the vicinity of FDP 1; therefore, modification of the extraction well network to include alluvial extraction within the FDP 1 area may capture VOC contaminated alluvial aquifer groundwater, as well as some contaminated groundwater from the underlying bedrock aquifer. If modification of the existing system were to be considered as part of site wide optimization, a pilot test to verify the simulation would be necessary.

The investigation also included ISCO bench-scale testing to evaluate the viability of using sodium persulfate, hydrogen peroxide, or sodium percarbonate to treat VOCs within the source area. The testing concluded that site-specific geochemical conditions were acceptable for iron activated sodium persulfate, alkaline activated sodium persulfate, and catalyzed hydrogen peroxide. The bench scale test did not evaluate the feasibility of reagent distribution within the site-specific geology.

4.5.1.4. Early Indicators of Potential Issues

In 2011, alluvial well cleaning and extraction well rehabilitation, including electrical system and extraction pump replacement, was completed to address the periodic loss of hydraulic containment. Additionally, the design pumping rate of the extraction system (247.5 gallons per minute [167 gallons per minute from Site 1 and 80.5 gallons per minute from Site 10]) is not being realized (the November 2012 average is 150 gpm for Sites 1 and 10) due to extraction well component malfunctioning and scaling in system conveyance piping. Maintenance activities are being performed to increase the extraction well flow rates and clean portions of the GWTP extraction system lines to enhance GWTP throughput. The extraction well component evaluation is anticipated to be an ongoing process resulting from an aging system. Conveyance piping scale removal was completed in February 2013 for a majority of the system. Following the cleaning, the average pumping rate increased from approximately 150 gpm to approximately 185 gpm, resulting in capture at all alluvial and bedrock aquifer extraction wells at Site 1 in February 2013 and March 2013. In addition to scaling in the pipes, other mechanical components are showing signs of age. One of two compressors has failed and one of two computer systems has failed while the other requires replacement for technical upgrades to current day standards. Such mechanical

failures are expected for equipment used since 1998 and indicate that additional failures may be pending for other equipment.

4.5.1.5. Implementation of Institutional Controls and Other Measures

An IC to prohibit onsite use of untreated groundwater was implemented through the *Final Construction, Excavation and Groundwater Use Restriction Plan for Installation Restoration Program Sites* (CH2M HILL, 2002c). This plan accomplishes compliance with the LUCs identified for groundwater at Site 1. Development of an LUC remedial design (RD), which formalizes documents LUC implementation details, will be completed following signature of the OU-4 ROD for soil.

4.5.2 Question B – Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and RAOs Used at the Time of Selection Still Valid?

Current and anticipated future land use is industrial and is expected to remain the same. The exposure assumptions used to develop the HHRA, although conservative (residential use), are reasonable given the current land use has not changed over time at Site 1.

As discussed during the previous Five-Year Review, recent USEPA guidance on vapor intrusion provided after the completion of the HHRA for Site 1 indicated that further assessment of vapor intrusion was warranted to ensure that risks to occupants of buildings located within 100 feet of TCE-contaminated groundwater are not unacceptable. As noted in **Table 4-2**, the ABL facility-wide vapor intrusion assessment is ongoing. As part of the assessment, preliminary buildings were identified based upon their proximity to (within 100 feet) a monitoring well with detected concentrations of VOCs above USEPA (2012a; 2012b) generic residential groundwater-to-indoor-air vapor intrusion screening levels (VISLs). The residential VISLs are groundwater concentrations that correspond to target indoor air concentrations in accordance with USEPA (2002) draft VI guidance and recent USEPA vapor intrusion technical documents. These groundwater to indoor air screening values are based on a cancer risk of 1×10^{-6}, a non-cancer hazard quotient of 1, and a residential exposure scenario using a generic attenuation factor of 0.001. Three buildings of interest, Buildings 831, 832, and 833 were identified at Site 1 (**Figure 4-28**) and included in the facility-wide phase 1 vapor intrusion assessment for ABL Plant 1. Building surveys were conducted at each preliminary building of interest in December 2012. Based on the results of the building surveys the Site 1, most of the preliminary buildings of interest have not been identified as final vapor intrusion buildings of interest where additional vapor intrusion investigation is recommended. However due to the uncertainty of the plume configuration, additional evaluation of the vapor intrusion pathway is recommended prior to determining the path forward associated with the vapor intrusion pathway at Site 1. Results of the building surveys and recommendations are summarized as follows.

- **Building 831 –** Building 831 is used as an instrumentation/control room for burning ground operations. One to four employees work in the building for a maximum of 5 hours per day during burning activities. The building footprint is approximately 65 square feet and the building has an 8-foot ceiling. The single-story building consists of one room. The building is a pre-fabricated steel chamber with metals walls, ceiling, and floor. The steel chamber sits on a concrete pad, which is elevated 6 inches above grade. Similar to a shipping container, the seams are fully welded; therefore, no joints exist in the metal floor of the building. Additionally, the metal floor is covered with tile. No expansion joints, cracks, or floor drains were observed during the survey. A mechanical forced air heating, ventilation, and air conditioning system provides a single air-conditioning zone in the building. The construction characteristics limit the potential for significant vapor intrusion; therefore, unless new groundwater data suggests that VOC concentrations are significantly higher than what is currently assumed, this building will not be identified as a final building of interest.
- **Buildings 832 and 833 –** Buildings 832 and 833 are storage sheds. Diesel fuel oil #20, WD-40, acetone, and actrel are used and/or stored in Building 832. The buildings are not regularly occupied. The building footprints are approximately 300 square feet and each building has an 8-foot ceiling. The single-story buildings each consist of one room. The walls and roof are made of steel. The foundations are concrete elevated 3 inches above grade. No expansion joints, cracks, or floor drains were observed during the survey. Four passive vents

in each building provide ventilation. Buildings 832 and 833 are not considered suitable for occupation; therefore, they were not identified as final buildings of interest.

- **Unidentified Building 1** – Structure was located as an open air cage. There is no complete vapor intrusion exposure pathway; therefore, this building was not identified as a final building of interest.
- **Unidentified Building 2** – Structure not located during the survey.
- **Unidentified Building 3** – Structure not located during the survey.

Because volatiles are present in the groundwater at Site 1 at concentrations above the generic residential VISLs, LUCs are recommended to prevent residential or industrial building construction without further vapor intrusion investigation and/or implementation of mitigation measures. Results of the vapor intrusion assessment will be documented in a future vapor intrusion investigation report.

During this Five-Year Review period, risk-based screening levels for evaluating human health risks associated with exposure to 1,4-dioxane were established. 1,4-dioxane is a stabilizer that was commonly used in chlorinated solvents, including TCE and 1,1,1-TCA, historically disposed of at Site 1. Groundwater, influent, and effluent samples collected at Site 1 in 1999, 2000, and 2005 were analyzed for 1,4-dioxane. All results were non-detect; however, the reporting limits ranged from 200 to 250,000 µg/L, exceeding the November 2012 Regional Screening Level (RSL) of 0.67 µg/L. Additional changes to toxicity and RSL values have been made during this Five-Year Review period (**Table 4-5**). These recent changes will be considered in refinement of the list of COCs at Site 1 (see issue and recommendation on **Table 4-8**). Because LUCs are in place prohibiting unrestricted use of the groundwater; these toxicity changes do not impact the current protectiveness of the remedy.

Biota (fish tissue) samples are collected every 2 years from the North Branch Potomac River to assess any impacts to biota and risks to human health from ingestion of these fish, potentially associated with Site 1. The assessment of risk associated with ingestion of these fish for the last two monitoring events (2010 and 2012) is presented in **Appendix F**. The risk calculations indicated that ingestion of fish from the North Branch Potomac River adjacent to and downstream of Site 1 may result in unacceptable non-carcinogenic hazards and carcinogenic risks, using the 2010 fish tissue data. However, these risks were similar to the risks associated with ingestion of the one fish sample collected upstream of the site. Additionally, ingestion of fish caught in 2012 would not result in any unacceptable risks.

Groundwater samples are analyzed for explosives as part of regular RCRA LTM at Site 1. As discussed in Section 4.4.2.3, perchlorate and RDX have been detected in groundwater above their respective tap water RSLs. Explosives were not detected in groundwater during the 1995 RI and, therefore, were not evaluated as part of the HHRA. Explosives were included in the 2001 ERA and no unacceptable risks for surface water and sediment were identified. To address the detections of explosives in groundwater, human health risks were calculated using the explosives data from groundwater samples collected in March, June, and September 2012 as a part of RCRA monitoring. Additionally, the groundwater data were also conservatively used to represent potential surface water data associated with discharge of groundwater from the site to the river, under natural flow (non-pumping conditions). Risks associated with potable use of the groundwater (adult and child resident), construction worker exposure to groundwater, and recreational use of the river (adult and child recreational user) were evaluated. The risk calculations were performed using standard HHRA methodology, following USEPA's Risk Assessment for Superfund (RAGs) Part A (USEPA, 1989), Part D (USEPA, 2001b), and Part E (USEPA, 2004).

The maximum detected concentration of each explosive detected in groundwater was compared to the USEPA tap water RSL (USEPA, 2012) to identify contaminants of potential concern (COPCs) for quantitative evaluation in the HHRA. If the maximum concentration exceeded the criteria, the constituent was identified as a COPC. Constituents that were not detected in any of the samples or were detected at concentrations less than the criteria were not identified as COPCs. RSLs based on non-carcinogenic effects were adjusted from an HI of 1 to an HI of 0.1 to account for exposure to more than one constituent with the same target organ. RSLs for cancer are based on a carcinogenic risk of 10^{-6} and were used as presented in the USEPA RSL Table. The COPC screening is shown in Table H.2 in **Appendix H**. As shown on this table, perchlorate and RDX were identified as COPCs. As shown in Tables H.3.1.RME,

reasonable maximum exposure (RME) concentrations (RME scenario portrays the highest level of human exposure that could reasonably be expected to occur) were calculated as the 95% UCL for the two COPCs using USEPA's ProUCL program. The RME concentrations were also used for the central tendency exposure (CTE) scenario, which is an evaluation of risk for individuals who have average or typical exposure to and intake of environmental media, as this exposure represents the best estimate of the "mean" concentration. The exposure parameters used for each of the scenarios evaluated in the risk calculation (potable use of groundwater by adult, child, and lifetime residents; dermal contact with groundwater by construction workers; and recreational exposure to surface water represented by groundwater data by adult and child recreational users) are shown in Tables H.4.1.RME through H.4.1.CTE. The non-carcinogenic reference doses (RfDs) and carcinogenic slope factors (CSFs) used to estimate the non-carcinogenic hazards and carcinogenic risks are shown in Tables H.5.1 and H.6.1.

The non-carcinogenic hazards and carcinogenic risks for each receptor are calculated in Tables H.7.1. RME through H.7.3. CTE and summarized in Tables H.9.1.RME through H.9.3.CTE. The risk estimates for each receptor are summarized in **Tables 4-6** and **4-7** and compared to USEPA's target HI of 1 and target estimated lifetime cancer risk (ELCR) range of 1×10^{-6} to 1×10^{-4}. Target organ specific non-carcinogenic hazards less than 1 are below USEPA's non-carcinogenic hazard target of 1. When the RME HI exceeded 1 or the RME ELCR exceeded 1×10^{-6} to 1×10^{-4}, risk estimates were calculated for the CTE scenario. Results of the HHRA indicate there are no potentially unacceptable risks to a construction worker exposed to groundwater in an excavation or adult/child recreational user exposure to surface water (assuming groundwater concentrations are representative of surface water). Future potable use of groundwater could result in potentially unacceptable non-carcinogenic hazards or carcinogenic risks associated with the perchlorate and RDX detected in the groundwater.

Although perchlorate and RDX were not identified as groundwater COCs in the ROD, and, therefore, the selected remedy was not designed to address these COCs, the identification of risks associated with perchlorate and RDX does not impact the overall protectiveness of the remedy. LUCs are currently in place to prevent exposure to groundwater. Additionally, the treatment plant was upgraded in 2010 to treat perchlorate via ion exchange and a discharge limit was established for this constituent. Currently the treatment plant is not designed to address RDX and a discharge limit has not been established. An evaluation using the same methodology as used for the discharge limits of other COCs was used to estimate a threshold value for discharge of RDX (1,689 µg/L maximum daily and 1,126 µg/L average monthly at 540 gallons per minute). RDX data from January 2008 influent sampling (detected concentration of 1.66 µg/L) was screened against this threshold and all detected concentrations were below the threshold. Therefore it can be reasonably assumed that in the short-term, there is no risk from discharge of RDX to the river. A discharge limit for RDX should be issued by the state and monitoring of this constituent added to the O&M plan.

The RAOs identified in the Site 1 (OU-3) ROD are being met. Although groundwater concentrations of VOCs remain above MCLs, concentrations of VOCs in the alluvial and bedrock aquifers are decreasing and contaminant migration has been minimized. The ROD identified an anticipated project life of 30 years to calculate net present worth, but indicated that because of the presence of DNAPL, compliance with chemical-specific ARARs (MCLs) for groundwater would not likely occur during the 30-year project life. The ROD projected that compliance with chemical-specific ARARs (MCLs) for a major portion of the aquifer could occur in 30 years with the remainder of the aquifer (DNAPL zone) to be hydraulically contained with continued groundwater extraction.

Recent findings indicate that multiple potential source areas may be present throughout the aquifers (clay lenses, riverside disposal areas, bedrock fractures, and FDPs). As indicated by the progress of the remedy since its start in 1998, it is expected that compliance with the chemical-specific ARARs for a major portion of the aquifer may not occur within 30 years of the ROD as a result of the presence of multiple potential source areas. The potential source areas will continue to be hydraulically contained with groundwater extraction.

TABLE 4-6
Summary of RME Cancer Risks and Hazard Indices (Explosives)
Allegany Ballistics Laboratory

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks >10^{-4}	Chemicals with Cancer Risks >10^{-5} and <10^{-4}	Chemicals with Cancer Risks >10^{-6} and <10^{-5}	HI	Chemicals with HI >1
Future Resident	Groundwater	Ingestion	NA				31	Perchlorate (30), RDX (1.3)
Adult		Dermal Contact	NA				0.4	
		Inhalation	NA				NA	
		Total	NA				32	
Future Resident	Groundwater	Ingestion	NA				73	Perchlorate (70), RDX (3)
Child		Dermal Contact	NA				0.9	
		Inhalation	NA				NA	
		Total	NA				74	
Future Resident	Groundwater	Ingestion	2.3E-04	RDX (2.3E-04)			NA	
Child/Adult		Dermal Contact	2.0E-06			RDX (2.0E-06)	NA	
		Inhalation	NA				NA	
		Total	2.3E-04				NA	
Future Construction	Groundwater	Ingestion	NA				NA	
Worker		Dermal Contact	2.4E-08				0.27	
		Inhalation	NA				NA	
		Total	2.4E-08				0.27	
Current/Future	Groundwater*	Ingestion	3.8E-07				0.08	
Recreational User		Dermal Contact	9.8E-08				0.037	
Adult		Inhalation	NA				NA	
		Total	4.7E-07				0.12	
Current/Future	Groundwater*	Ingestion	1.9E-07				0.11	
Recreational User		Dermal Contact	4.5E-08				0.045	
Child		Inhalation	NA				NA	
		Total	2.4E-07				0.16	

NA = Exposure assessment not applicable

*Groundwater data conservatively used to represent potential surface water data associated with discharge of groundwater from the site to the river.

TABLE 4-7
Summary of CTE Cancer Risks and Hazard Indices (Explosives)
Allegany Ballistics Laboratory

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks $>10^{-4}$	Chemicals with Cancer Risks $>10^{-5}$ and $<10^{-4}$	Chemicals with Cancer Risks $>10^{-6}$ and $<10^{-5}$	HI	Chemicals with HI >1
Future Resident	Groundwater	Ingestion	NA				15	Perchlorate (14)
Adult		Dermal Contact	NA				0.18	
		Inhalation	NA				NA	
		Total	NA				15	
Future Resident	Groundwater	Ingestion	NA				49	Perchlorate (47), RDX (2)
Child		Dermal Contact	NA				0.35	
		Inhalation	NA				NA	
		Total	NA				49	
Future Resident	Groundwater	Ingestion	8.3E-05		RDX (8.3E-05)		NA	
Child/Adult		Dermal Contact	4.8E-07				NA	
		Inhalation	NA				NA	
		Total	8.3E-05				NA	

NA = Exposure assessment not applicable

4.5.3 Question C – Has Any Other Information Come to Light that Could Call Into Question the Protectiveness of the Remedy?

There is no other information that calls into question the protectiveness of the remedy.

4.5.4 Technical Assessment Summary

Based on the information presented herein, the remedy for Site 1 (OU-3) is functioning as intended by the ROD containing source areas in the aquifer and minimizing the discharge of contaminated groundwater to the North Branch Potomac River. There have been no changes in the physical conditions of the site that would affect the protectiveness of the remedy. Exposure pathways that could result in an unacceptable risk are being controlled through a combination of the groundwater extraction system, engineered LUCs (such as site security, fencing, and signage), and ICs. Initial results of the ABL facility-wide vapor intrusion assessment indicate that based upon building construction and occupancy there are limited potential current vapor intrusion pathways at Site 1; however, there is uncertainty with alluvial and bedrock plume extent and contaminant concentrations. An expanded LTM well network to better understand the current plume configuration is recommended. This may impact the potential for vapor intrusion pathways in the vicinity of Site 1. In addition, potential future vapor intrusion risk has not yet been assessed.

4.6 Issues, Recommendations, and Follow-up Actions

Table 4-8 outlines the issues identified during this Five-Year Review and presents recommendations and follow-up actions for Site 1 (OU-3).

4.7 Protectiveness Statement

A protectiveness determination of the remedy at Site 1 (OU-3) consisting of containment (through groundwater extraction and treatment) with LUCs cannot be made at this time until further information regarding the vapor intrusion pathway is obtained. All other exposure pathways that could result in an unacceptable risk are being controlled through a combination of the groundwater extraction system, engineered LUCs (such as site security, fencing, and signage) and ICs. It is expected that the vapor intrusion assessment will be completed by December 2014, at which time a protectiveness determination will be made.

TABLE 4-8
Issues, Recommendations, and Follow-Up Actions for Site 1 (OU-3)
Allegany Ballistics Laboratory

Issue	Recommendations and Follow-up Actions	Party Responsible	Milestone Date*	Affects Protectiveness	
				Current	Future
Carry-over Issues from Third Five-Year Review Report, September 2008					
Land use restrictions (property use and access restrictions) to prohibit the onsite use of untreated groundwater have not been formally documented.	A formal LUC plan covering all media at Site 1 consisting of OU-3 and OU-4 will be completed upon finalization of the ROD for Site 1 soil (OU-4).	Navy USEPA WVDEP	June 2014	N	Y
The expected timeframe for RA as described in the ROD was 30 years. Once the soil source areas are mitigated or removed, it is anticipated that the contaminant mass in groundwater will be reduced.	Following these actions, the groundwater remedial approach and associated timeframes will be assessed.	Navy USEPA WVDEP	September 2016	N	N
The vapor intrusion pathway was not evaluated for Site 1 (OU-3), as part of the RI/FS for this site. Since there are potentially occupied buildings within 100 feet of the TCE plume in groundwater at Site 1, further evaluation of the vapor intrusion pathway to assess whether this pathway generates potentially unacceptable risk should be performed in accordance with current vapor intrusion guidance.	Basewide vapor intrusion evaluation currently underway.	Navy USEPA WVDEP	Dec 2014	Y	Y
Issues Identified During Current Five-Year Review					
RSL established for 1,4-dioxane. Historical data shows no detections; however, detection limit exceeds current RSL.	Evaluate the presence or absence of 1,4-dioxane in groundwater and treatment plant effluent using low concentration analytical method.	Navy USEPA WVDEP	June 2014 (Sampling in March 2014)	N	Y
Risk from chemicals associated with explosives has historically not been evaluated for groundwater; however RDX and perchlorate have recently been detected in groundwater as part of RCRA sampling.	Modify CERCLA LTM program to include analysis of perchlorate and RDX. Establish a discharge limit for RDX and, if necessary, evaluate upgrades to treatment plant to address RDX. Continue perchlorate treatment already installed.	Navy USEPA WVDEP	March 2014	N	Y
Uncertainty exists associated with alluvial and bedrock plume extent and contaminant concentrations.	Revise the Five-Year Review monitoring well network to include appropriate wells that could provide additional insight into the plume extent and contaminant concentrations.	Navy USEPA WVDEP	March 2014	N	Y
Compliance with chemical-specific ARARs (MCLs) for groundwater is not likely to occur within the assumed project life in the ROD.	Conduct optimization analysis to determine time frame and practicability of reaching MCLs. Develop method for utilizing groundwater data to evaluate the potential risks to receptors in the river during partial capture loss.	Navy USEPA WVDEP	September 2018 implementation (establish framework by December 2014)**	N	Y

TABLE 4-8
Issues, Recommendations, and Follow-Up Actions for Site 1 (OU-3)
Allegany Ballistics Laboratory

Issues	Recommendations and Follow-up Actions	Party Responsible	Milestone Date*	Affects Protectiveness	
				Current	Future
COCs were not specifically identified in the 1997 ROD.	Develop a COC list based on Remedial Investigation results and optimize the COC list and sampling approach based on LTM results. Document revised COCs in Memo to Site File or ESD, as appropriate.	Navy USEPA WVDEP	April 2014	N	N
The data collected during the LTM program indicate that there is a potential negative influence on ecological receptors in the sediment of the river adjacent to Site 1. It is believed that these potential impacts are due to contaminants in Site 1 soil (OU-4) transported to the river by stormwater.	The LTM program will be modified to better assess ecological risk following the forthcoming remedial action for Site 1 soil.	Navy USEPA WVDEP	Dec 2016	N	Y

*Achievement of milestone dates are dependent on Navy funding.

** Completion of the optimization analysis may be dependent upon completion of the soil remedy (removal of potential source areas along the river bank).

TABLE 4-1
Expected Outcomes for Site 1 (OU-3)
Five Year ROD Review
Allegany Ballistics Laboratory
Rocket Center, West Virginia

Risk									
Human Health	**Ecological**	**COC Requiring Action**	**Basis for Action**	**RAO**	**Remedy Component**	**Performance Standard Identified in ROD**	**Success Metric**	**Expected Outcomes**	**Exit Strategy**
Waste/Soil									
To be addressed under separate ROD									
Groundwater									
Ingestion of, dermal contact with, and inhalation of chlorinated VOCs in groundwater under future potable use scenario.	No exposure pathway.	VOCs	Cancer risk above 10-4 and/or non-cancer hazard above 1	Prevent or minimize exposure of potential future onsite residents and construction workers to contaminated groundwater originating from Site 1[1]	LUCs	Not identified.	Periodic inspection of the site to ensure compliance with LUCs	Continued industrial land use	Federal MCLs
				Prevent or minimize offsite migration of contamination originating from Site 1	Groundwater Extraction	Groundwater extraction will be terminated after contaminant levels in dissolved phase TCE plume are below MCLs, providing residual groundwater contaminant concentrations do not present unacceptable risk to human health and ecological receptors in the river.	Monitor hydraulic head in alluvial and bedrock aquifers to ensure hydraulic containment of leading edge of plume	Hydraulic containment to the maximum extent practicable	Continued industrial land use
							Monitor groundwater concentrations in dissolved phase plume to confirm reduction in contaminant concentrations		
							Monitor treatment plant effluent to ensure compliance with WVDEP discharge limits		
					Air Stripping	All emissions from air stripper shall be in compliance with Clean Air Act and requirements of WV Air Pollution Control Act.	Monitor treatment plant air emissions to ensure compliance with established air emissions standards		
					Targeting DNAPLs	Not identified.	Monitor hydraulic head in the alluvial and bedrock aquifers to ensure hydraulic containment of DNAPL source area		
Sediment/Surface Water									
No risk identified.	Potential risk to aquatic receptors from direct exposure to sediment and surface water[3]	Antimony, cadmium, anthracene, benzo(a)anthracene, benzo(a)pyrene, chrysene, flouranthene, TCE, and VC	EEQs above 1	Prevent or minimize offsite migration of contamination originating from Site 1	Groundwater Extraction	Surface water and sediment shall be monitored according to substantive requirements in NPDES permit.	Monitor surface water and sediment concentrations to confirm contaminant concentrations are not increasing from baseline/background conditions as a result of treated groundwater discharge to river	Hydraulic containment to the maximum extent practicable	Federal MCLs
						Surface water and sediment will be sampled to monitor contaminant concentrations.	Monitor surface water and sediment concentrations to confirm contaminant concentrations are not increasing from baseline/background conditions as a result of groundwater contaminant discharge to river		
						Risk evaluation for fish tissue will be completed before discharge of treated groundwater begins.	Monitor fish tissue concentrations to ensure no risks to human health as a result of groundwater contaminant and treated groundwater discharge to river[2]		
						Not identified.	Monitor benthic invertebrate community conditions to ensure no degradation from baseline/background conditions as a result of groundwater contaminant and treated groundwater discharge to river		

[1] Risk to the construction worker not evaluated as part of the HHRA contained in the Focused RI for Site 1. Risk is assumed, however to a lesser degree than calculated potential future residential risk.
[2] Fish tissue screening levels are used to determine constituents of potential concern (COPCs) and evaluate potential risks to human health from fish ingestion.
[3] Semi-quantitative risk assessment conducted.

TABLE 4-3

Ecological Screening Statistics - Pore Water

Five Year ROD Review

Allegany Balistics Laboratory

Rocket Center, West Virginia

Chemical	Range of Non-Detect Values	Frequency of Detection	Minimum Concentration Detected	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Arithmetic Mean	Standard Deviation of Mean	95% UCL (Norm)	Screening Value	Frequency of Exceedance[1]	Maximum Hazard Quotient[2]	95% UCL Hazard Quotient	Mean Hazard Quotient
Volatile Organic Compounds (UG/L)													
1,1,1-Trichloroethane	0.25 - 5.00	0 / 28	--	--	--	0.67	0.87	0.96	11.0	-- / --	0.45	0.09	0.06
1,1,2,2-Tetrachloroethane	0.20 - 5.00	0 / 28	--	--	--	0.66	0.88	0.94	610	-- / --	0.01	0.002	0.001
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	1.00 - 5.00	0 / 28	--	--	--	1.32	0.82	1.59	NSV	-- / --	NSV	NSV	NSV
1,1,2-Trichloroethane	0.25 - 5.00	0 / 28	--	--	--	0.67	0.87	0.96	1,200	-- / --	0.00	0.00	0.00
1,1-Dichloroethane	0.13 - 5.00	3 / 28	0.32	0.82	AS01-1PW04-R18	0.60	0.81	0.86	47.0	0 / 28	0.02	0.02	0.01
1,1-Dichloroethene	0.50 - 5.00	2 / 28	0.53	1.48	AS01-1PW02-R17	0.73	0.77	0.98	25.0	0 / 28	0.06	0.04	0.03
1,2,4-Trichlorobenzene	0.20 - 5.00	0 / 28	--	--	--	0.66	0.88	0.94	NSV	-- / --	NSV	NSV	NSV
1,2-Dibromo-3-chloropropane	1.00 - 5.00	0 / 28	--	--	--	0.98	0.75	1.22	NSV	-- / --	NSV	NSV	NSV
1,2-Dibromoethane	0.25 - 1.00	0 / 28	--	--	--	0.32	0.15	0.36	NSV	-- / --	NSV	NSV	NSV
1,2-Dichlorobenzene	0.13 - 5.00	0 / 28	--	--	--	0.63	0.90	0.92	NSV	-- / --	NSV	NSV	NSV
1,2-Dichloroethane	0.25 - 5.00	0 / 28	--	--	--	0.67	0.87	0.96	910	-- / --	0.01	0.001	0.001
1,2-Dichloropropane	0.20 - 5.00	0 / 28	--	--	--	0.66	0.88	0.94	525	-- / --	0.01	0.002	0.001
1,3-Dichlorobenzene	0.25 - 5.00	0 / 28	--	--	--	0.67	0.87	0.96	NSV	-- / --	NSV	NSV	NSV
1,4-Dichlorobenzene	0.13 - 5.00	0 / 28	--	--	--	0.63	0.90	0.92	NSV	-- / --	NSV	NSV	NSV
2-Butanone	4.21 - 7.20	5 / 25	2.69	3.59	AS01-1PW05-R18	2.73	0.41	2.87	14,000	0 / 25	0.00	0.00	0.00
2-Hexanone	2.50 - 5.00	0 / 25	--	--	--	1.95	0.63	2.17	99.0	-- / --	0.05	0.02	0.02
4-Methyl-2-pentanone	2.50 - 5.00	0 / 21	--	--	--	1.85	0.64	2.09	170	-- / --	0.03	0.01	0.01
Acetone	3.00 - 18.2	0 / 28	--	--	--	4.14	2.44	4.93	1,500	-- / --	0.01	0.003	0.003
Benzene	0.13 - 5.00	0 / 28	--	--	--	0.63	0.90	0.92	130	-- / --	0.04	0.01	0.005
Bromochloromethane	0.20 - 5.00	0 / 23	--	--	--	0.69	0.98	1.04	NSV	-- / --	NSV	NSV	NSV
Bromodichloromethane	0.25 - 5.00	0 / 28	--	--	--	0.67	0.87	0.96	NSV	-- / --	NSV	NSV	NSV
Bromoform	0.50 - 5.00	0 / 28	--	--	--	0.76	0.83	1.03	320	-- / --	0.02	0.003	0.002
Bromomethane	0.50 - 5.00	0 / 28	--	--	--	0.81	0.81	1.07	110	-- / --	0.05	0.01	0.01
Carbon disulfide	0.50 - 5.00	0 / 28	--	--	--	0.76	0.83	1.03	0.92	-- / --	**5.43**	**1.12**	0.82
Carbon tetrachloride	0.25 - 5.00	0 / 28	--	--	--	0.67	0.87	0.96	240	-- / --	0.02	0.004	0.003
Chlorobenzene	0.13 - 5.00	0 / 28	--	--	--	0.63	0.90	0.92	64.0	-- / --	0.08	0.01	0.01
Chloroethane	0.50 - 5.00	0 / 28	--	--	--	0.81	0.81	1.07	NSV	-- / --	NSV	NSV	NSV
Chloroform	0.13 - 5.00	0 / 28	--	--	--	0.63	0.90	0.92	28.0	-- / --	0.18	0.03	0.02
Chloromethane	0.50 - 5.00	0 / 28	--	--	--	0.76	0.83	1.03	5,500	-- / --	0.001	0.0002	0.0001
cis-1,2-Dichloroethene	0.25 - 5.00	14 / 28	0.58	640	AS01-1PW02-R17	33.2	122	72.5	590	1 / 28	**1.08**	0.12	0.06
cis-1,3-Dichloropropene	0.25 - 5.00	0 / 28	--	--	--	0.67	0.87	0.96	24.4	-- / --	0.20	0.04	0.03
Cyclohexane	0.50 - 5.00	0 / 28	--	--	--	0.93	0.79	1.18	NSV	-- / --	NSV	NSV	NSV
Dibromochloromethane	0.25 - 5.00	0 / 28	--	--	--	0.67	0.87	0.96	NSV	-- / --	NSV	NSV	NSV
Dichlorodifluoromethane (Freon-12)	0.25 - 5.00	0 / 28	--	--	--	0.73	0.85	1.00	NSV	-- / --	NSV	NSV	NSV
Ethylbenzene	0.25 - 5.00	0 / 28	--	--	--	0.67	0.87	0.96	290	-- / --	0.02	0.003	0.002

TABLE 4-3

Ecological Screening Statistics - Pore Water

Five Year ROD Review

Allegany Balistics Laboratory

Rocket Center, West Virginia

Chemical	Range of Non-Detect Values	Frequency of Detection	Minimum Concentration Detected	Maximum Concentration Detected	Sample ID of Maximum Detected Concentration	Arithmetic Mean	Standard Deviation of Mean	95% UCL (Norm)	Screening Value	Frequency of Exceedance[1]	Maximum Hazard Quotient[2]	95% UCL Hazard Quotient	Mean Hazard Quotient
Isopropylbenzene	0.25 - 5.00	0 / 28	--	--	--	0.67	0.87	0.96	2.60	-- / --	**1.92**	0.37	0.26
m- and p-Xylene	0.50 - 5.00	0 / 23	--	--	--	0.88	0.88	1.20	13.0	-- / --	0.38	0.09	0.07
Methyl acetate	1.00 - 5.00	0 / 28	--	--	--	0.98	0.75	1.22	NSV	-- / --	NSV	NSV	NSV
Methylcyclohexane	0.50 - 5.00	0 / 28	--	--	--	0.93	0.79	1.18	NSV	-- / --	NSV	NSV	NSV
Methylene chloride	0.25 - 5.00	0 / 28	--	--	--	0.73	0.85	1.00	2,200	-- / --	0.0023	0.0005	0.0003
Methyl-tert-butyl ether (MTBE)	0.50 - 5.00	0 / 28	--	--	--	0.76	0.83	1.03	11,070	-- / --	0.0005	0.0001	0.0001
o-Xylene	0.25 - 5.00	0 / 23	--	--	--	0.71	0.96	1.06	13.0	-- / --	0.38	0.08	0.05
Styrene	0.13 - 5.00	0 / 28	--	--	--	0.63	0.90	0.92	72.0	-- / --	0.07	0.01	0.01
Tetrachloroethene	0.25 - 5.00	0 / 28	--	--	--	0.67	0.87	0.96	98.0	-- / --	0.05	0.01	0.01
Toluene	0.25 - 5.00	0 / 28	--	--	--	0.67	0.87	0.96	9.80	-- / --	0.51	0.10	0.07
trans-1,2-Dichloroethene	0.25 - 5.00	7 / 28	0.26	2.49	AS01-1PW02-R17	0.65	0.80	0.91	590	0 / 28	0.004	0.002	0.001
trans-1,3-Dichloropropene	0.50 - 5.00	0 / 28	--	--	--	0.76	0.83	1.03	24.4	-- / --	0.20	0.04	0.03
Trichloroethene	0.25 - 5.00	7 / 28	0.15	28.2	AS01-1PW02-R17	1.61	5.27	3.30	47.0	0 / 28	0.60	0.07	0.03
Trichlorofluoromethane (Freon-11)	0.50 - 5.00	0 / 28	--	--	--	0.81	0.81	1.07	NSV	-- / --	NSV	NSV	NSV
Vinyl chloride	0.25 - 2.00	10 / 28	0.25	395	AS01-1PW02-R17	19.4	74.8	43.5	930	0 / 28	0.42	0.05	0.02
Xylene, total	3.00 - 3.00	0 / 5	--	--	--	1.50	0.0	1.50	13.0	-- / --	0.23	0.12	0.12

NSV - No Screening Value

1 - Count of detected samples exceeding or equaling Screening Value

2 - Shaded cells indicate hazard quotient based on reporting limits

TABLE 4-5

Comparison Between Prior Toxicity Values (2008) and 2013 Toxicity Values Under EPA Hierarchy (2003)

Five Year ROD Review

Allegany Ballistics Laboratory

Rocket Center, West Virginia

		Ingestion Exposure								Inhalation Exposure [a]								Tap Water RSL			
		RfDo				SFo				RfC				IUR				(TR =10-6; HQ = 0.1)			
		(mg/kg-day)				$(mg/kg\text{-}day)^{-1}$				(mg/m^3)				$(ug/m^3)^{-1}$				ug/L			
Chem Group	Analyte	2008	Ref	2013	Ref	2008	Ref	2013	Ref	2008	Ref	2013	Ref	2008	Ref	2013	Ref	2008	Ref	2013	Ref
VOC	1,1,1-Trichloroethane	2	I	2	I	--		--		5	I	5	I	--		--		910	nc	750	nc
VOC	1,1,2,2-Tetrachloroethane	0.004	P	0.02	I	0.2	I	0.2	I	--		--		0.000058	I	0.000058	C	0.067	ca	0.066	ca
VOC	1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	30	I	30	I	--		--		30	H	30	H	--		--		5900	nc	5300	nc
VOC	1,1,2-Trichloroethane	0.004	I	0.004	I	0.057	I	0.057	I	--		0.0002	X	0.000016	I	0.000016	I	0.24	ca	0.041	nc
VOC	1,1-Dichloroethane	0.2	P	0.2	P	0.0057	C	0.0057	C	--		--		0.0000016	C	0.0000016	C	2.4	ca	2.4	ca
VOC	1,1-Dichloroethene	0.05	I	0.05	I	--		--		0.2	I	0.2	I	--		--		34	nc	26	nc
VOC	1,2,3-Trichlorobenzene	n/a		0.0008	X	n/a		--		n/a		--		n/a		--		n/a		0.52	nc
VOC	1,2,4-Trichlorobenzene	0.01	I	0.01	I	0.0036	C	0.029	P	0.004	P	0.002	P	--		--		0.82	nc	0.39	nc
VOC	1,2-Dibromo-3-chloropropane	0.0002	P	0.0002	P	0.8	P	0.8	P	0.0002	I	0.0002	I	0.006	P	0.006	P	0.00032	ca	0.00032	ca
VOC	1,2-Dibromoethane	0.009	I	0.009	I	2	I	2	I	0.009	I	0.009	I	0.0006	I	0.0006	I	0.0065	ca	0.0065	ca
VOC	1,2-Dichlorobenzene	0.09	I	0.09	I	--		--		0.2	H	0.2	H	--		--		37	nc	28	nc
VOC	1,2-Dichloroethane	0.02	P	0.006	X	0.091	I	0.091	I	2.4	A	0.007	P	0.000026	I	0.000026	I	0.15	ca	0.15	ca
VOC	1,2-Dichloropropane	--		0.09	A	0.036	C	0.036	C	0.004	I	0.004	I	0.00001	C	0.00001	C	0.39	ca	0.38	ca
VOC	1,3-Dichlorobenzene	n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a	
VOC	1,4-Dichlorobenzene	--		0.07	A	0.0054	C	0.0054	C	0.8	I	0.8	I	0.000011	C	0.000011	C	0.43	ca	0.42	ca
VOC	1,4-Dioxane	--		0.03	I	0.011	I	0.1	I	3.6	A	0.11	A	--		0.0000077	C	6.1	ca	0.67	ca
VOC	2-Butanone	0.6	I	0.6	I	--		--		5	I	5	I	--		--		710	nc	490	nc
VOC	2-Hexanone	n/a		0.005	I	n/a		--		n/a		0.03	I	n/a		--		n/a		3.4	nc
VOC	4-Methyl-2-pentanone	0.08	H	0.08	H	--		--		3	I	3	I	--		--		200	nc	100	nc
VOC	Acetone	0.9	I	0.9	I	--		--		31	A	31	A	--		--		2200	nc	1200	nc
VOC	Benzene	0.004	I	0.004	I	0.055	I	0.055	I	0.03	I	0.03	I	0.0000078	I	0.0000078	I	0.41	ca	0.39	ca
VOC	Bromochloromethane	n/a		--		n/a		--		n/a		0.04	X	n/a		--		n/a		8.3	nc
VOC	Bromodichloromethane	0.02	I	0.02	I	0.062	I	0.062	I	--		--		--		0.000037	C	1.1	ca	0.12	ca
VOC	Bromoform	0.02	I	0.02	I	0.0079	I	0.0079	I	--		--		0.0000011	I	0.0000011	I	8.5	ca	7.9	ca
VOC	Bromomethane	0.0014	I	0.0014	I	--		--		0.005	I	0.005	I	--		--		0.87	nc	0.7	nc
VOC	Carbon disulfide	0.1	I	0.1	I	--		--		0.7	I	0.7	I	--		--		100	nc	72	nc
VOC	Carbon tetrachloride	0.0007	I	0.004	I	0.13	I	0.07	I	0.19	A	0.1	I	0.000015	I	0.000006	I	0.2	ca	0.39	ca
VOC	Chlorobenzene	0.02	I	0.02	I	--		--		0.05	P	0.05	P	--		--		9.1	nc	7.2	nc
VOC	Chloroethane	--		--		--		--		10	I	10	I	--		--		2100	nc	2100	nc
VOC	Chloroform	0.01	I	0.01	I	0.031	C	0.031	C	0.098	A	0.098	A	0.000023	I	0.000023	I	0.19	ca	0.19	ca
VOC	Chloromethane	--		--		0.013	H	--		0.09	I	0.09	I	0.0000018	H	--		1.8	ca	19	nc
VOC	cis-1,2-Dichloroethene	0.01	P	0.002	I	--		--		--		--		--		--		37	nc	2.8	nc
VOC	cis-1,3-Dichloropropene	0.03	I	0.03	I	0.1	I	0.1	I	0.02	I	0.02	I	0.000004	I	0.000004	I	0.43	ca	0.41	ca
VOC	Cyclohexane	--		--		--		--		6	I	6	I	--		--		1300	nc	1300	nc
VOC	Dibromochloromethane	0.02	I	0.02	I	0.084	I	0.084	I	--		--		--		0.000027	C	0.8	ca	0.15	ca
VOC	Dichlorodifluoromethane (Freon-12)	0.2	I	0.2	I	--		--		0.2	H	0.1	X	--		--		39	nc	19	nc
VOC	Ethylbenzene	0.1	I	0.1	I	0.011	C	0.011	C	1	I	1	I	0.0000025	C	0.0000025	C	1.5	ca	1.3	ca
VOC	Isopropylbenzene	0.1	I	0.1	I	--		--		0.4	I	0.4	I	--		--		68	nc	39	nc
VOC	m- and p-Xylene	--		0.2	(4)	--		--		0.7	C	0.1	(4)	--		--		150	nc	19	nc
VOC	Methyl acetate	1	H	1	X	--		--		--		--		--		--		3700	nc	1600	nc
VOC	Methylcyclohexane	n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a	
VOC	Methylene chloride	0.06	I	0.006	I	0.0075	I	0.002	I	1.1	A	0.6	I	0.00000047	I	0.00000001	I	4.8	ca	8.4	nc
VOC	Methyl-tert-butyl ether (MTBE)	--		--		0.0018	C	0.0018	C	3	I	3	I	0.00000026	C	0.00000026	C	12	ca	12	ca
VOC	o-Xylene	2	H	0.2	(4)	--		--		0.7	C	0.1	(4)	--		--		140	nc	19	nc
VOC	Styrene	0.2	I	0.2	I	--		--		1	I	1	I	--		--		160	nc	110	nc
VOC	Tetrachloroethene	0.01	I	0.006	I	0.54	C	0.0021	I	0.27	A	0.04	I	0.0000059	C	0.00000026	I	0.11	ca	3.5	nc
VOC	Toluene	0.08	I	0.08	I	--		--		5	I	5	I	--		--		230	nc	86	nc
VOC	trans-1,2-Dichloroethene	0.02	I	0.02	I	--		--		0.06	P	0.06	P	--		--		11	nc	8.6	nc
VOC	trans-1,3-Dichloropropene	0.03	I	0.03	I	0.1	I	0.1	I	0.02	I	0.02	I	0.000004	I	0.000004	I	0.43	ca	0.41	ca
VOC	Trichloroethene	--		0.0005	I	0.013	C	0.046	I	--		0.002	I	0.000002	C	0.0000041	I	1.7	ca	0.26	nc
VOC	Trichlorofluoromethane(Freon-11)	0.3	I	0.3	I	--		--		0.7	H	0.7	H	--		--		130	nc	110	nc
VOC	Vinyl chloride	0.003	I	0.003	I	0.72	I	0.72	I	0.1	I	0.1	I	0.0000044	I	0.0000044	I	0.016	ca	0.015	ca
Explo	1,3,5-Trinitrobenzene (1,3,5-TNB)	0.03	I	0.03	I	--		--		--		--		--		--		110	nc	46	nc

TABLE 4-5

Comparison Between Prior Toxicity Values (2008) and 2013 Toxicity Values Under EPA Hierarchy (2003)

Five Year ROD Review

Allegany Ballistics Laboratory

Rocket Center, West Virginia

		Ingestion Exposure								Inhalation Exposure [a]								Tap Water RSL			
		RfDo				SFo				RfC				IUR				(TR =10-6; HQ = 0.1)			
		(mg/kg-day)				$(mg/kg\text{-}day)^{-1}$				(mg/m^3)				$(ug/m^3)^{-1}$				ug/L			
Chem Group	Analyte	2008	Ref	2013	Ref	2008	Ref	2013	Ref	2008	Ref	2013	Ref	2008	Ref	2013	Ref	2008	Ref	2013	Ref
Explo	1,3-Dinitrobenzene (1,3-DNB)	0.0001	I	0.0001	I	--		--		--		--		--		--		0.37	nc	0.15	nc
Explo	2,4,6-Trinitrotoluene (2,4,6-TNT)	0.0005	I	0.0005	I	0.03	I	0.03	I	--		--		--		--		1.8	nc	0.76	nc
Explo	2,4-Dinitrotoluene (2,4-DNT)	0.002	I	0.002	I	--		0.31	C	--		--		--		0.000089	C	7.3	nc	0.2	ca
Explo	2,6-Dinitrotoluene (2,6-DNT)	0.001	P	0.0003	X	--		1.5	P	--		--		--		--		3.7	nc	0.042	ca
Explo	2-Amino-4,6-dinitrotoluene (2-Am-DNT)	0.002	(3)	0.002	(3)	--		--		--		--		--		--		7.3	nc	3	nc
Explo	2-Nitrotoluene (2-NT)	0.0009	P	0.0009	P	0.22	P	0.22	P	--		--		--		--		0.31	ca	0.27	ca
Explo	3-Nitrotoluene (3-NT)	0.02	P	0.0001	X	--		--		--		--		--		--		73	nc	0.13	nc
Explo	4-Amino-2,6-dinitrotoluene (4-Am-DNT)	0.002	(3)	0.002	(3)	--		--		--		--		--		--		7.3	nc	3	nc
Explo	4-Nitrotoluene (4-NT)	0.004	P	0.004	P	0.016	P	0.016	P	--		--		--		--		4.2	ca	3.7	ca
Explo	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	0.003	I	0.003	I	0.11	I	0.11	I	--		--		--		--		0.61	ca	0.61	ca
Explo	Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	0.004	P	0.004	P	--		--		--		--		--		--		15	nc	6.1	nc
Explo	Nitrobenzene (NB)	0.0005	I	0.002	I	--		--		0.002	H	0.009	I	--		0.00004	I	0.34	nc	0.12	ca
Explo	Nitroglycerin	0.0001	P	0.0001	P	0.017	P	0.017	P	--		--		--		--		0.37	nc	0.15	nc
Explo	Nitroguanadine	0.1	I	0.1	I	--		--		--		--		--		--		370	nc	160	nc
Explo	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	0.05	I	0.05	I	--		--		--		--		--		--		180	nc	78	nc
Explo	Perchlorate	0.0007	I	0.0007	I	--		--		--		--		--		--		2.6	nc	1.1	nc
Explo	PETN	n/a		0.002	P	n/a		0.004	X	n/a		--		n/a		--		n/a		3	nc
Metal	Aluminum	1	P	1	P	--		--		0.005	P	0.005	P	--		--		3700	nc	1600	nc
Metal	Antimony	0.0004	I	0.0004	I	--		--		--		--		--		--		1.5	nc	0.6	nc
Metal	Arsenic	0.0003	I	0.0003	I	1.5	I	1.5	I	0.00003	C	0.000015	C	0.0043	I	0.0043	I	0.045	ca	0.045	ca
Metal	Barium	0.2	I	0.2	I	--		--		0.0005	H	0.0005	H	--		--		730	nc	290	nc
Metal	Beryllium	0.002	I	0.002	I	--		--		0.00002	I	0.00002	I	0.0024	I	0.0024	I	7.3	nc	1.6	nc
Metal	Cadmium	0.0005	I	0.0005	I	--		--		--		0.00001	A	0.0018	I	0.0018	I	1.8	nc	0.69	nc
Metal	Calcium	n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a	
Metal	Chromium	--		--		--		--		--		--		0.012	I	--		--		--	
Metal	Chromium(III)	1.5	I	1.5	I	--		--		--		--		--		--		5500	nc	1600	nc
Metal	Chromium(VI)	0.003	I	0.003	I	--		0.5	J	0.000008	I	0.0001	I	0.084	I	0.084	S	11	nc	0.031	ca
Metal	Cobalt	0.0003	P	0.0003	P	--		--		0.000006	P	0.000006	P	0.009	P	0.009	P	1.1	nc	0.47	nc
Metal	Copper	0.04	H	0.04	H	--		--		--		--		--		--		150	nc	62	nc
Metal	Cyanide	0.02	I	0.0006	I	--		--		--		0.0008	(6)	--		--		73	nc	0.14	nc
Metal	Iron	0.7	P	0.7	P	--		--		--		--		--		--		2600	nc	1100	nc
Metal	Lead	--		--		--		--		--		--		--		--		--		--	
Metal	Magnesium	n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a	
Metal	Manganese	0.024	I	0.024	S	--		--		0.00005	I	0.00005	I	--		--		88	nc	32	nc
Metal	Mercury	0.0003	I	0.0003	I	--		--		--		0.0003	S	--		--		1.1	nc	0.43	nc
Metal	Nickel	0.02	I	0.02	I	--		--		--		0.00009	A	--		0.00026	C	73	nc	30	nc
Metal	Potassium	n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a	
Metal	Selenium	0.005	I	0.005	I	--		--		--		0.02	C	--		--		18	nc	7.8	nc
Metal	Silver	0.005	I	0.005	I	--		--		--		--		--		--		18	nc	7.1	nc
Metal	Sodium	n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a	
Metal	Thallium	0.000065	(5)	0.00001	X	--		--		--		--		--		--		0.24	nc	0.016	nc
Metal	Vanadium	0.005	(2)	0.005	(2)	--		--		--		0.0001	A	--		--		18	nc	6.3	nc
Metal	Zinc	0.3	I	0.3	I	--		--		--		--		--		--		1100	nc	470	nc
PCB	Aroclor-1016	0.00007	I	0.00007	I	0.07	I	0.07	(1)	--		--		0.00002	I	0.00002	(1)	0.26	nc	0.11	nc
PCB	Aroclor-1221	--		--		2	I	2	(1)	--		--		0.00057	I	0.00057	(1)	0.0068	ca	0.004	ca
PCB	Aroclor-1232	--		--		2	I	2	(1)	--		--		0.00057	I	0.00057	(1)	0.0068	ca	0.004	ca
PCB	Aroclor-1242	--		--		2	I	2	(1)	--		--		0.00057	I	0.00057	(1)	0.034	ca	0.034	ca
PCB	Aroclor-1248	--		--		2	I	2	(1)	--		--		0.00057	I	0.00057	(1)	0.034	ca	0.034	ca
PCB	Aroclor-1254	0.00002	I	0.00002	I	2	I	2	(1)	--		--		0.00057	I	0.00057	(1)	0.034	ca	0.031	nc
PCB	Aroclor-1260	--		--		2	I	2	(1)	--		--		0.00057	I	0.00057	(1)	0.034	ca	0.034	ca
Pest	4,4'-DDD	--		--		0.24	I	0.24	I	--		--		--		0.000069	C	0.28	ca	0.027	ca
Pest	4,4'-DDE	--		--		0.34	I	0.34	I	--		--		--		0.000097	C	0.2	ca	0.2	ca
Pest	4,4'-DDT	0.0005	I	0.0005	I	0.34	I	0.34	I	--		--		0.000097	I	0.000097	I	0.2	ca	0.2	ca

TABLE 4-5

Comparison Between Prior Toxicity Values (2008) and 2013 Toxicity Values Under EPA Hierarchy (2003)

Five Year ROD Review

Allegany Ballistics Laboratory

Rocket Center, West Virginia

		Ingestion Exposure								Inhalation Exposure [a]								Tap Water RSL			
		RfDo				SFo				RfC				IUR				(TR =10-6; HQ = 0.1)			
		(mg/kg-day)				(mg/kg-day)$^{-1}$				(mg/m^3)				(ug/m^3)$^{-1}$				ug/L			
Chem Group	Analyte	2008	Ref	2013	Ref	2008	Ref	2013	Ref	2008	Ref	2013	Ref	2008	Ref	2013	Ref	2008	Ref	2013	Ref
Pest	Aldrin	0.00003	I	0.00003	I	17	I	17	I	--		--		0.0049	I	0.0049	I	0.004	ca	0.004	ca
Pest	alpha-BHC	--		0.008	A	6.3	I	6.3	I	--		--		0.0018	I	0.0018	I	0.011	ca	0.0062	ca
Pest	alpha-Chlordane	0.0005	I	0.0005	I	0.35	I	0.35	I	0.0007	I	0.0007	I	0.0001	I	0.0001	I	0.19	ca	0.19	ca
Pest	beta-BHC	--		--		1.8	I	1.8	I	--		--		0.00053	I	0.00053	I	0.037	ca	0.022	ca
Pest	delta-BHC	n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a	
Pest	Dieldrin	0.00005	I	0.00005	I	16	I	16	I	--		--		0.0046	I	0.0046	I	0.0042	ca	0.0015	ca
Pest	Endosulfan I	0.006	I	0.006	I	--		--		--		--		--		--		22	nc	7.8	nc
Pest	Endosulfan II	0.006	I	0.006	I	--		--		--		--		--		--		22	nc	7.8	nc
Pest	Endosulfan sulfate	n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a	
Pest	Endrin	0.0003	I	0.0003	I	--		--		--		--		--		--		1.1	nc	0.17	nc
Pest	Endrin aldehyde	n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a	
Pest	Endrin ketone	n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a	
Pest	gamma-BHC (Lindane)	0.0003	I	0.0003	I	1.1	C	1.1	C	--		--		0.00031	C	0.00031	C	0.061	ca	0.036	ca
Pest	gamma-Chlordane	0.0005	I	0.0005	I	0.35	I	0.35	I	0.0007	I	0.0007	I	0.0001	I	0.0001	I	0.19	ca	0.19	ca
Pest	Heptachlor	0.0005	I	0.0005	I	4.5	I	4.5	I	--		--		0.0013	I	0.0013	I	0.015	ca	0.0018	ca
Pest	Heptachlor epoxide	0.000013	I	0.000013	I	9.1	I	9.1	I	--		--		0.0026	I	0.0026	I	0.0074	ca	0.0033	ca
Pest	Methoxychlor	0.005	I	0.005	I	--		--		--		--		--		--		18	nc	2.7	nc
Pest	Toxaphene	--		--		1.1	I	1.1	I	--		--		0.00032	I	0.00032	I	0.061	ca	0.013	ca
SVOC	1,1-Biphenyl	0.05	I	0.05	I	--		0.008	X	--		0.0004	X	--		--		180	nc	0.083	nc
SVOC	1,2,4,5-Tetrachlorobenzene	0.0003	I	0.0003	I	--		--		--		--		--		--		1.1	nc	0.12	nc
SVOC	2,2'-Oxybis(1-chloropropane)	0.04	I	0.04	I	0.07	H	0.07	H	--		--		0.00001	H	0.00001	H	0.32	ca	0.31	ca
SVOC	2,3,4,6-Tetrachlorophenol	0.03	I	0.03	I	--		--		--		--		--		--		110	nc	17	nc
SVOC	2,4,5-Trichlorophenol	0.1	I	0.1	I	--		--		--		--		--		--		370	nc	89	nc
SVOC	2,4,6-Trichlorophenol	0.001	P	0.001	P	0.011	I	0.011	I	--		--		0.0000031	I	0.0000031	I	3.7	nc	0.9	nc
SVOC	2,4-Dichlorophenol	0.003	I	0.003	I	--		--		--		--		--		--		11	nc	3.5	nc
SVOC	2,4-Dimethylphenol	0.02	I	0.02	I	--		--		--		--		--		--		73	nc	27	nc
SVOC	2,4-Dinitrophenol	0.002	I	0.002	I	--		--		--		--		--		--		7.3	nc	3	nc
SVOC	2,4-Dinitrotoluene	0.002	I	0.002	I	--		0.31	C	--		--		--		0.000089	C	7.3	nc	0.2	ca
SVOC	2,6-Dinitrotoluene	0.001	P	0.0003	X	--		1.5	P	--		--		--		--		3.7	nc	0.042	ca
SVOC	2-Chloronaphthalene	0.08	I	0.08	I	--		--		--		--		--		--		290	nc	55	nc
SVOC	2-Chlorophenol	0.005	I	0.005	I	--		--		--		--		--		--		18	nc	7.1	nc
SVOC	2-Methylnaphthalene	0.004	I	0.004	I	--		--		--		--		--		--		15	nc	2.7	nc
SVOC	2-Methylphenol	0.05	I	0.05	I	--		--		--		0.6	C	--		--		180	nc	72	nc
SVOC	2-Nitroaniline	n/a		0.01	X	n/a		--		n/a		0.00005	X	n/a		--		n/a		15	nc
SVOC	2-Nitrophenol	n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a	
SVOC	3,3'-Dichlorobenzidine	--		--		0.45	I	0.45	I	--		--		--		0.00034	C	0.15	ca	0.11	ca
SVOC	3-Nitroaniline	0.0003	P	n/a		0.021	P	n/a		0.001	P	n/a		--		n/a		1.1	nc	n/a	
SVOC	4,6-Dinitro-2-methylphenol	0.0001	P	0.00008	X	--		--		--		--		--		--		0.37	nc	0.12	nc
SVOC	4-Bromophenyl-phenylether	n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a	
SVOC	4-Chloro-3-methylphenol	n/a		0.1	A	n/a		--		n/a		--		n/a		--		n/a		110	nc
SVOC	4-Chloroaniline	0.004	I	0.004	I	0.054	P	0.2	P	--		--		--		--		1.2	ca	0.32	ca
SVOC	4-Chlorophenyl-phenylether	n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a	
SVOC	4-Methylphenol	0.005	H	0.1	A	--		--		--		0.6	C	--		--		18	nc	140	nc
SVOC	4-Nitroaniline	0.003	P	0.004	P	0.021	P	0.02	P	0.004	P	0.006	P	--		--		3.2	ca	3.3	ca
SVOC	4-Nitrophenol	n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a	
SVOC	Acenaphthene	0.06	I	0.06	I	--		--		--		--		--		--		220	nc	40	nc
SVOC	Acenaphthylene	n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a	
SVOC	Acetophenone	0.1	I	0.1	I	--		--		--		--		--		--		370	nc	150	nc
SVOC	Anthracene	0.3	I	0.3	I	--		--		--		--		--		--		1100	nc	130	nc
SVOC	Atrazine	0.035	I	0.035	I	0.23	C	0.23	C	--		--		--		--		0.29	ca	0.26	ca
SVOC	Benzaldehyde	0.1	I	0.1	I	--		--		--		--		--		--		370	nc	150	nc
SVOC	Benzo(a)anthracene	--		--		0.73	E	0.73	E	--		--		0.00011	C	0.00011	C	0.029	ca	0.029	ca
SVOC	Benzo(a)pyrene	--		--		7.3	I	7.3	I	--		--		0.0011	C	0.0011	C	0.0029	ca	0.0029	ca

TABLE 4-5

Comparison Between Prior Toxicity Values (2008) and 2013 Toxicity Values Under EPA Hierarchy (2003)

Five Year ROD Review

Allegany Ballistics Laboratory

Rocket Center, West Virginia

		Ingestion Exposure								Inhalation Exposure [a]								Tap Water RSL			
		RfDo				SFo				RfC				IUR				(TR =10-6; HQ = 0.1)			
		(mg/kg-day)				$(mg/kg\text{-}day)^{-1}$				(mg/m^3)				$(ug/m^3)^{-1}$				ug/L			
Chem Group	Analyte	2008	Ref	2013	Ref	2008	Ref	2013	Ref	2008	Ref	2013	Ref	2008	Ref	2013	Ref	2008	Ref	2013	Ref
SVOC	Benzo(b)fluoranthene	--		--		0.73	E	0.73	E	--		--		0.00011	C	0.00011	C	0.029	ca	0.029	ca
SVOC	Benzo(g,h,i)perylene	n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a	
SVOC	Benzo(k)fluoranthene	--		--		0.073	E	0.073	E	--		--		0.00011	C	0.00011	C	0.29	ca	0.29	ca
SVOC	bis(2-Chloroethoxy)methane	0.003	P	0.003	P	--		--		--		--		--		--		11	nc	4.6	nc
SVOC	bis(2-Chloroethyl)ether	--		--		1.1	I	1.1	I	--		--		0.00033	I	0.00033	I	0.012	ca	0.012	ca
SVOC	bis(2-Ethylhexyl)phthalate	0.02	I	0.02	I	0.014	I	0.014	I	--		--		--		0.0000024	C	4.8	ca	4.8	ca
SVOC	Butylbenzylphthalate	0.2	I	0.2	I	0.0019	P	0.0019	P	--		--		--		--		35	ca	14	ca
SVOC	Caprolactam	0.5	I	0.5	I	--		--		--		--		--		--		1800	nc	770	nc
SVOC	Carbazole	n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a	
SVOC	Chrysene	--		--		0.0073	E	0.0073	E	--		--		0.000011	C	0.000011	C	2.9	ca	2.9	ca
SVOC	Dibenz(a,h)anthracene	--		--		7.3	E	7.3	E	--		--		0.0012	C	0.0012	C	0.0029	ca	0.0029	ca
SVOC	Dibenzofuran	n/a		0.001	X	n/a		--		n/a		--		n/a		--		n/a		0.58	nc
SVOC	Diethylphthalate	0.8	I	0.8	I	--		--		--		--		--		--		2900	nc	1100	nc
SVOC	Dimethyl phthalate	n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a	
SVOC	Di-n-butylphthalate	0.1	I	0.1	I	--		--		--		--		--		--		370	nc	67	nc
SVOC	Di-n-octylphthalate	n/a		0.01	P	n/a		--		n/a		--		n/a		--		n/a		16	nc
SVOC	Fluoranthene	0.04	I	0.04	I	--		--		--		--		--		--		150	nc	63	nc
SVOC	Fluorene	0.04	I	0.04	I	--		--		--		--		--		--		150	nc	22	nc
SVOC	Hexachlorobenzene	0.0008	I	0.0008	I	1.6	I	1.6	I	--		--		0.00046	I	0.00046	I	0.042	ca	0.042	ca
SVOC	Hexachlorobutadiene	0.001	P	0.001	P	0.078	I	0.078	I	--		--		0.000022	I	0.000022	I	0.86	ca	0.26	ca
SVOC	Hexachlorocyclopentadiene	0.006	I	0.006	I	--		--		0.0002	I	0.0002	I	--		--		22	nc	2.2	nc
SVOC	Hexachloroethane	0.001	I	0.0007	I	0.014	I	0.04	I	--		0.03	I	0.000004	I	0.000011	C	3.7	nc	0.51	nc
SVOC	Indeno(1,2,3-cd)pyrene	--		--		0.73	E	0.73	E	--		--		0.00011	C	0.00011	C	0.029	ca	0.029	ca
SVOC	Isophorone	0.2	I	0.2	I	0.00095	I	0.00095	I	2	C	2	C	--		--		71	ca	67	ca
SVOC	Naphthalene	0.02	I	0.02	I	--		--		0.003	I	0.003	I	0.000034	C	0.000034	C	0.14	ca	0.14	ca
SVOC	Nitrobenzene	0.0005	I	0.002	I	--		--		0.002	H	0.009	I	--		0.00004	I	0.34	nc	0.12	ca
SVOC	n-Nitroso-di-n-propylamine	--		--		7	I	7	I	--		--		--		0.002	C	0.0096	ca	0.0093	ca
SVOC	n-Nitrosodiphenylamine	--		--		0.0049	I	0.0049	I	--		--		--		0.0000026	C	14	ca	10	ca
SVOC	Pentachlorophenol	0.03	I	0.005	I	0.12	I	0.4	I	--		--		--		0.0000051	C	0.56	ca	0.035	ca
SVOC	Phenanthrene	n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a		n/a	
SVOC	Phenol	0.3	I	0.3	I	--		--		0.2	C	0.2	C	--		--		1100	nc	450	nc
SVOC	Pyrene	0.03	I	0.03	I	--		--		--		--		--		--		110	nc	8.7	nc

Notes:

[a] Note: Inhalation values listed for non-volatile compounds (e.g., metals) are only applicable to dust inhalation and would not be appropriate for groundwater.
Red shading indicates current value (2013) is more stringent than the corresponding 2008 value (increase in cancer potency, decrease in noncancer reference values, or decrease in RSL).
Green shading indicates current value (2013) is less stringent than the corresponding 2008 value (decrease in cancer potency, increase in noncancer reference values, or increase in RSL).
Yellow shading indicates current value (2013) exists while there was no corresponding 2008 value.
Orange shading indicates no current value (2013) exists while there was a 2008 value.

Surrogate Toxicity Values and RSL:
Toxicity values and tap water RSLs for 1,3-Dichloropropene are used for cis-1,3-Dichloropropene and trans-1,3-Dichloropropene.
Toxicity values and tap water RSLs for Antimony (metallic) are used for Antimony.
Toxicity values and tap water RSLs for Chlordane are used for alpha-Chlordane and gamma-Chlordane.
Toxicity values and tap water RSLs for Endosulfan are used for Endosulfan I and Endosulfan II.
Toxicity values and tap water RSLs for Mercuric Chloride (and other Mercury salts) are used for Mercury.
Toxicity values and tap water RSLs for Nickel Soluble Salts are used for Nickel.
Toxicity values and tap water RSLs for Thallium (Soluble Salts) are used for Thallium.

Acronyms:

RfDo - Oral Reference Dose	RfC - Inhalation Reference Concentration	Ref - Reference
SFo - Oral Slope Factor	IUR - Inhalation Unit Risk	RSL - Regional Screening Level
mg/kg-day - milligrams per kilogram per day	mg/m^3 - milligrams per cubic meter	ug/m^3 - micrograms per cubic meter

TABLE 4-5

Comparison Between Prior Toxicity Values (2008) and 2013 Toxicity Values Under EPA Hierarchy (2003)

Five Year ROD Review

Allegany Ballistics Laboratory

Rocket Center, West Virginia

		Ingestion Exposure								Inhalation Exposure [a]								Tap Water RSL			
		RfDo				SFo				RfC				IUR				(TR =10-6; HQ = 0.1)			
		(mg/kg-day)				$(mg/kg\text{-}day)^{-1}$				(mg/m^3)				$(ug/m^3)^{-1}$				ug/L			
Chem Group	Analyte	2008	Ref	2013	Ref	2008	Ref	2013	Ref	2008	Ref	2013	Ref	2008	Ref	2013	Ref	2008	Ref	2013	Ref

ug/L - microgram per liter
VOC - volatile organic compound
Pest - pesticides

n/a - not available
SVOC - semi-volatile organic compound
Explo - explosive

-- chemical is listed on the table but no value is provided.
PCB - polychlorinated biphenyls

References:
2013 RSLs - May 2013 EPA Regional Screening Levels Table.
2008 RSLs - September 2008 EPA Regional Screening Levels Table.
Tap Water RSLs presented are based on Cancer Target Risk (TR) of 10^{-6} and non-cancer hazard quotient (HQ) of 0.1.

A = Agency for Toxic Substances and Disease Registry
C = California EPA
E = Environmental Criteria and Assessment Office
J = New Jersey Department of Environmental Protection
H = Health Effects Assessment Summary Tables
I = Integrated Risk Information System
P = EPA's Provisional Peer Reviewed Toxicity Values
X = EPA's Provisional Peer Reviewed Toxicity Values Appendix

1) Aroclor 1016 is considered "lowest risk" and assigned appropriate toxicity values. All other Aroclors are assigned the high risk toxicity values.
2) The oral RfD toxicity value for Vanadium was derived from the IRIS oral RfD for Vanadium Pentoxide by factoring out the molecular weight (MW) of the oxide ion.
3) The IRIS oral RfD of 2E-03 mg/kg-day for 2,4-Dinitrotoluene is used as a surrogate for 2-Amino-4,6-Dinitrotoluene and 4-Amino-2,6-Dinitrotoluene.
4) The IRIS oral RfD of 2E-01 mg/kg-day for xylene, mixture is used as a surrogate for the 3 xylene congeners.
5) The oral RfD toxicity value for Thallium (Soluble Salts) was derived from the IRIS oral RfD for Thallium sulfate by factoring out the molecular weight (MW) of Thallium salt.
6) The IRIS inhalation RfC of 8E-04 mg/m^3 for Hydrogen cyanide is used as a surrogate for Cyanide.

R:\USNAVFACENGCOM405450\ABL\MAPFILES\430115_5_YEAR_ROD_REVIEW_REPORT\FIG4_1_SITE1_LAYOUT.MXD BALDRIDGE 8/20/2013 9:17:20 AM

Legend

- NPDES Outfall SSL-3
- Alluvial Groundwater Flow
- Bedrock Groundwater Flow
- LUC Boundary
- Former Inert and Open Burn Area
- Former Disposal Pits (FDP)
- Active Burning Ground
- Outside Active Burning Ground (OABG)
- Approximate location of former burn pans
- Former Earthen Burn Pads
- Current Concrete Burn Pads
- Site 1 Boundary

N

0 75 150 Feet

1 inch = 150 feet

Figure 4-1
Site 1 Layout
5 Year ROD Review Report
Allegany Ballistics Laboratory
Rocket Center, West Virginia

CH2MHILL

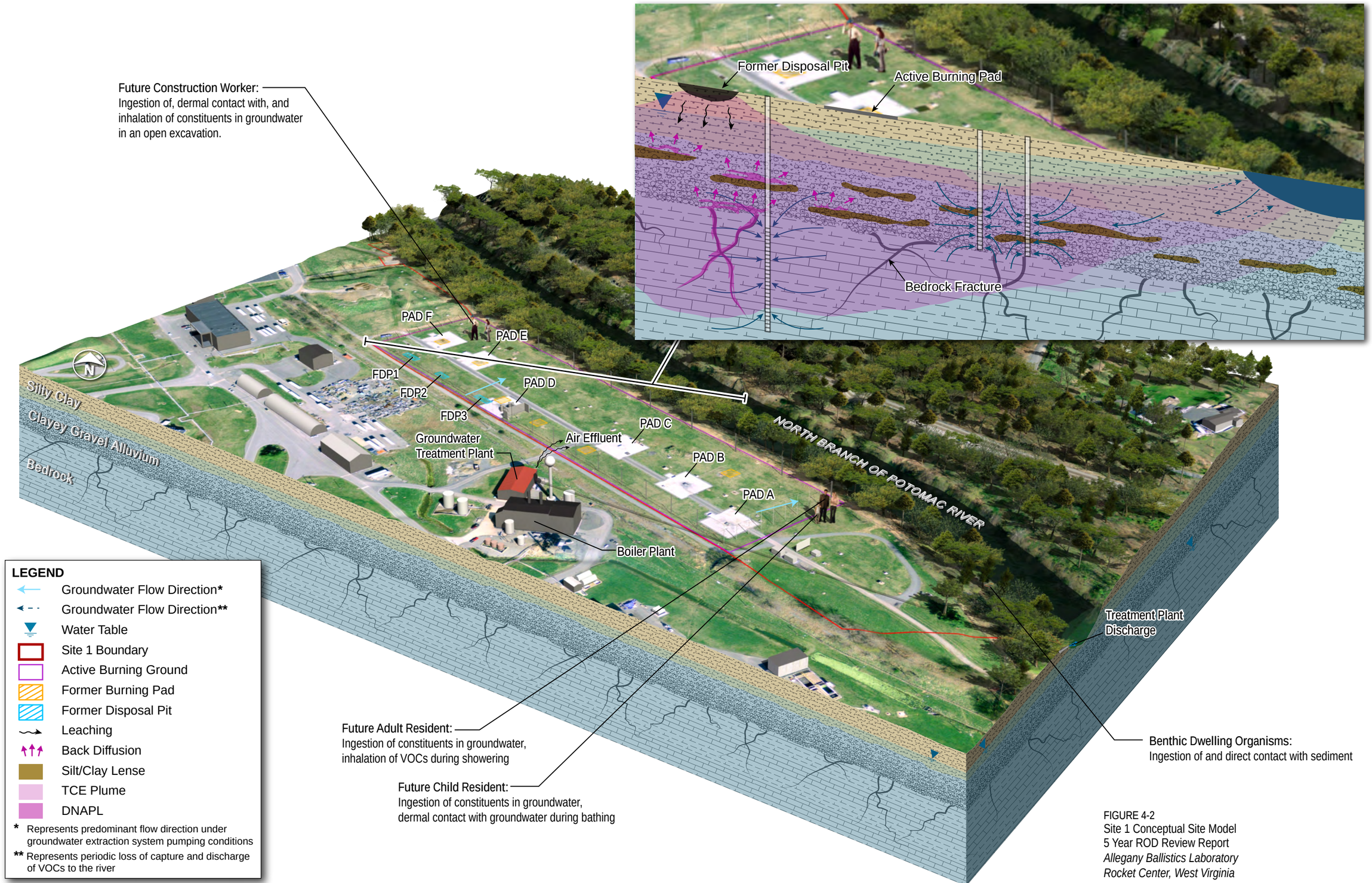


FIGURE 4-2
Site 1 Conceptual Site Model
5 Year ROD Review Report
Allegany Ballistics Laboratory
Rocket Center, West Virginia

R:\USNAVFACENGCOM405450\ABL\MAPFILES\430115_5_YEAR_ROD_REVIEW_REPORT\FIG4_3_SITE1_ALLUVIAL_TCE_PLUME_MAP_1998.MXD BALDRIDGE 8/20/2013 9:42:04 AM

Legend

- Monitoring Well - Alluvial
- Extraction Well - Alluvial
- Alluvial Groundwater Flow
- Roads
- Structures
- Former Disposal Pit
- Burn Pads
- Site 1 Boundary
- Active Burning Ground
- Vegetation

TCE Plume

- 5 - 99 µg/L
- 100 - 999 µg/L
- 1000 - 4999 µg/L
- 5000 - 9999 µg/L
- 10000 - 14999 µg/L
- 15000 - 24999 µg/L
- >25000 µg/L
- Data not available, plume configuration interpreted

N

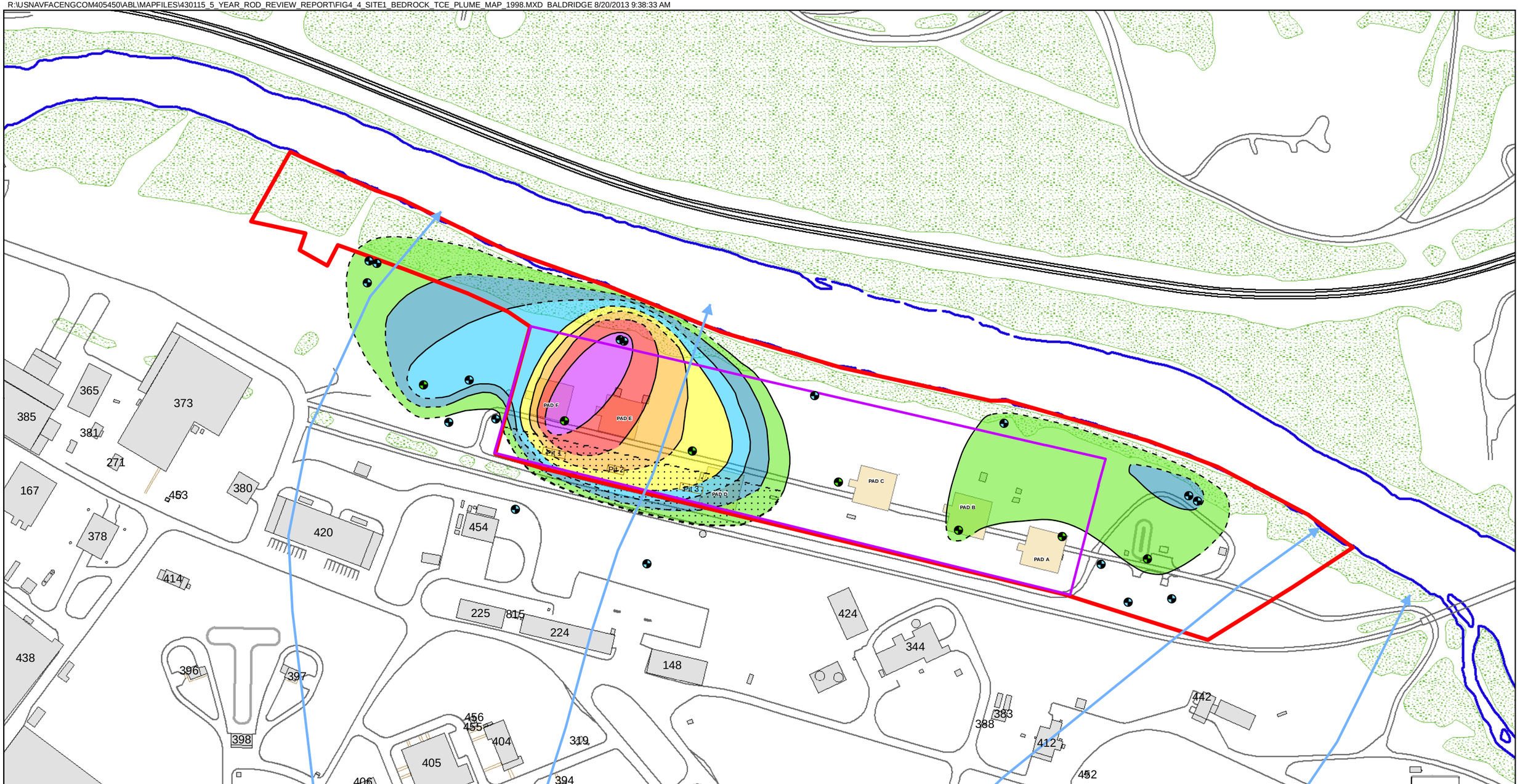
0 50 100 200 Feet

1 inch = 200 feet

Figure 4-3
Alluvial Aquifer Site TCE Plume - 1998
5 Year ROD Review Report
Allegany Ballistics Laboratory
Rocket Center, West Virginia

CH2MHILL

R:\USNAVFACENGCOM405450\ABL\MAPFILES\430115_5_YEAR_ROD_REVIEW_REPORT\FIG4_4_SITE1_BEDROCK_TCE_PLUME_MAP_1998.MXD BALDRIDGE 8/20/2013 9:38:33 AM



Legend

- Monitoring Well - Bedrock
- Extraction Well - Bedrock
- Bedrock Groundwater Flow
- Roads
- Structures
- Former Disposal Pit
- Burn Pads
- Vegetation
- Active Burning Ground

TCE Plume

- 5 - 99 µg/L
- 100 - 999 µg/L
- 1000 - 4999 µg/L
- 5000 - 9999 µg/L
- 10000 - 14999 µg/L
- 15000 - 24999 µg/L
- >25000 µg/L

- Site 1 Boundary
- Data not available, plume configuration interpreted

N

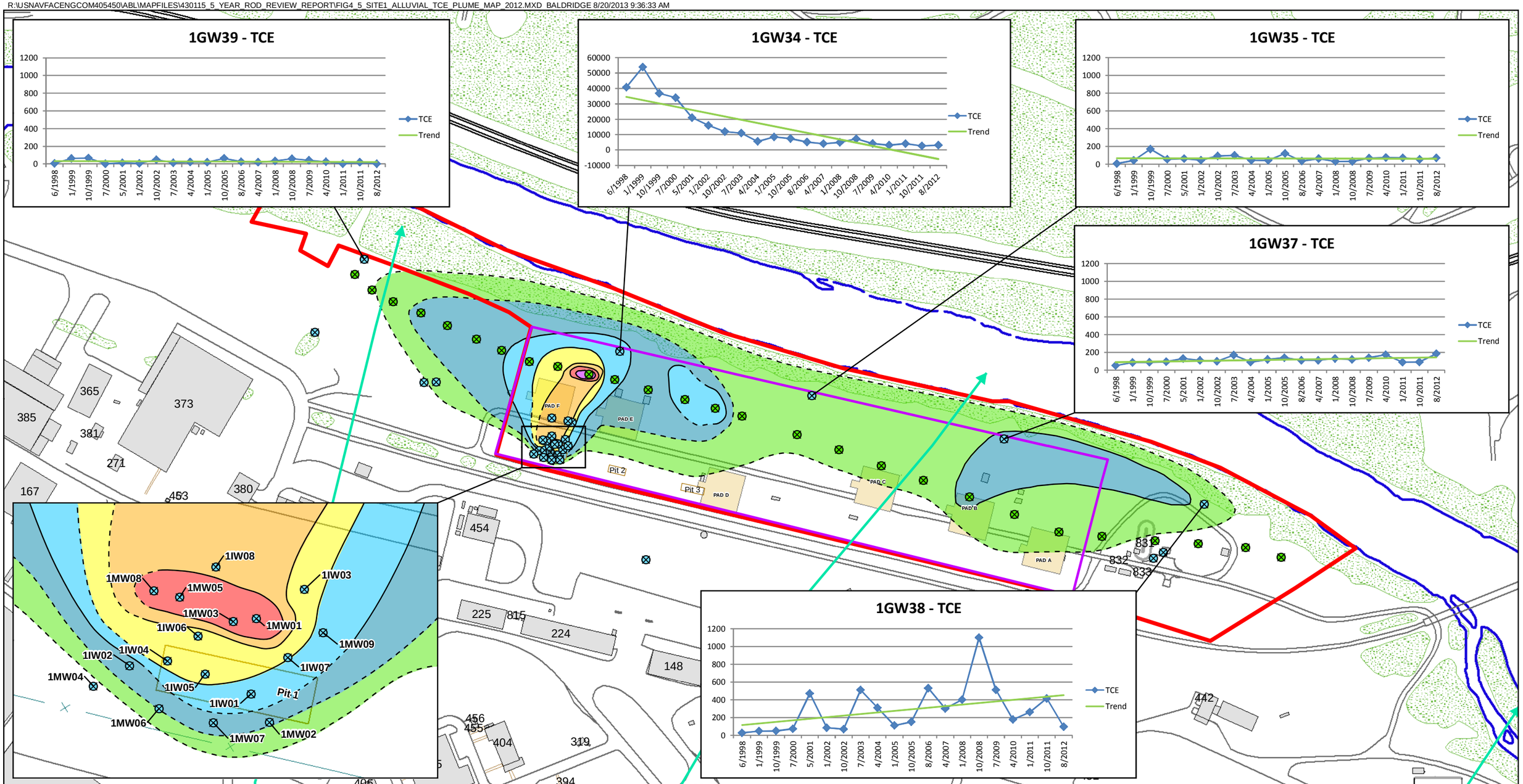
0 50 100 200 Feet

1 inch = 200 feet

Figure 4-4
Bedrock Aquifer TCE Plume - 1998
5 Year ROD Review Report
Allegany Ballistics Laboratory
Rocket Center, West Virginia

CH2MHILL

R:\USNAVFACENGCOM405450\ABL\MAPFILES\430115_5_YEAR_ROD_REVIEW_REPORT\FIG4_5_SITE1_ALLUVIAL_TCE_PLUME_MAP_2012.MXD BALDRIDGE 8/20/2013 9:36:33 AM



Legend

- Monitoring Well - Alluvial
- Extraction Well - Alluvial
- Alluvial Groundwater Flow
- Roads
- Structures
- Former Disposal Pit
- Burn Pads
- Vegetation

TCE Plume

- 5 - 99 µg/L
- 100 - 999 µg/L
- 1000 - 4999 µg/L
- 5000 - 9999 µg/L
- 10000 - 14999 µg/L
- 15000 - 24999 µg/L
- >25000 µg/L

- Site 1 Boundary
- Active Burning Ground

Note

- Data shown in µg/L

N

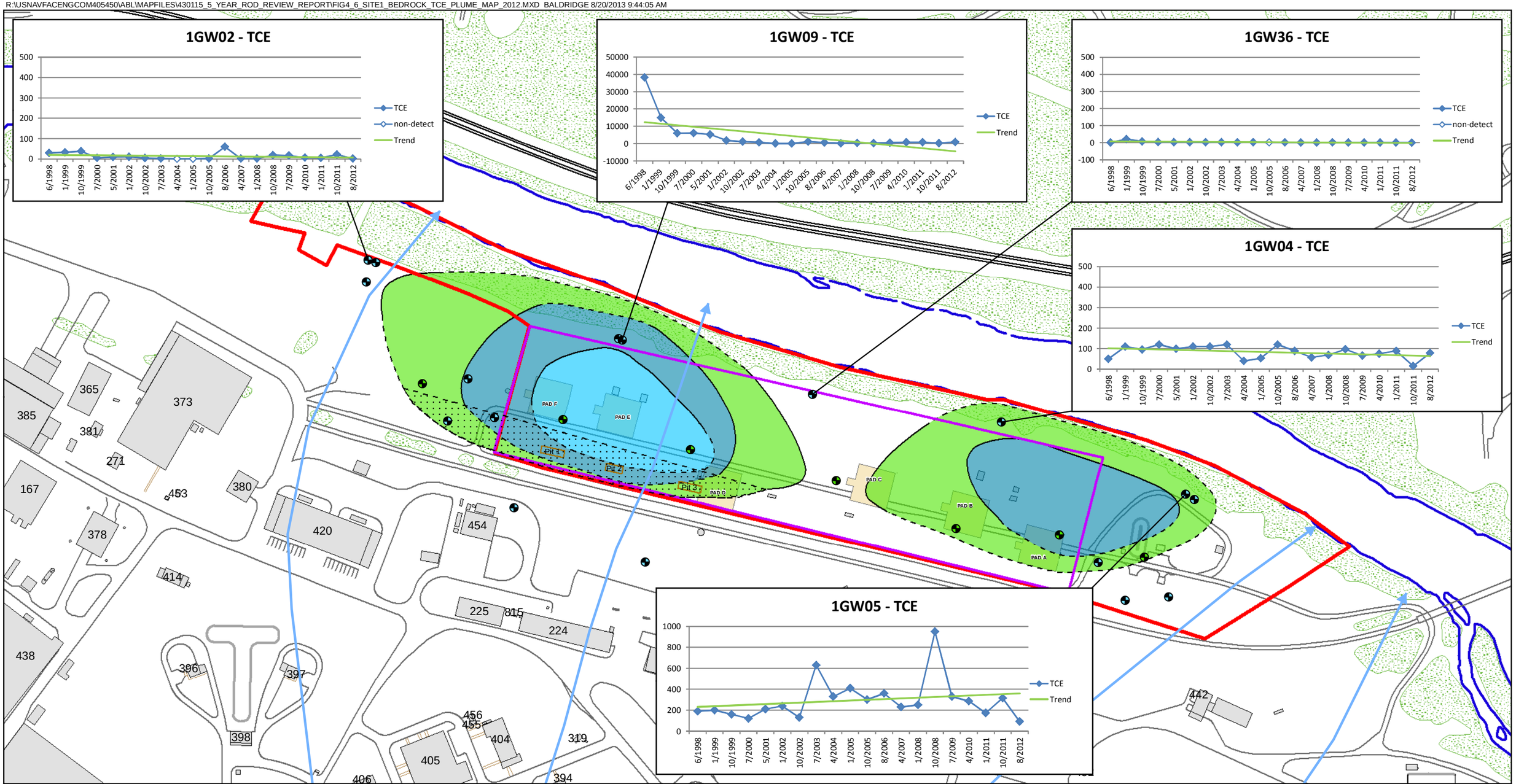
0 100 200 Feet

1 inch = 200 feet

Figure 4-5
Alluvial Aquifer TCE Plume - 2012
5 Year ROD Review Report
Allegany Ballistics Laboratory
Rocket Center, West Virginia

CH2MHILL

R:\USNAVFACENGCOM405450\ABL\MAPFILES\430115_5_YEAR_ROD_REVIEW_REPORT\FIG4_6_SITE1_BEDROCK_TCE_PLUME_MAP_2012.MXD BALDRIDGE 8/20/2013 9:44:05 AM



Legend

- Monitoring Well - Bedrock
- Extraction Well - Bedrock
- Bedrock Groundwater Flow
- Roads
- Burn Pads
- Former Disposal Pit
- Structures
- Vegetation

TCE Plume

- 5 - 99 µg/L
- 100 - 999 µg/L
- 1000 - 4999 µg/L

- Site 1 Boundary
- Active Burning Ground
- Data not available, plume configuration interpreted

Note
- Data shown in µg/L.
- 1/2 Detection limit used for non-detect values.

N

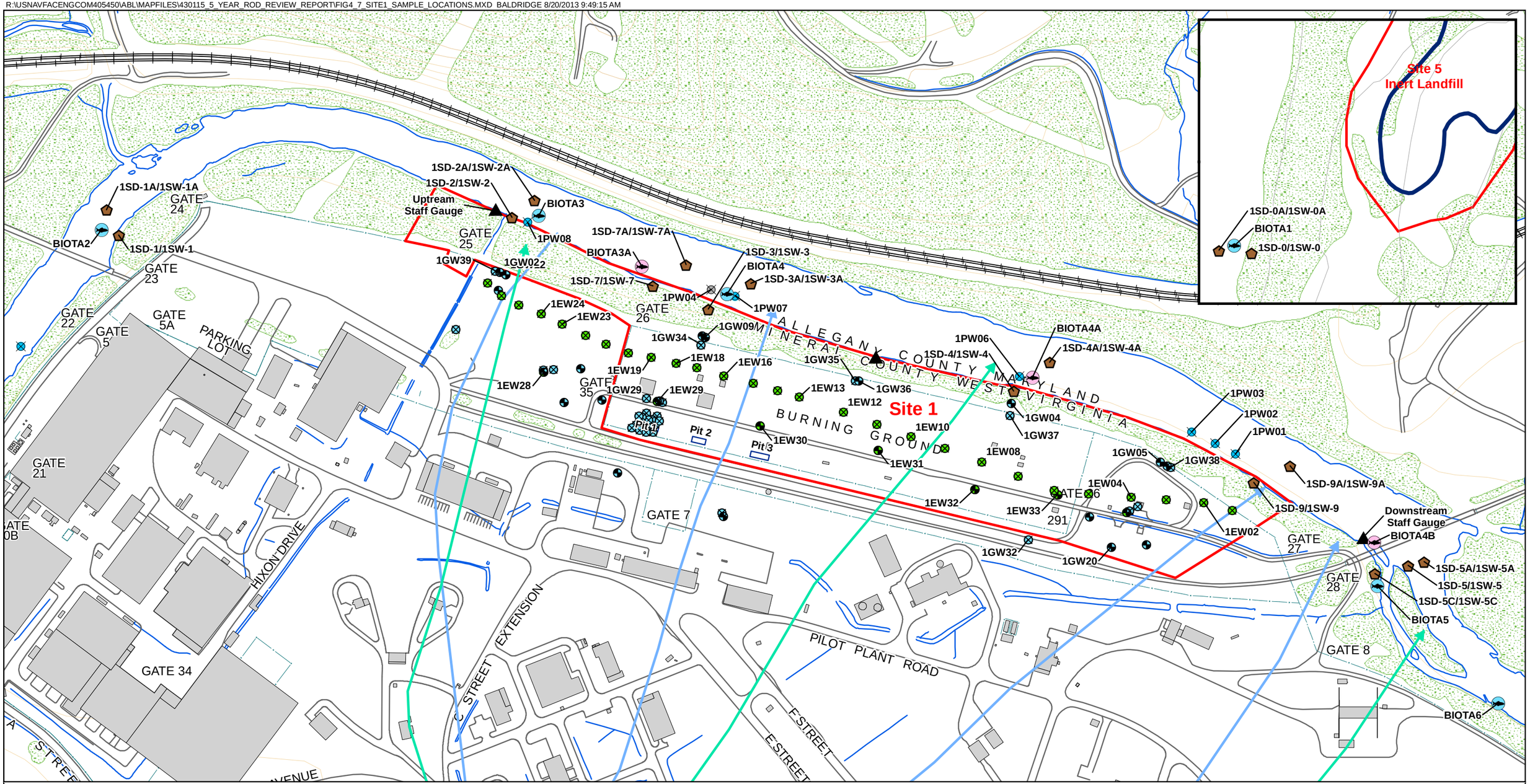
0 100 200 Feet

1 inch = 200 feet

Figure 4-6
Bedrock Aquifer TCE Plume - 2012
5 Year ROD Review Report
Allegany Ballistics Laboratory
Rocket Center, West Virginia

CH2MHILL

R:\USNAVFACENGCOM405450\ABL\MAPFILES\430115_5_YEAR_ROD_REVIEW_REPORT\FIG4_7_SITE1_SAMPLE_LOCATIONS.MXD BALDRIDGE 8/20/2013 9:49:15 AM



Legend

- Benthic Invertebrate Sample Location
- Benthic Invertebrate and Fish Tissue Sample Location
- Abandoned Pore Water Location
- Pore Water Sample Locations
- Monitoring Well - Bedrock
- Monitroing Well - Alluvial
- Extraction Well - Bedrock
- Extraction Well - Alluvial
- Staff Gauge
- Sediment/Surface Water
- Alluvial Groundwater Flow
- Bedrock Groundwater Flow
- Disposal Pit
- Water Body
- Road
- Railroad
- Site 1 Boundary
- Building
- Vegetation

N

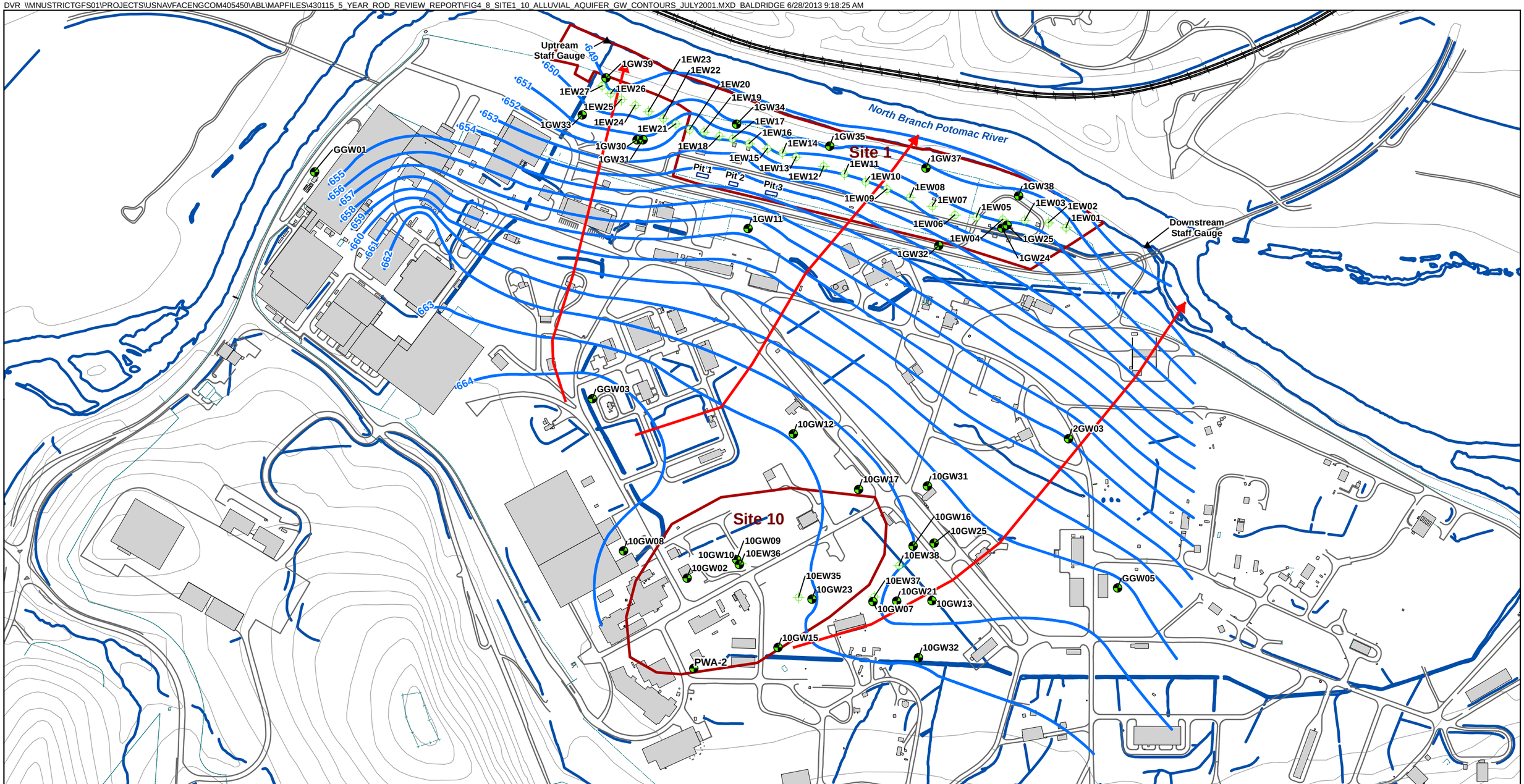
0 125 250 Feet

1 inch = 250 feet

Figure 4-7
Site 1 Sample Locations
5 Year ROD Review Report
Allegany Ballistics Laboratory
Rocket Center, West Virginia

CH2MHILL

DVR \\MNUSTRICTGFS01\PROJECTS\USNAVFACENGCOM405450\ABL\MAPFILES\430115_5_YEAR_ROD_REVIEW_REPORT\FIG4_8_SITE1_10_ALLUVIAL_AQUIFER_GW_CONTOURS_JULY2001.MXD BALDRIDGE 6/28/2013 9:18:25 AM



Legend

- Monitoring Well - Alluvial
- Extraction Well - Alluvial
- Staff Gauge
- Alluvial Groundwater Flow
- Potentiometric Surface Contours
- IR Site

N

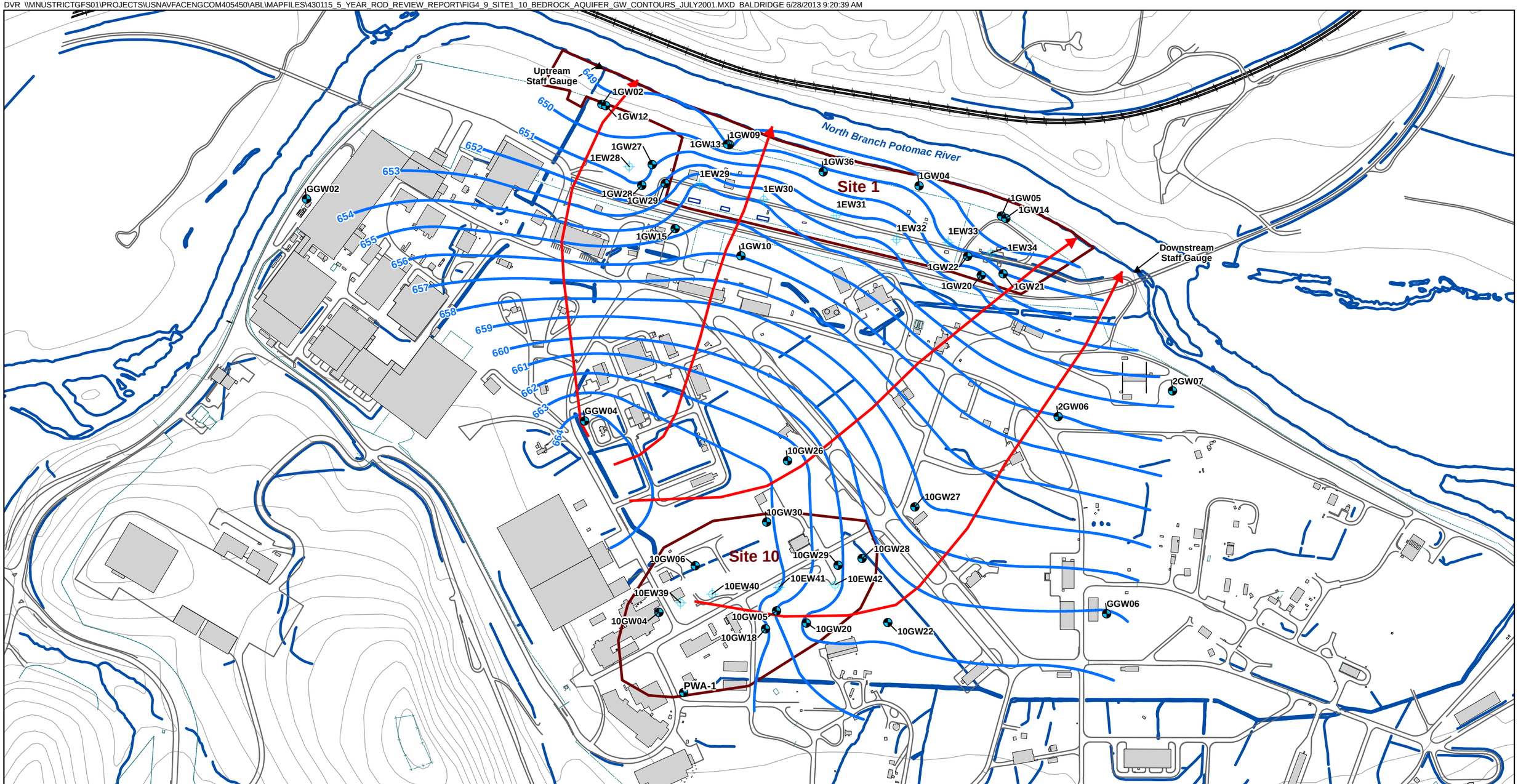
0 200 400 Feet

1 inch = 400 feet

Figure 4-8
Alluvial Aquifer Groundwater Contours – July 2001
5 Year ROD Review Report
Allegany Ballistics Laboratory
Rocket Center West Virginia

CH2MHILL

DVR \\MNUSTRICTGFS01\PROJECTS\USNAVFACENGCOM405450\ABL\MAPFILES\430115_5_YEAR_ROD_REVIEW_REPORT\FIG4_9_SITE1_10_BEDROCK_AQUIFER_GW_CONTOURS_JULY2001.MXD BALDRIDGE 6/28/2013 9:20:39 AM



Legend

- Extraction Well - Bedrock
- Monitoring Well - Bedrock
- Staff Gauge
- Potentiometric Surface Contours
- Bedrock Groundwater Flow
- IR Site

N

0 200 400 Feet

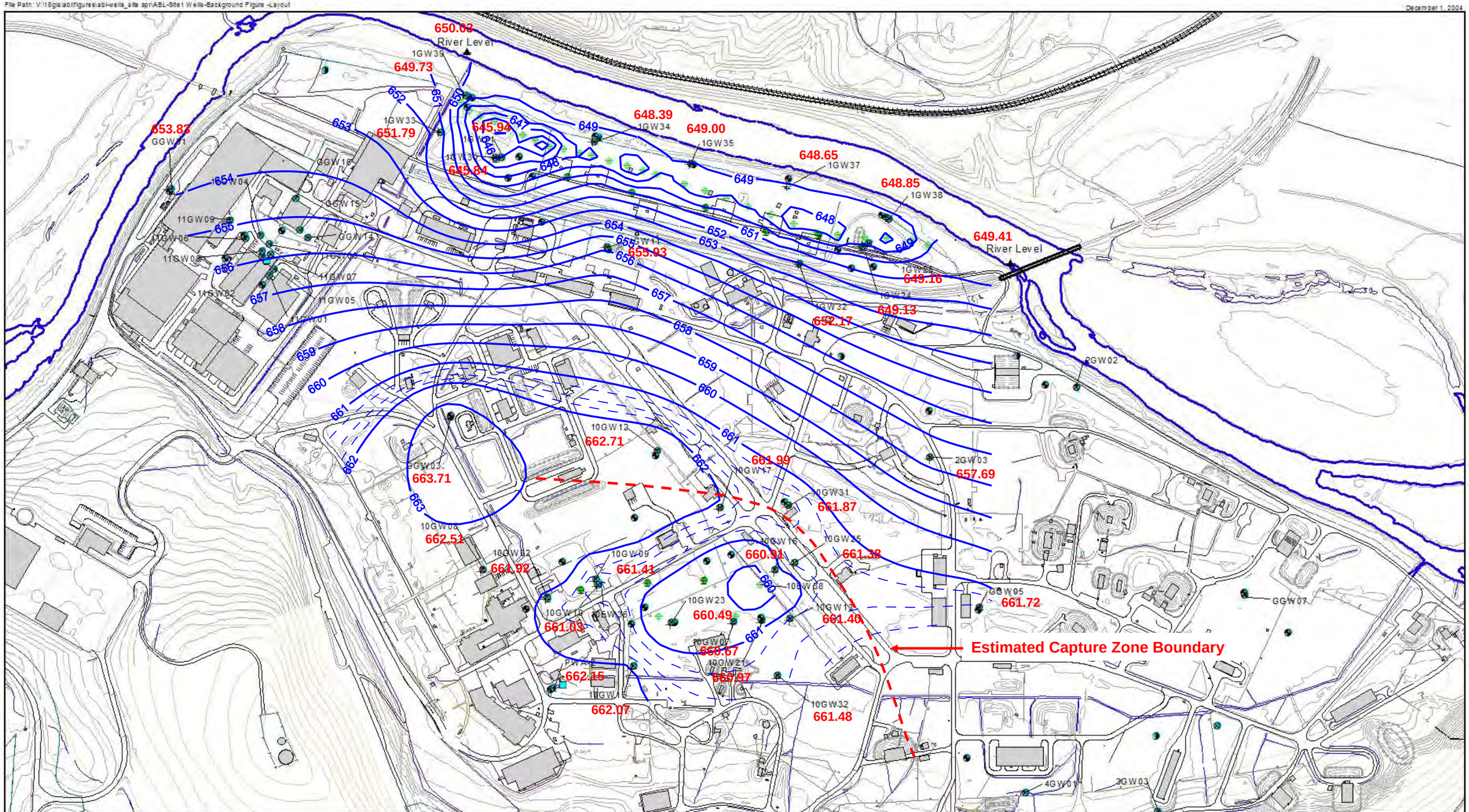
1 inch = 400 feet

Figure 4-9
Bedrock Aquifer Groundwater Contours – July 2001
5 Year ROD Review Report
Allegany Ballistics Laboratory
Rocket Center West Virginia

CH2MHILL

File Path: V:\18gis\abl\figures\abl-wells_site apr\ABL-Site1 Wells-Background Figure -Layout

December 1, 2004



LEGEND

- Extraction Well - Alluvial
- Extraction Well - Bedrock
- Monitoring Well - Alluvial
- Monitoring Well - Hybrid
- Monitoring Well - Bedrock
- Production Well

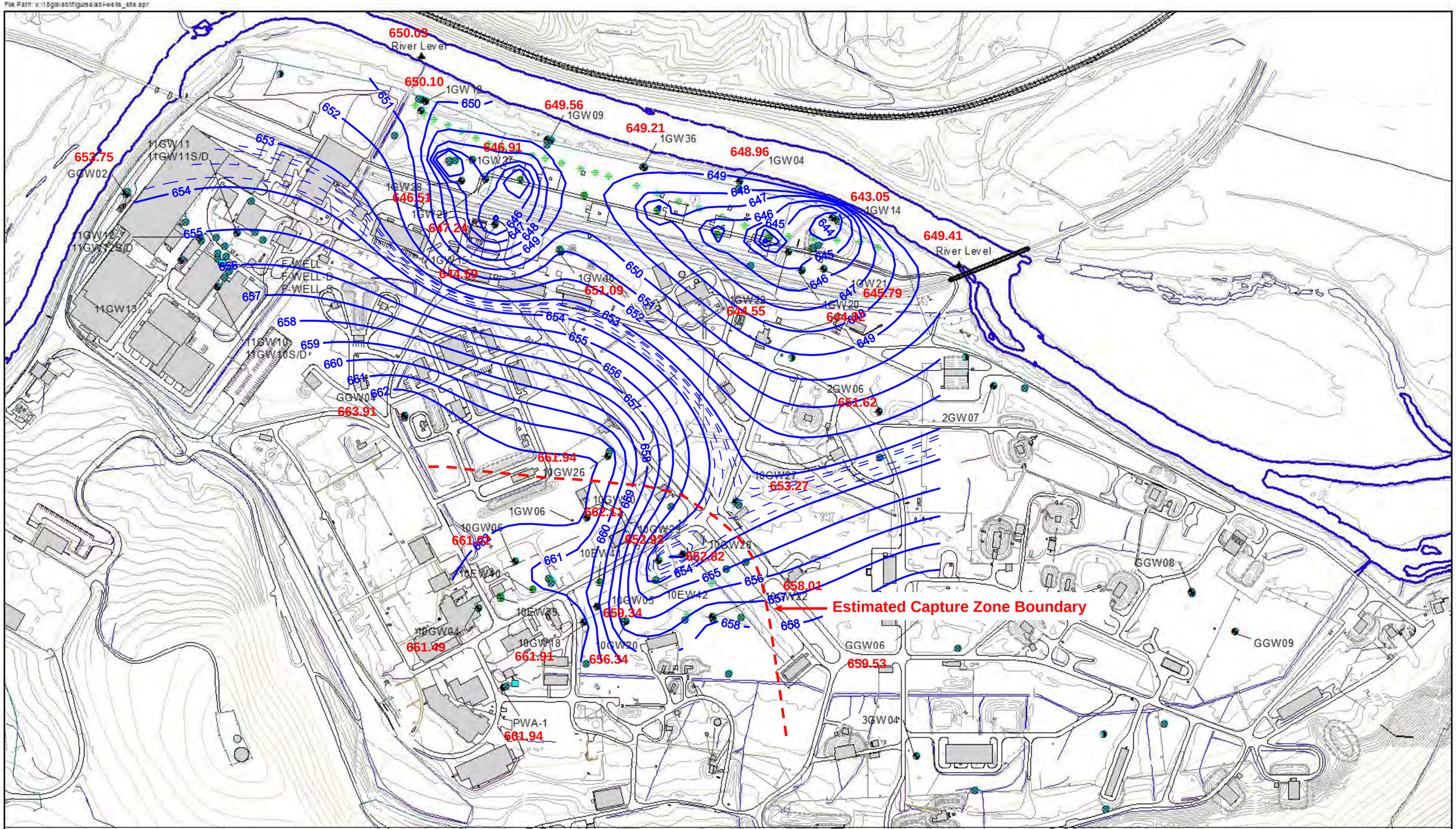
N

0 200 400 600 Feet

Alluvial Water Levels at Sites 1 and 10
Measured on January 10, 2008
(Water Levels in Feet MSL)

CH2MHILL

File Path: v:\18gis\abf\figures\abf-wells_site.apr



LEGEND

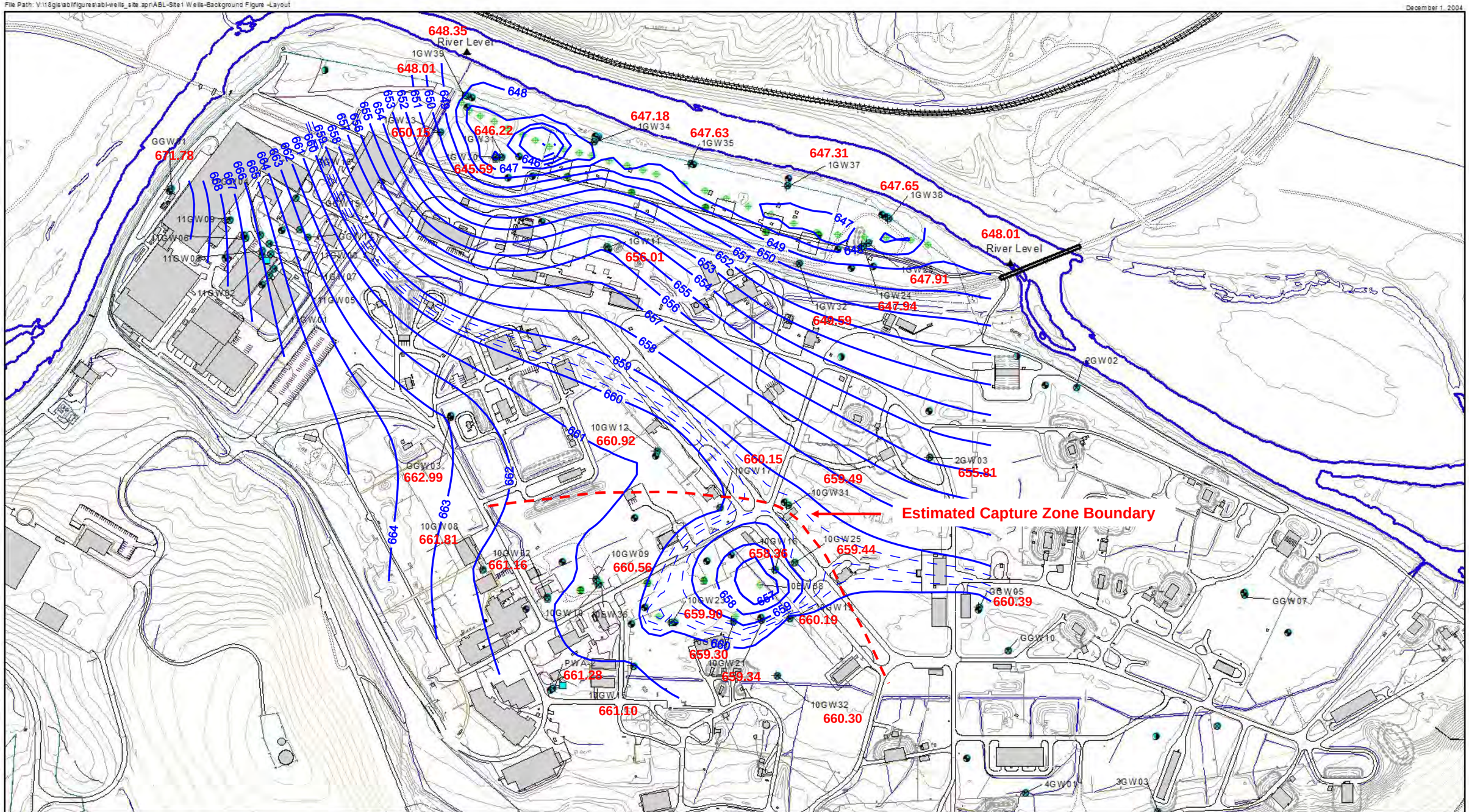
- Extraction Well - Alluvial
- Extraction Well - Bedrock
- Monitoring Well - Hybrid
- Monitoring Well - Alluvial
- Monitoring Well - Bedrock

N

400 0 400 800 Feet

Bedrock Water Levels at Sites 1 and 10
Measured on January 10, 2008
(Water Levels in Feet MSL)

CH2MHILL



LEGEND

- Extraction Well - Alluvial
- Extraction Well - Bedrock
- Monitoring Well - Alluvial
- Monitoring Well - Hybrid
- Monitoring Well - Bedrock
- Production Well

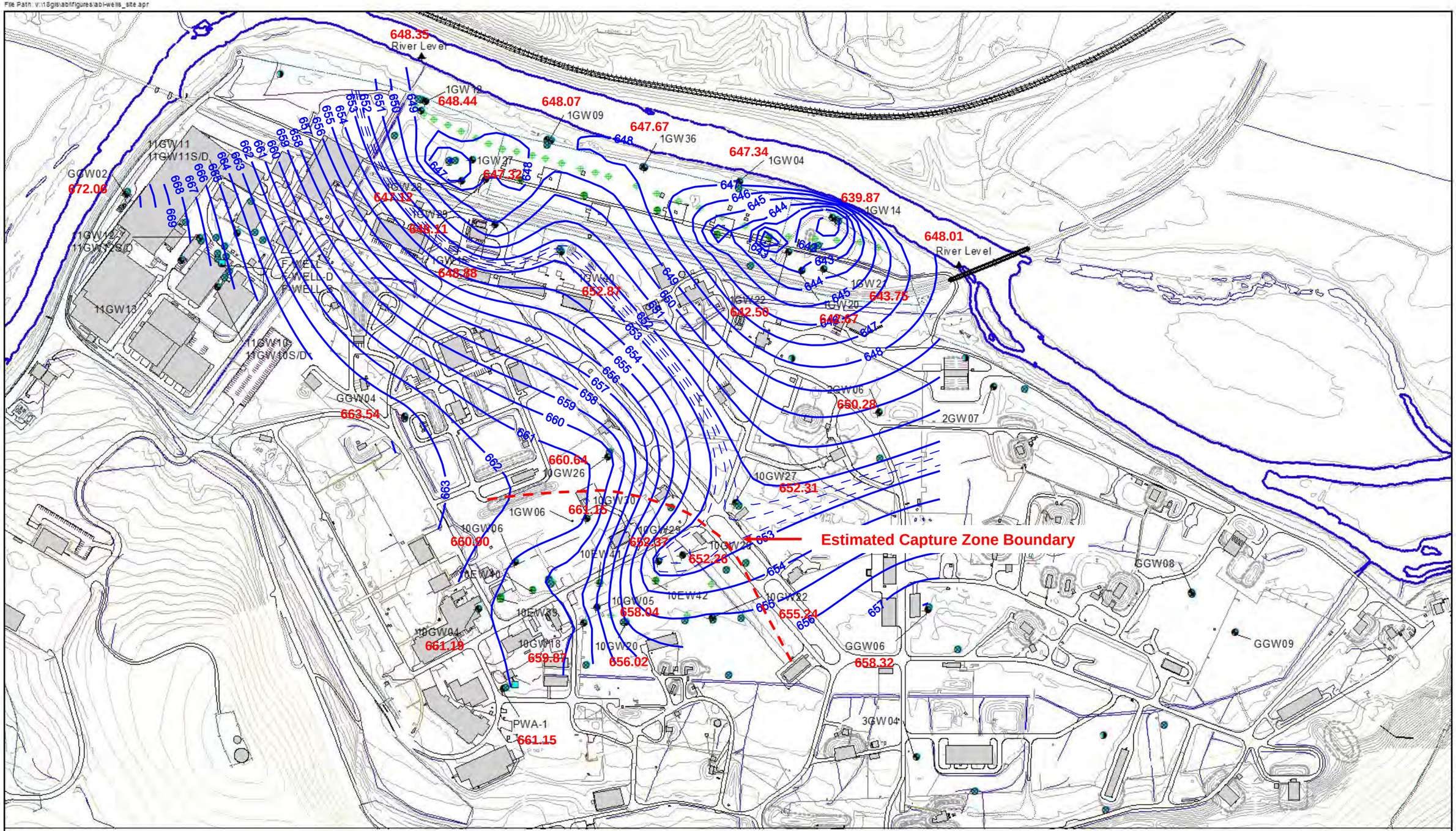
N

0 200 400 600 Feet

Alluvial Water Levels at Sites 1 and 10
Measured on October 6, 2008
(Water Levels in Feet MSL)

CH2MHILL

File Path: V:\18gis\abf\figures\abf-wells_site.apr



LEGEND

- Extraction Well - Alluvial
- Extraction Well - Bedrock
- Monitoring Well - Hybrid
- Monitoring Well - Alluvial
- Monitoring Well - Bedrock

N

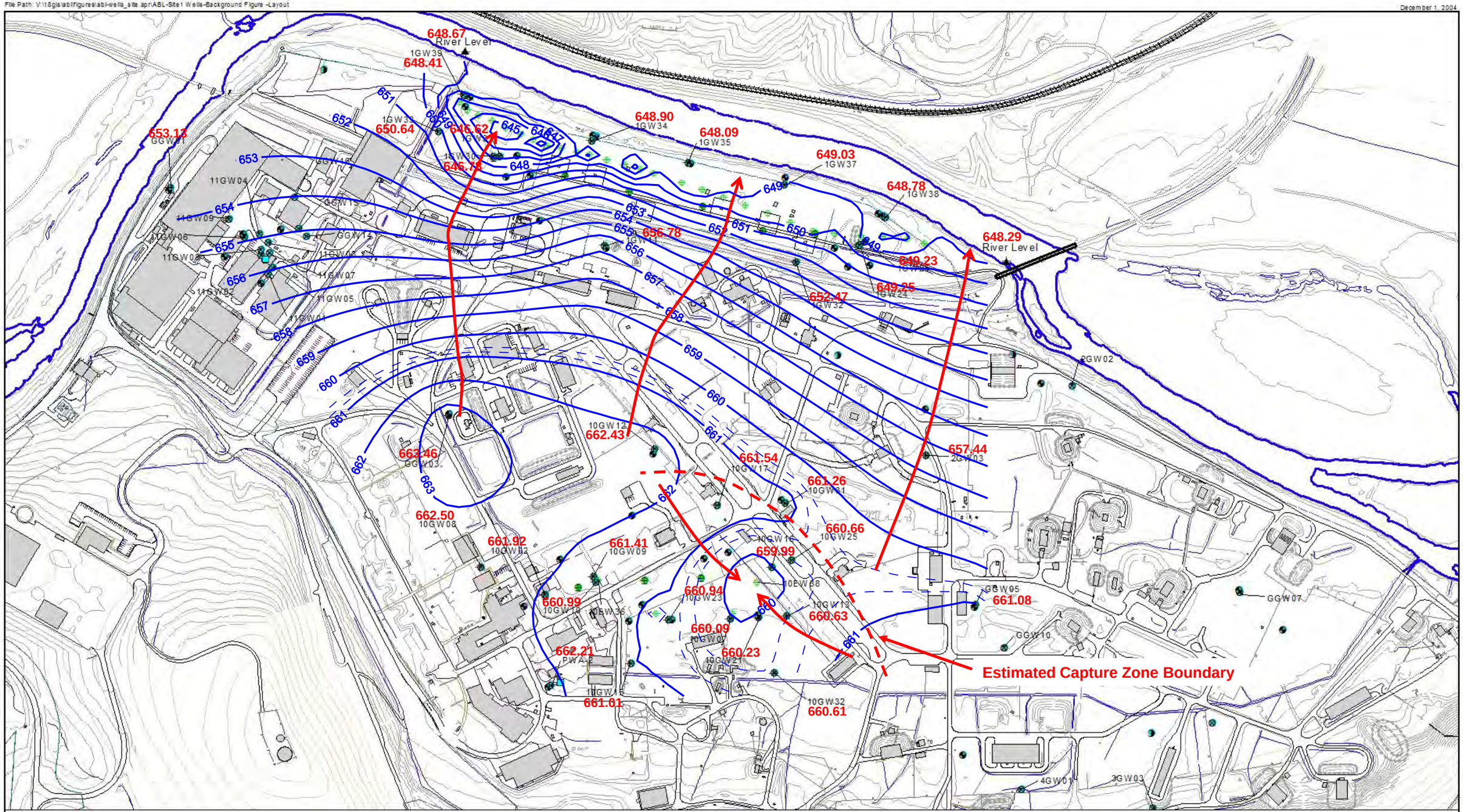
400 0 400 800 Feet

Bedrock Water Levels at Sites 1 and 10
Measured on October 6, 2008
(Water Levels in Feet MSL)

CH2MHILL

File Path: V:\18gis\abl\figures\abl-wells_site.apr\ABL-Site1 Wells-Background Figure -Layout

December 1, 2004



LEGEND

- Extraction Well - Alluvial
- Extraction Well - Bedrock
- Monitoring Well - Alluvial
- Monitoring Well - Hybrid
- Monitoring Well - Bedrock
- Production Well

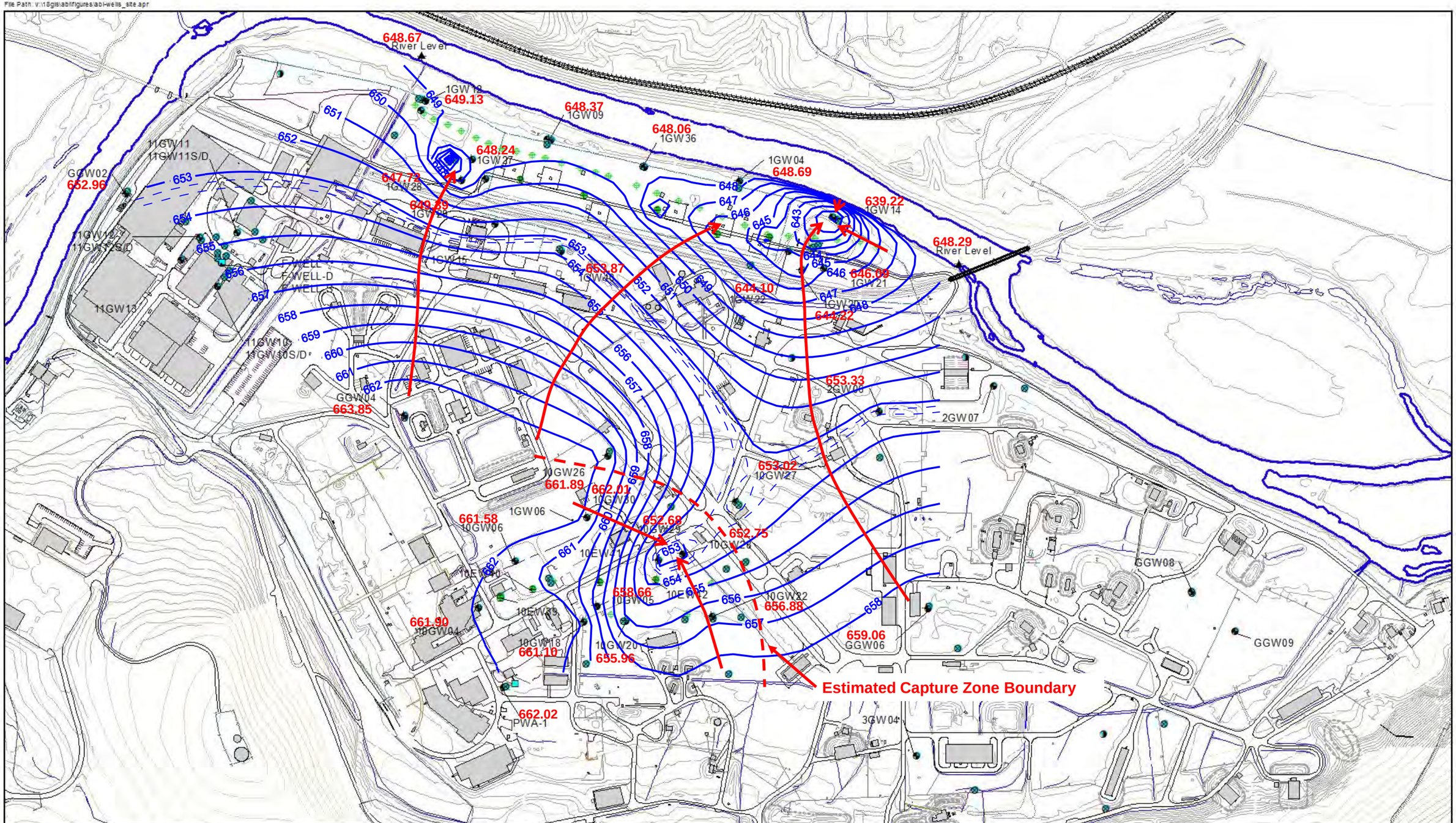
N

0 200 400 600 Feet

Figure 4-14
Alluvial Aquifer Groundwater Contours – July 2009
5 Year Rod Review Report
Allegany Ballistics Laboratory
Rocket Center West Virginia

CH2MHILL

File Path: V:\18gis\abl\figures\abl-wells_site.apr



LEGEND

- Extraction Well - Alluvial
- Extraction Well - Bedrock
- Monitoring Well - Hybrid
- Monitoring Well - Alluvial
- Monitoring Well - Bedrock

N

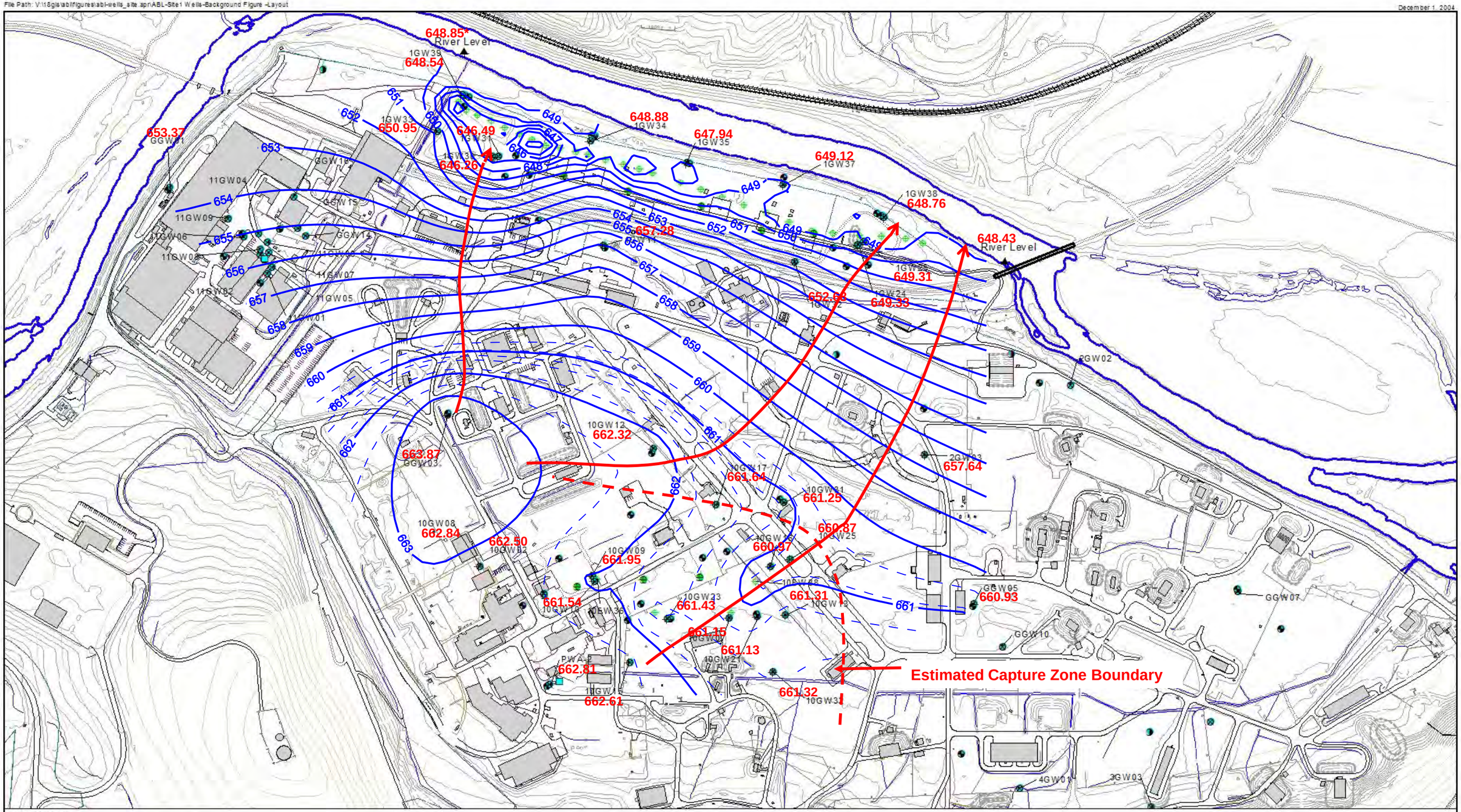
400 0 400 800 Feet

Figure 4-15
Bedrock Aquifer Groundwater Contours – July 2009
5 Year Rod Review Report
Allegany Ballistics Laboratory
Rocket Center West Virginia

CH2MHILL

File Path: V:\18gis\abl\figures\abl-wells_site.apr\ABL-Site1 Wells-Background Figure -Layout

December 1, 2004



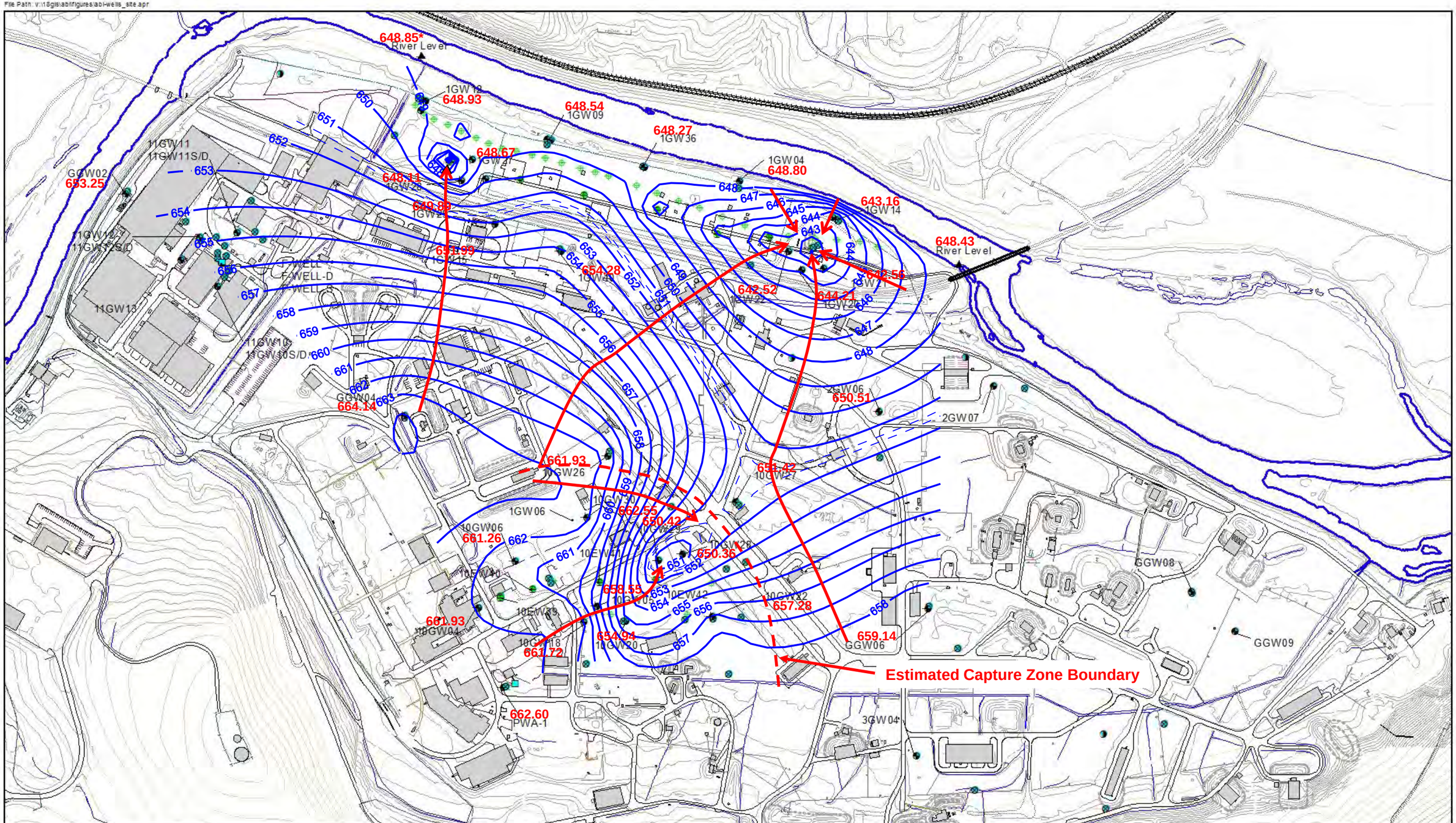
LEGEND

- Extraction Well - Alluvial
- Extraction Well - Bedrock
- Monitoring Well - Alluvial
- Monitoring Well - Hybrid
- Monitoring Well - Bedrock
- Production Well

Figure 4-16
Alluvial Aquifer Groundwater Contours – April 2010
5 Year Rod Review Report
Allegany Ballistics Laboratory
Rocket Center West Virginia

CH2MHILL

File Path: V:\18gis\abl\figures\abl-wells_site.apr



LEGEND

- Extraction Well - Alluvial
- Extraction Well - Bedrock
- Monitoring Well - Hybrid
- Monitoring Well - Alluvial
- Monitoring Well - Bedrock

N

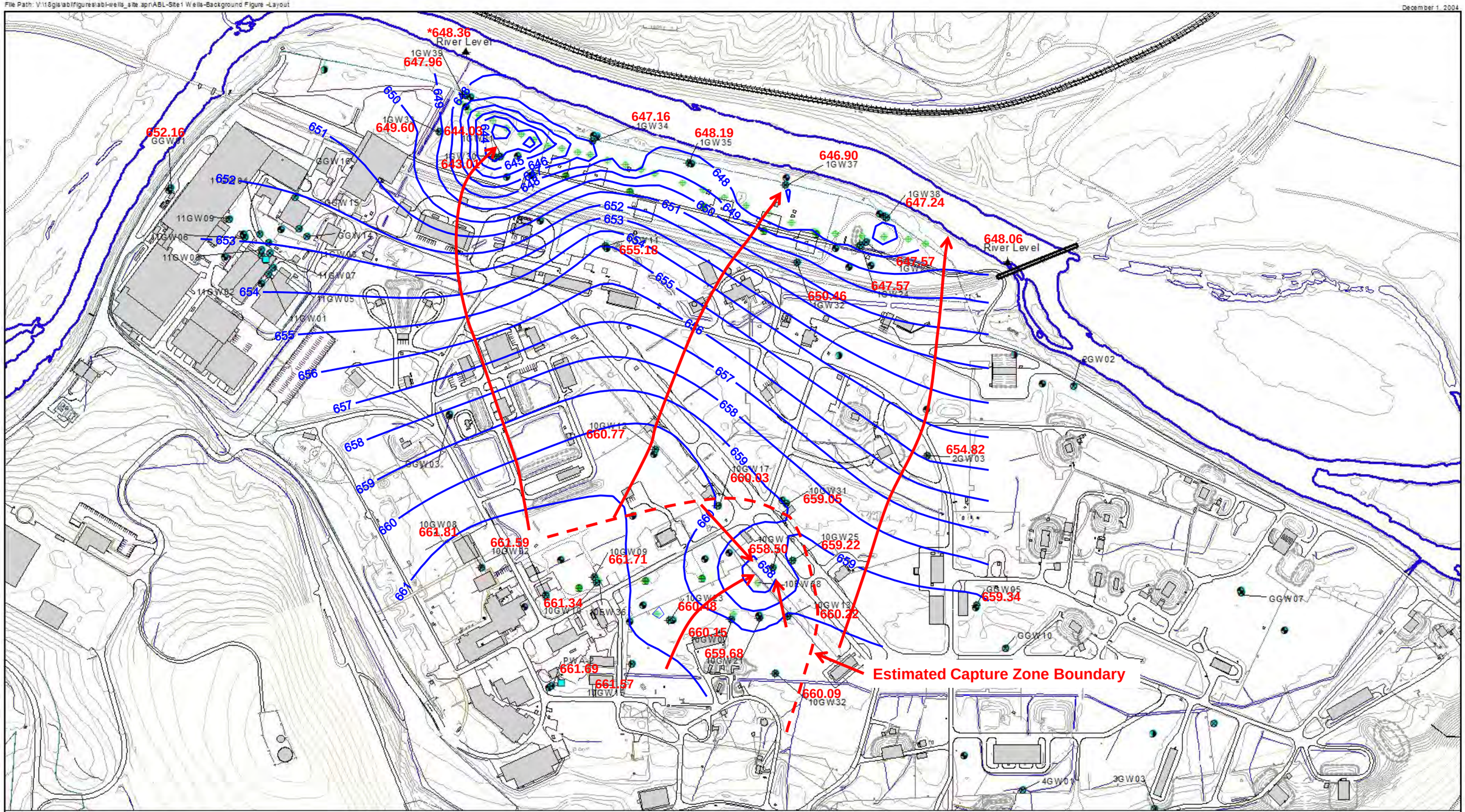
400 0 400 800 Feet

Figure 4-17
Bedrock Aquifer Groundwater Contours – April 2010
5 Year Rod Review Report
Allegany Ballistics Laboratory
Rocket Center West Virginia

CH2MHILL

File Path: V:\18gis\abl\figures\abl-wells_site.apr\ABL-Site1 Wells-Background Figure -Layout

December 1, 2004



LEGEND

- Extraction Well - Alluvial
- Extraction Well - Bedrock
- Monitoring Well - Alluvial
- Monitoring Well - Hybrid
- Monitoring Well - Bedrock
- Production Well

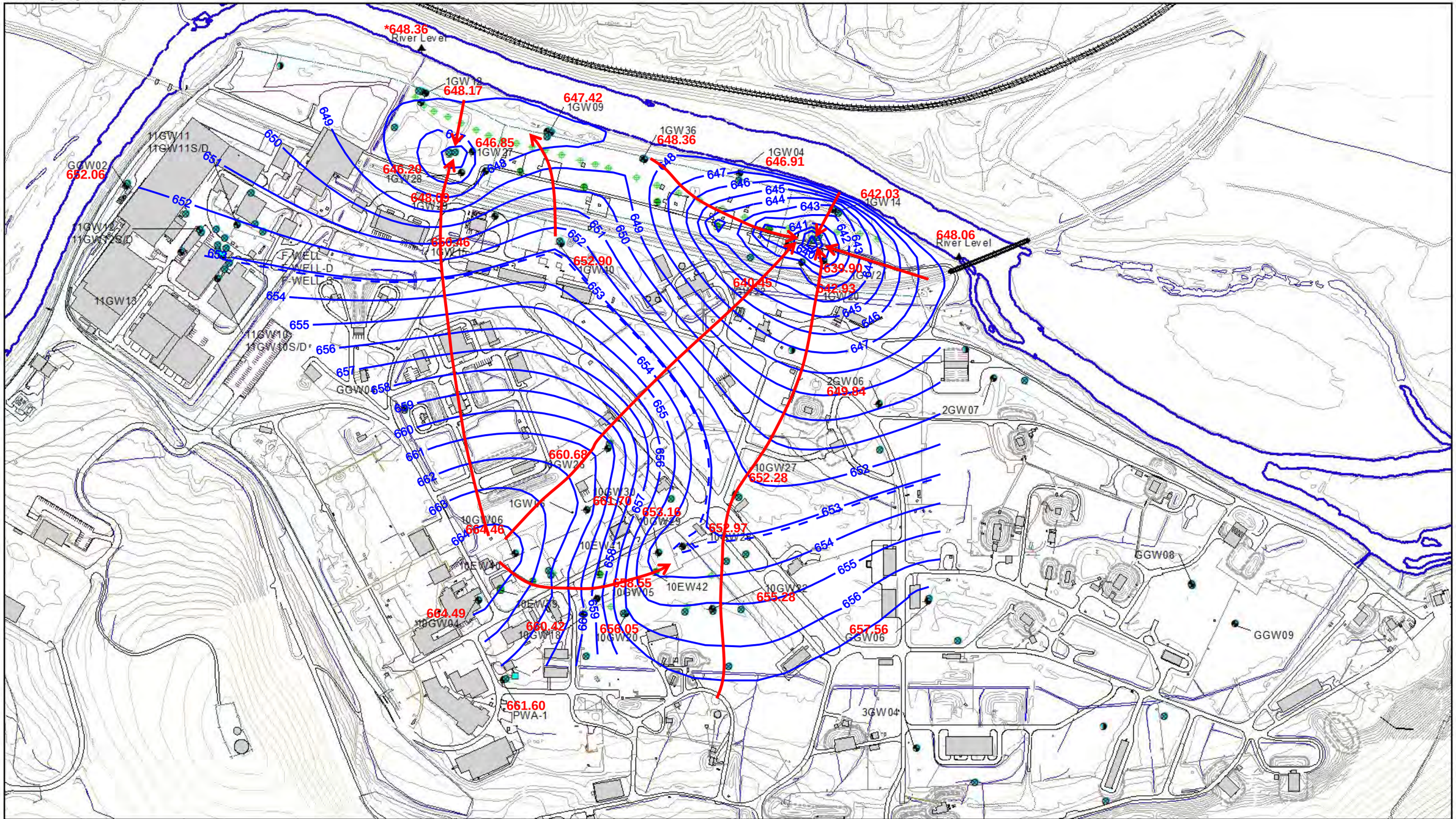
N

0 200 400 600 Feet

Figure 4-18
Alluvial Aquifer Groundwater Contours – January 2011
5 Year Rod Review Report
Allegany Ballistics Laboratory
Rocket Center West Virginia

CH2MHILL

File Path: V:\18gis\abl\figures\abl-wells_site.apr



LEGEND

- Extraction Well - Alluvial
- Extraction Well - Bedrock
- Monitoring Well - Hybrid
- Monitoring Well - Alluvial
- Monitoring Well - Bedrock

N

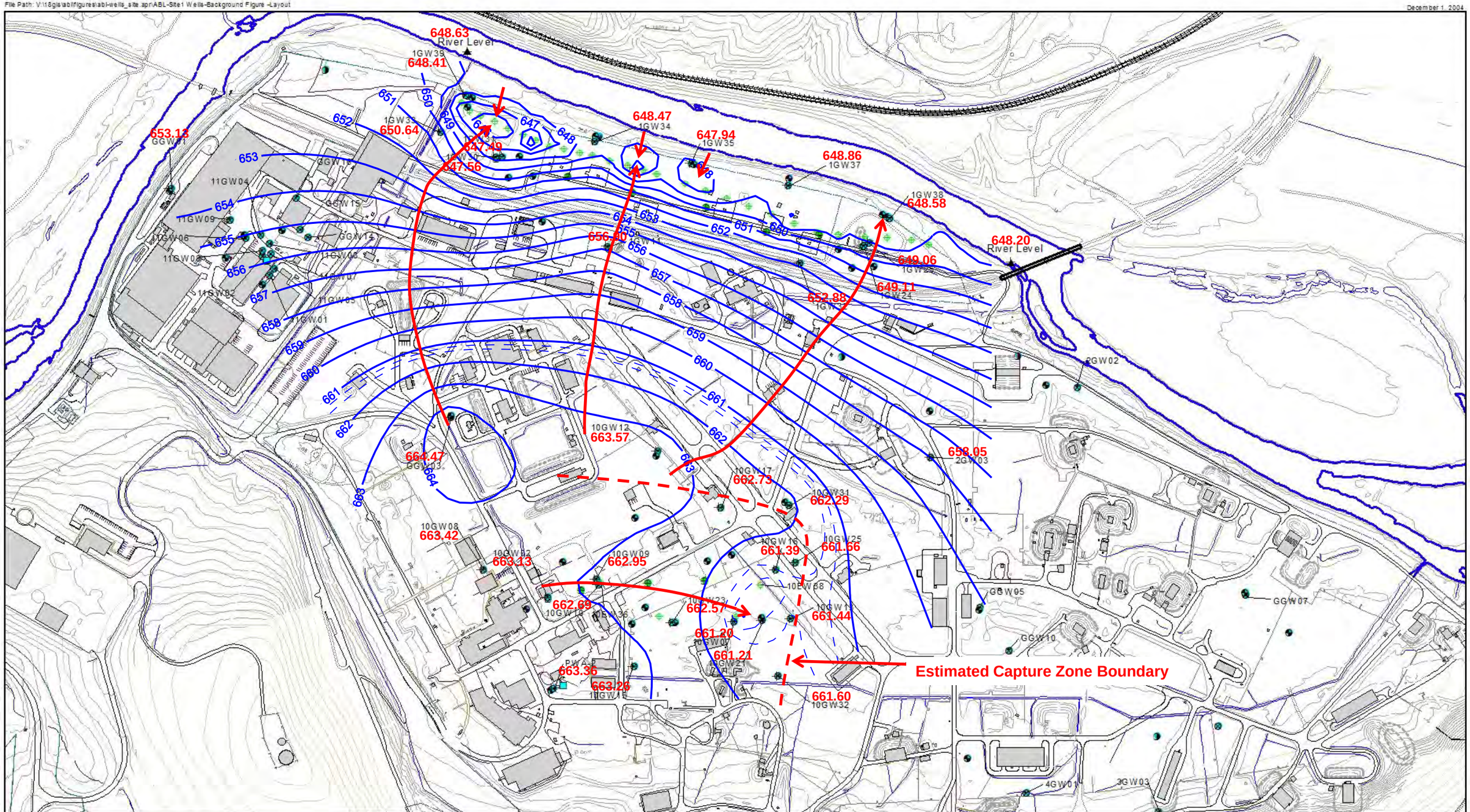
400 0 400 800 Feet

Figure 4-19
Bedrock Aquifer Groundwater Contours – January 2011
5 Year Rod Review Report
Allegany Ballistics Laboratory
Rocket Center West Virginia

CH2MHILL

File Path: V:\18gis\abl\figures\abl-wells_site.apr\ABL-Site1 Wells-Background Figure -Layout

December 1, 2004



LEGEND

- Extraction Well - Alluvial
- Extraction Well - Bedrock
- Monitoring Well - Alluvial
- Monitoring Well - Hybrid
- Monitoring Well - Bedrock
- Production Well

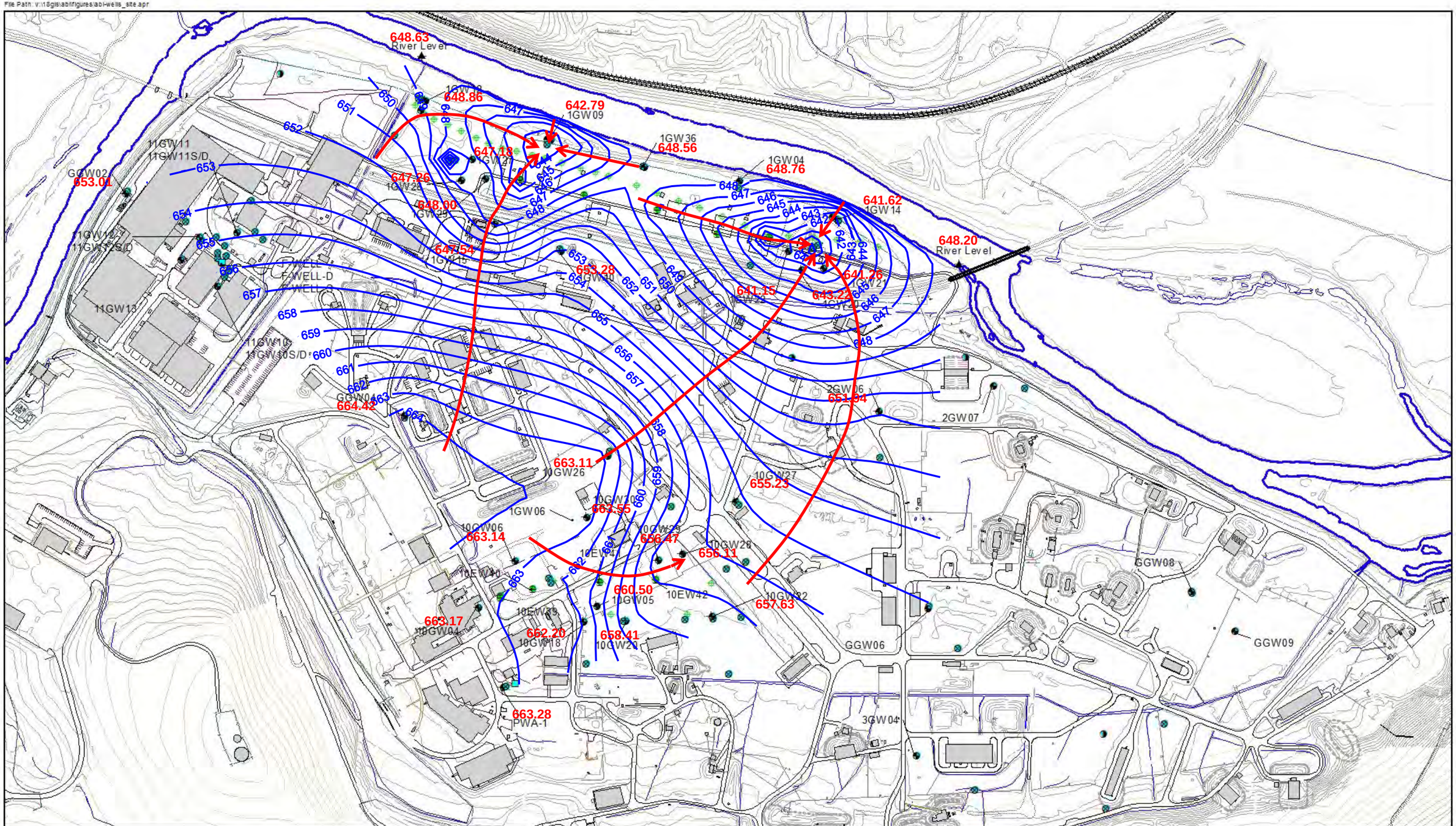
N

0 200 400 600 Feet

Figure 4-20
Alluvial Aquifer Groundwater Contours – October 2011
5 Year Rod Review Report
Allegany Ballistics Laboratory
Rocket Center West Virginia

CH2MHILL

File Path: V:\18gis\abl\figures\abl-wells_site.apr



LEGEND

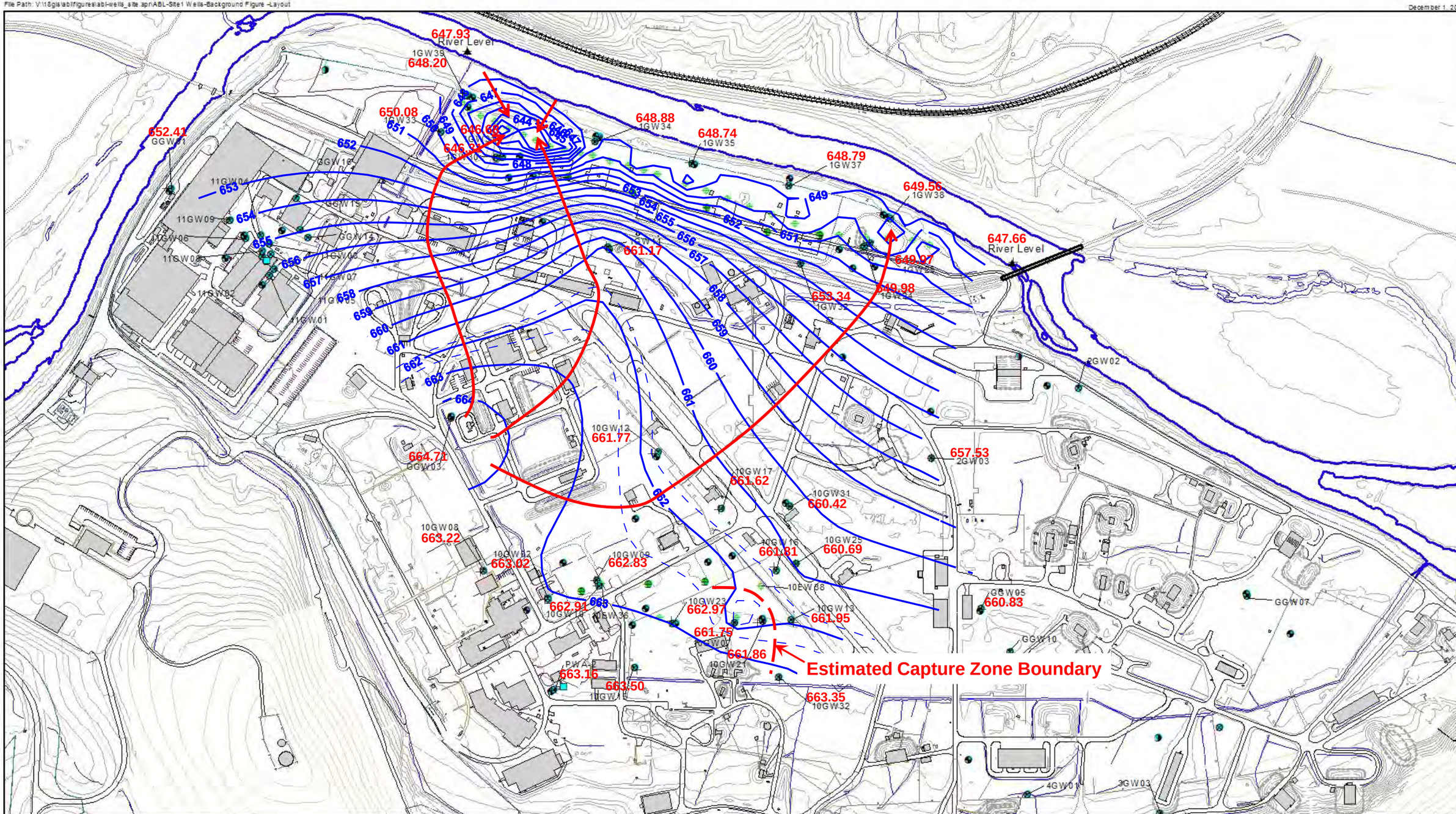
- Extraction Well - Alluvial
- Extraction Well - Bedrock
- Monitoring Well - Hybrid
- Monitoring Well - Alluvial
- Monitoring Well - Bedrock

N

400 0 400 800 Feet

Figure 4-21
Bedrock Aquifer Groundwater Contours – October 2011
5 Year Rod Review Report
Allegany Ballistics Laboratory
Rocket Center West Virginia

CH2MHILL



LEGEND

- Extraction Well - Alluvial
- Extraction Well - Bedrock
- Monitoring Well - Alluvial
- Monitoring Well - Hybrid
- Monitoring Well - Bedrock
- Production Well

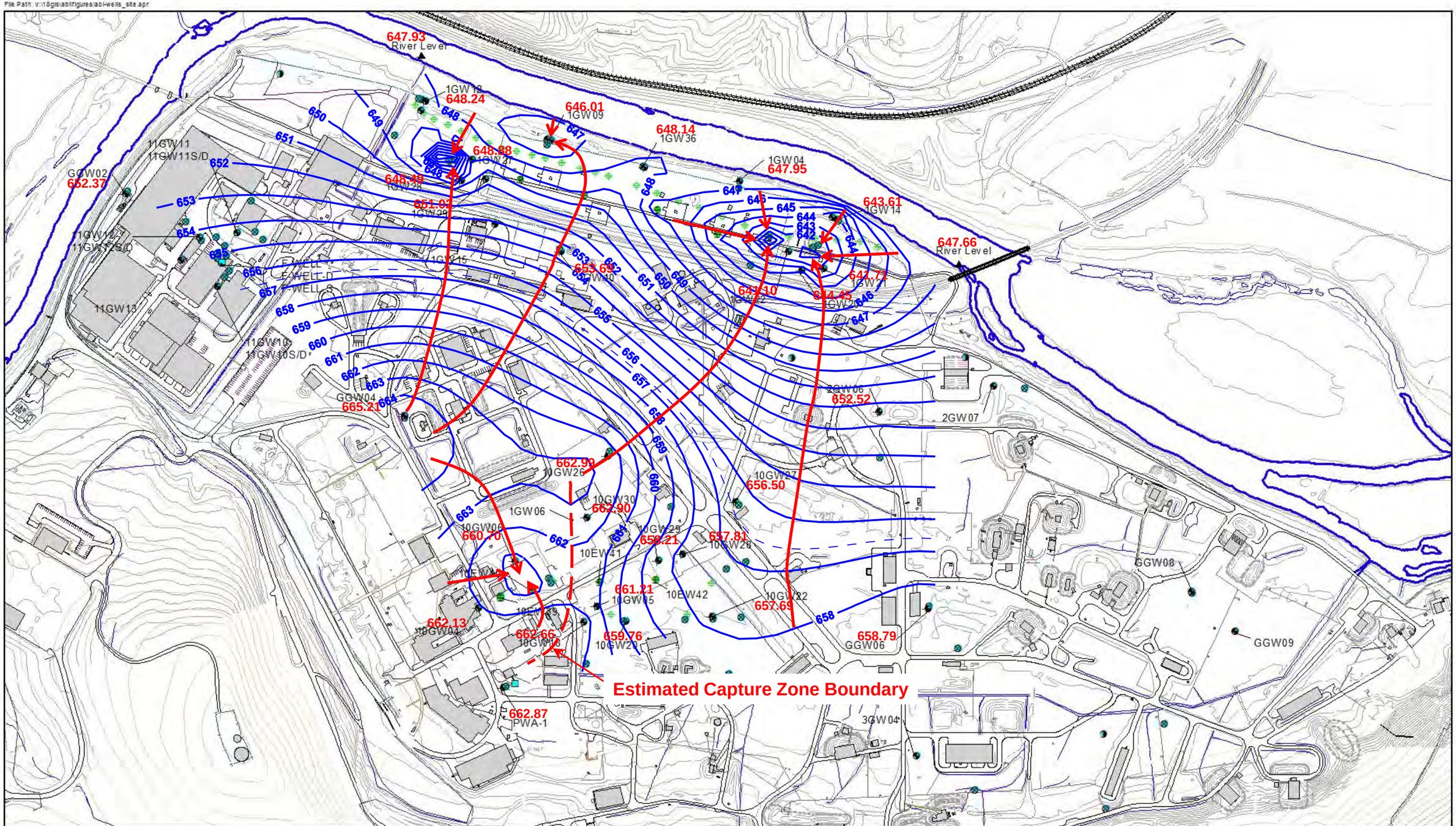
N

0 200 400 600 Feet

Figure 4-22
Alluvial Aquifer Groundwater Contours – August 2012
5 Year Rod Review Report
Allegany Ballistics Laboratory
Rocket Center West Virginia

CH2MHIL

File Path: V:\18gis\abl\figures\abl-wells_site.apr



LEGEND

- Extraction Well - Alluvial
- Extraction Well - Bedrock
- Monitoring Well - Hybrid
- Monitoring Well - Alluvial
- Monitoring Well - Bedrock

N

400 0 400 800 Feet

Figure 4-23
Bedrock Aquifer Groundwater Contours – August 2012
5 Year Rod Review Report
Allegany Ballistics Laboratory
Rocket Center West Virginia

CH2MHILL

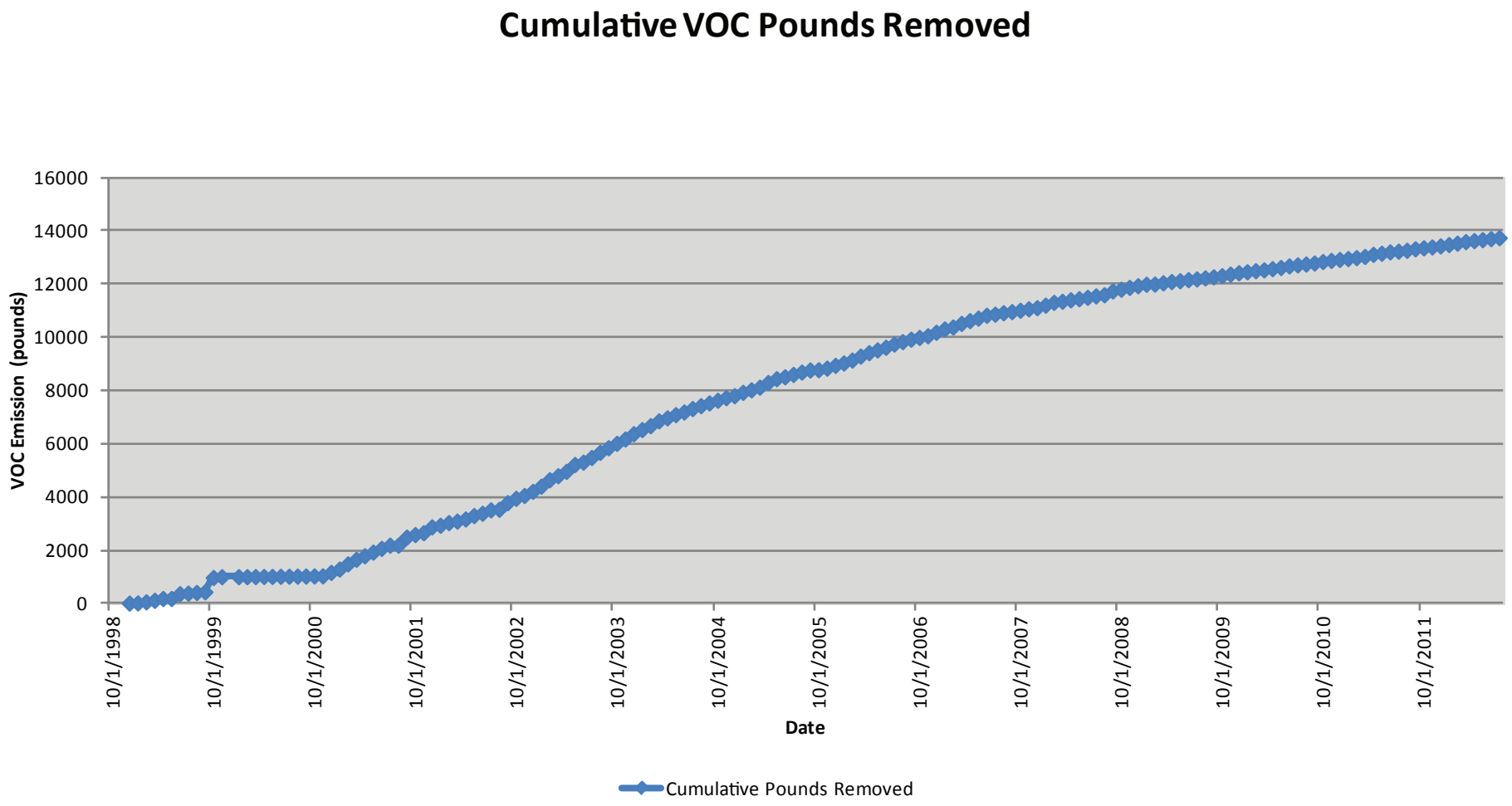
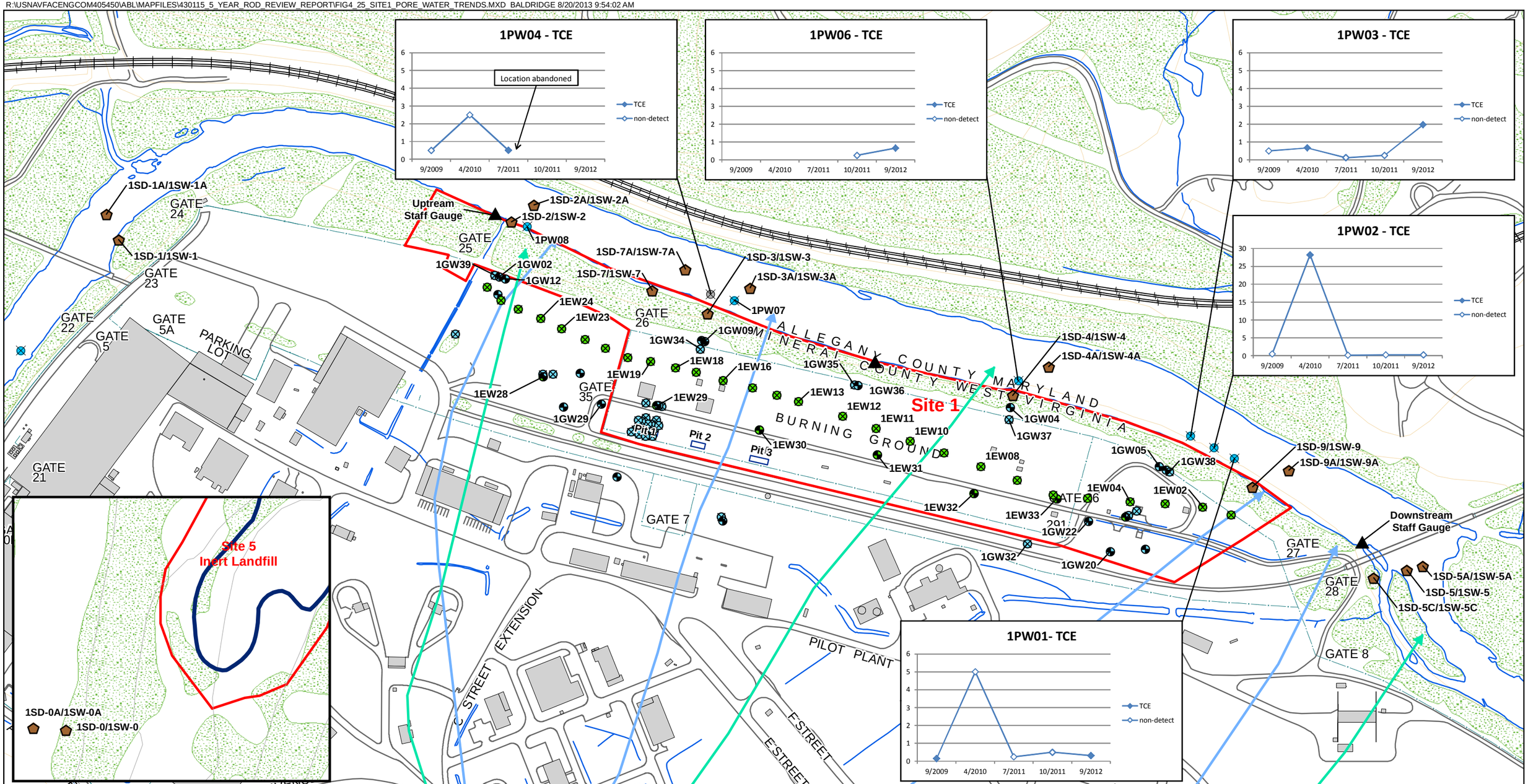


Figure 4-24
Groundwater Treatment Plant Air Emissions Trend
5 Year ROD Review Report
Allegany Ballistics Laboratory
Rocket Center, West Virginia

R:\USNAVFACENGCOM405450\ABL\MAPFILES\430115_5_YEAR_ROD_REVIEW_REPORT\FIG4_25_SITE1_PORE_WATER_TRENDS.MXD BALDRIDGE 8/20/2013 9:54:02 AM



Legend

- Abandoned Pore Water Location
- Pore Water Sample Locations
- Monitoring Well - Alluvial
- Monitoring Well - Bedrock
- Extraction Well - Alluvial
- Extraction Well - Bedrock
- Staff Gauge
- Sediment/Surface Water
- Alluvial Groundwater Flow
- Bedrock Groundwater Flow
- Disposal Pit
- Water Body
- Road
- Railroad
- Building
- Vegetation
- Site 1 Boundary

Note
- Data shown in µg/L.
- 1/2 Detection limit used for non-detect values.

N

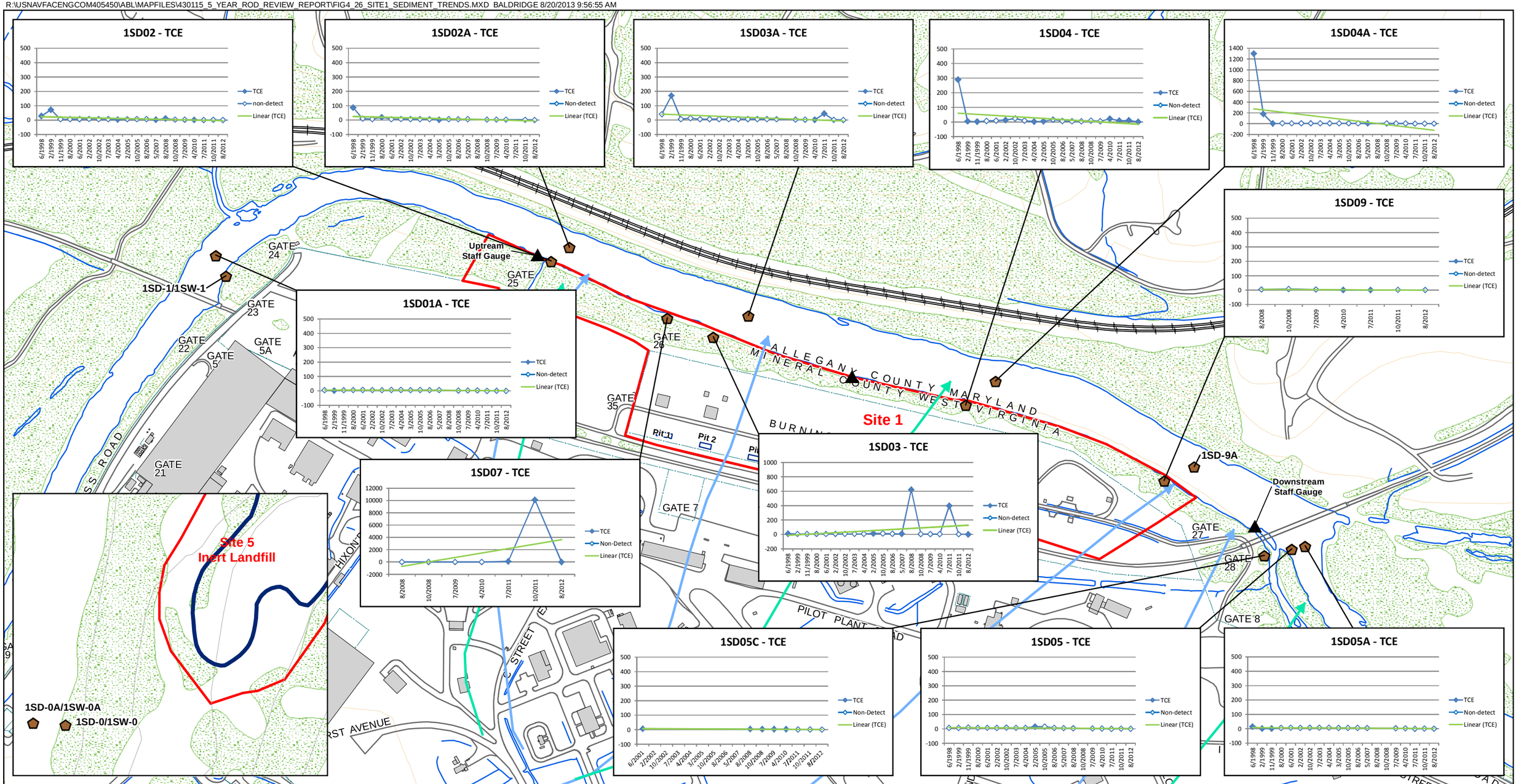
0 125 250 Feet

1 inch = 250 feet

Figure 4-25
Site 1 Pore Water Trends
5 Year ROD Review Report
Allegany Ballistics Laboratory
Rocket Center, West Virginia

CH2MHILL

R:\USNAVFACENGCOM405450\ABL\MAPFILES\430115_5_YEAR_ROD_REVIEW_REPORT\FIG4_26_SITE1_SEDIMENT_TRENDS.MXD BALDRIDGE 8/20/2013 9:56:55 AM



Legend

- Sediment/Surface Water
- Staff Gauge
- Alluvial Groundwater Flow
- Bedrock Groundwater Flow
- Disposal Pit
- Water Body
- Road
- Railroad
- Site 1 Boundary
- Building
- Vegetation

Note
- Data shown in µg/kg.
- ½ the detection limit used for non-detect values.

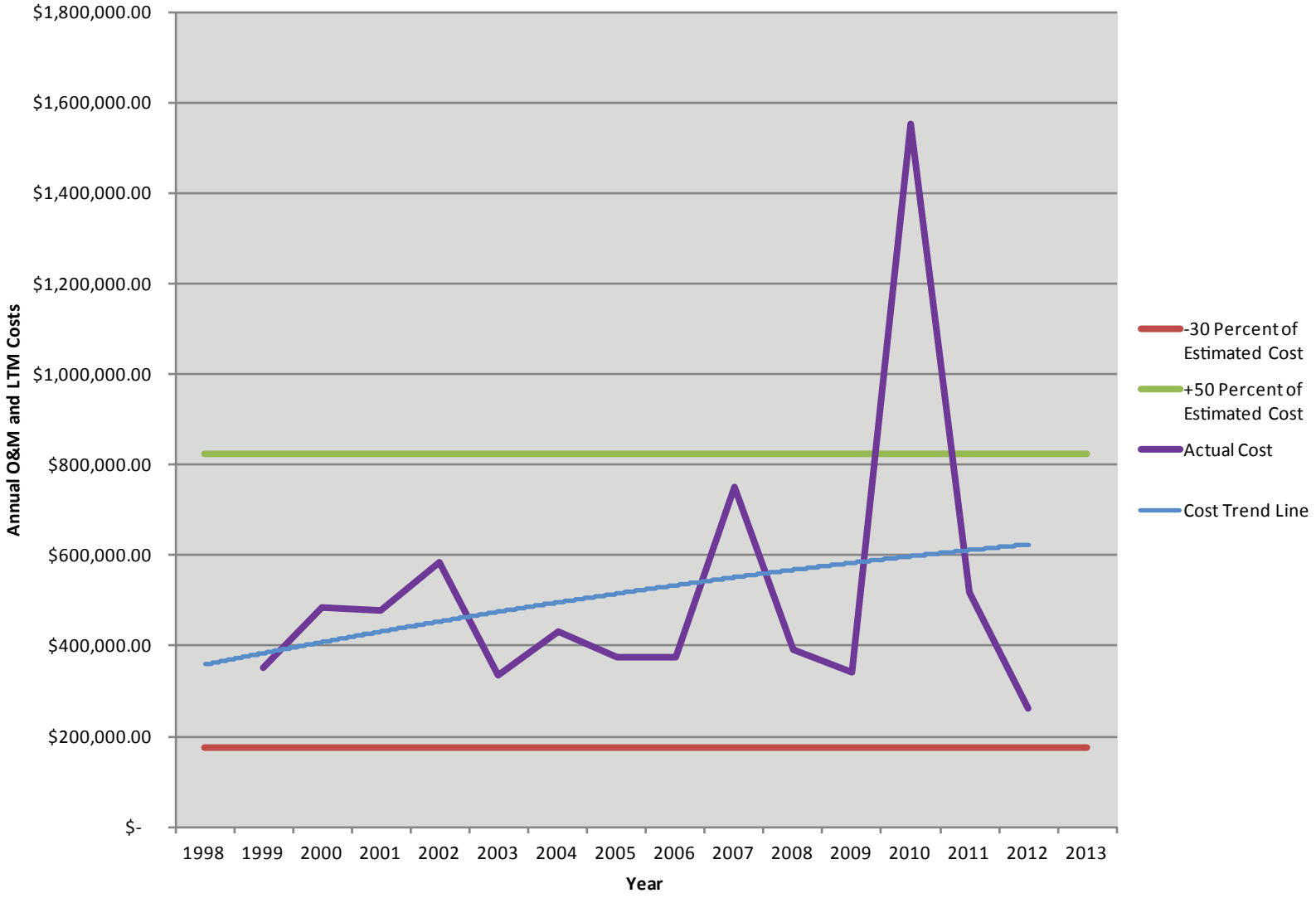
N

0 150 300 Feet

1 inch = 300 feet

Figure 4-26
Site 1 Sediment Trends
5 Year ROD Review Report
Allegany Ballistics Laboratory
Rocket Center, West Virginia

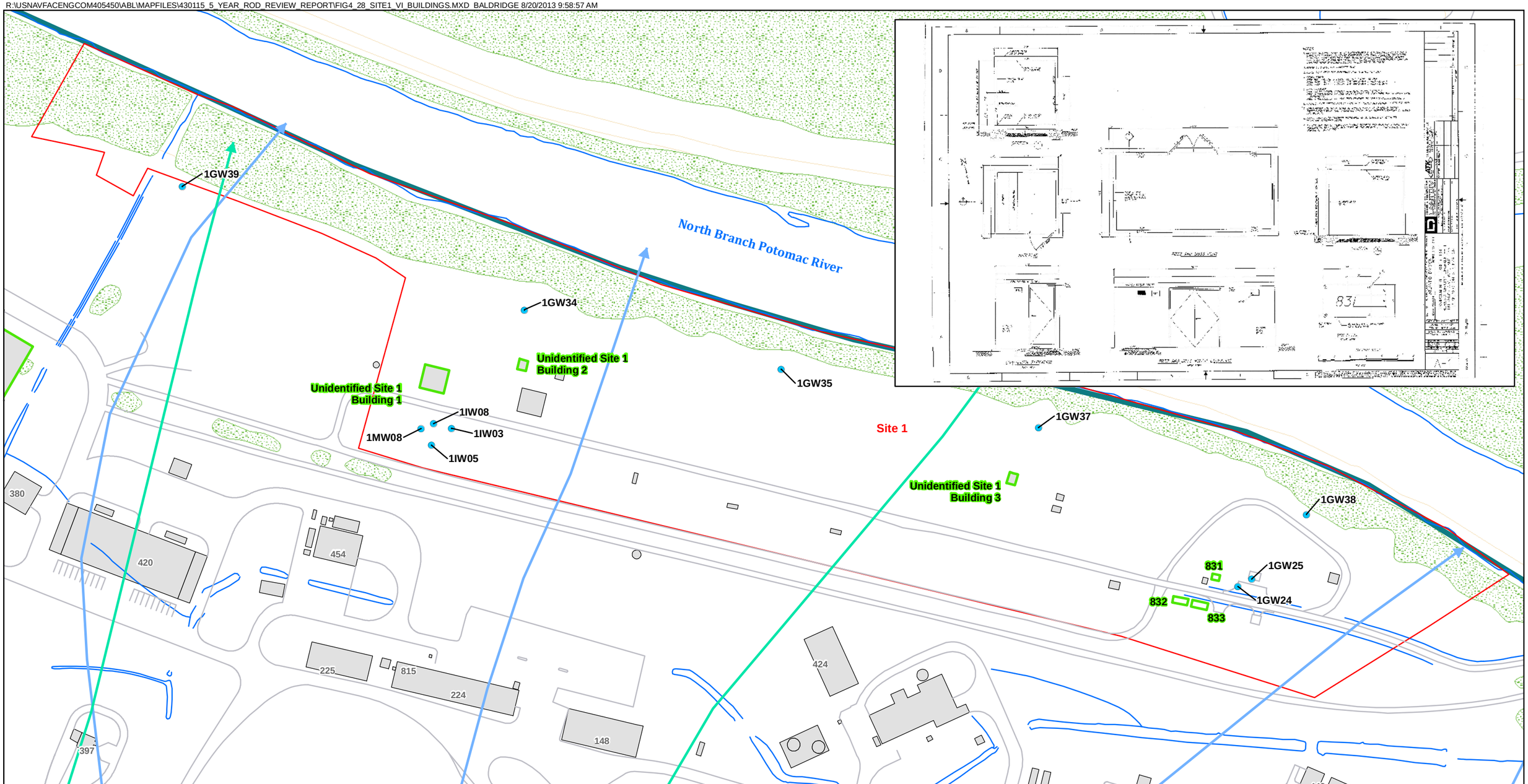
CH2MHILL



Note: Two cost estaimates provided for Selected Remedy. +50%/-30% range representative of high/low range of both estimates.

Figure 4-27
Annual O&M and LTM Costs
5 Year ROD Review Report
Allegany Ballistics Laboratory
Rocket Center, West Virginia

R:\USNAVFACENGCOM405450\ABL\MAPFILES\430115_5_YEAR_ROD_REVIEW_REPORT\FIG4_28_SITE1_VI_BUILDINGS.MXD BALDRIDGE 8/20/2013 9:58:57 AM



Legend

- Monitoring Well with Constituents of Interest above Groundwater-to-Indoor Air Screening Levels
- Alluvial Groundwater Flow
- Bedrock Groundwater Flow
- Preliminary Building of Interest
- IR Site
- Structure
- Undeveloped Area
- Plant 1
- Plant 2

N

0 75 150 Feet

1 inch = 150 feet

Figure 4-28
Site 1 Preliminary Vapor Intrusion Buildings of Interest
5 Year ROD Review Report
Allegany Ballistics Laboratory
Rocket Center, West Virginia

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SECTION 5

Site 5 – Inert Landfill (Operable Unit 1, Landfill Contents, and Surface Soil) and (Operable Unit 2, Groundwater, Surface Water, and Sediment)

This section provides an overview of the history and RA effectiveness for Site 5, OU-1, and OU-2.

5.1 Site Chronology

A chronology of major events for Site 5 (OU-1, Landfill Contents and Surface Soil and OU-2, Groundwater, Surface Water, and Sediment) is provided as follows:

Date	Event
January 1983	IAS (Environmental Science and Engineering [ES&E], 1983)
October 1987	Confirmation Study/Interim RI (Weston, 1987)
January 1996	RI (CH2M HILL, 1996a)
August 1996	Phase II RI (CH2M HILL, 1996b)
August 1996	FFS for Site 5 Landfill Contents and Surface Soil (CH2M HILL, 1996c)
February 12, 1997	ROD for landfill cap remedy for Site 5, OU-1 (Landfill Contents and Surface Soil) signed (Navy, 1997a)
March 1997	RD for OU-1 (CH2M HILL, 1997b)
July 10, 1997	Mobilized for Remedial Action Construction
November 1997	Draft Contractor Closeout Report for landfill cap at OU-1 submitted (OHM, 1997)
March 1998	Final Post-Closure O&M Plan for Site 5 (OU-1) (CH2M HILL, 1998b)
August 25, 1999	Deed Notification (Notice of Inactive Hazardous Substance or Waste Disposal Site) filed with Mineral County, West Virginia, for landfill at Site 5 (OU-5)
July 10, 2002	Navy signature date, Final Five-Year ROD Review Report, First Five-Year Review (CH2M HILL, 2002b)
September 15, 2003	Navy signature date, Final Five-Year ROD Review Report, Second Five-Year Review (CH2M HILL, 2003a)
March 2004	Final LTM Report for Sites 1, 5, and 10 (CH2M HILL, 2004b)
April 2004	Final LTM Report for Site 5 (CH2M HILL, 2004c)
September 2004	Final Focused RI and FS for Site 5 Groundwater, Surface Water, and Sediment (OU-2) (CH2M HILL, 2004d)
February 9, 2006	ROD for Permeable Reactive Barrier (PRB) at Site 5, OU-2 (Groundwater, Surface Water, and Sediment) signed (Navy, 2005b)
March 2006	Final Pre-Construction Work Package for PRB construction at Site 5 (OU-2)
April 2006	Construction of PRB at OU-2 initiated
June 8, 2006	Construction of PRB at OU-2 completed
June 2006	Final LTM Plan for Sites 1, 5, and 10 (CH2M HILL, 2006a)
March 2007	Final Construction Closeout Report for Site 5 (OU-2) (AGVIQ-CH2M HILL JVI, 2007a)
September 10, 2008	Navy signature date, Five-Year ROD Review Report, Third Five-Year Review (CH2M HILL, 2008d)
June 2010	SAP, LTM Plan for Sites 1, 5, and 10 (CH2M HILL, 2010b)
November 2010	Interim Draft LTM Report for Sites 1, 5, and 10 (SB-RAC AGVIQ/CH2M HILL, 2010)
April 2011	LTM Report for Sites 1, 5, and 10 (CH2M HILL, 2011a)
October 2011	SAP for Sites 1, 5, and 10 (Update 01) (CH2M HILL, 2011b)
July 2012	SAP for Sites 1, 5, and 10 (Update 02) (CH2M HILL, 2012b)
October 2012	Interim CERCLA LTM Report for Sites 1, 5, and 10 (SB-RAC AGVIQ/CH2M HILL, 2012b)

5.2 Background

5.2.1 Description and History

Site 5 (Inert Landfill) is a 1.3-acre former landfill located on an elevated portion of land (a terrace) above the North Branch Potomac River in the undeveloped area of ABL Plant 1 (**Figure 5-1**). The Site 5 landfill operated from the early 1960s to 1985, accepting inert wastes generated by ABL. Inert wastes are defined as wastes not contaminated with explosives nor generated at an area on ABL where explosives were managed. Wastes reported to have been disposed of at Site 5 include drums that previously contained chlorinated solvents, including TCE, fluorescent tubes, unknown laboratory and photographic chemicals, fiberglass and other resin-coated fibers, metal and plastic machining wastes, and construction and demolition debris (Navy, 2005a).

Site 5 consists of the following two OUs:

- OU-1, landfill contents and surface soil
- OU-2, alluvial and bedrock groundwater beneath and downgradient from the landfill, and the surface water and sediments of the North Branch Potomac River adjacent to Site 5

Site 5 was initially identified during the IAS (ES&E, 1983) that was performed at ABL in 1983 under the Navy Assessment and Control of Installation Pollutants Program (NACIP) (Navy, 2005a). Site 5 has since been defined and investigated in many previous investigations including the Confirmation Study/Interim RI, RI, and Phase II RI. The objective of the RI was to investigate the location of contamination and estimate potential risks to human health and the environment. Soil samples indicated potential risk associated with exposure to soil and landfill contents associated with Site 5, and in accordance with the ROD (Navy, 1997a), a geosynthetic clay liner and flexible membrane cap were installed at the site. The RI identified potential risk from exposure to groundwater contaminant levels in OU-2 and determined that the constituents that produce the potential exposure risk (the risk drivers) are TCE, iron, and manganese (Navy, 2005a). Previous groundwater sampling has shown that there has been a release of TCE from the Site 5 landfill to both the alluvial and bedrock groundwater beneath and downgradient of the Site 5 landfill, and to surface water and sediment of the North Branch Potomac River. In accordance with the final ROD (Navy, 2005a) for OU-2, a PRB wall was installed and placed just downgradient of the landfill on the northern side, to intercept contaminated alluvial groundwater as it emerges from beneath the landfill. The goal of the PRB is to passively reduce the TCE concentrations in groundwater to acceptable levels as the alluvial groundwater passes through the PRB downgradient of the landfill (Navy, 2005a).

5.2.2 Physical Characteristics

A CSM (**Figure 5-2**) has been developed to summarize the site conditions, contaminant distribution, transport pathways, potential receptors and exposure pathways, and land use data collected during site investigations. The majority of the site is grass and tree covered (downgradient of the landfill cap). Elevations at Site 5 range from approximately 680 to 700 feet amsl. A drainage ditch system borders the Site 5 landfill to convey surface runoff from the landfill to the North Branch of the Potomac River (**Figure 5-2**).

Site 5 is underlain by the following two distinct lithologies: (1) unconsolidated alluvial deposits of fill, silty clay, and clayey gravel (alluvial aquifer) and (2) predominantly shale bedrock (bedrock aquifer). The depth to bedrock at Site 5 is approximately 15 to 20 feet below grade. The alluvial aquifer extends from the eastern edge of the landfill to the river. **Figure 5-3** presents groundwater elevation contours that show, in general, that alluvial groundwater at Site 5 flows northwest. The alluvial groundwater does not flow directly westward from the landfill to the river. Rather it flows northwestward, sub-parallel to the river, eventually discharging to the river at the northern end of Site 5, west of alluvial monitoring well 5GW20. There is insufficient information to draw water level contour lines south of the landfill. However, based on historical data it is expected that the water table in this area generally mimics the surface topography which would suggest that groundwater is flowing northwest, toward the river and Site 5 landfill. As designed and constructed, the hydraulic conductivity at the PRB is approximately the same as the surrounding soil material; however, the relatively high porosity of zero-valent iron particles within the PRB causes localized reduction of groundwater velocity, increasing the residence time of groundwater within the PRB, which

facilitates groundwater treatment in the alluvial aquifer. The absence of a confining unit and the relatively small difference in hydraulic head between the two aquifers indicate that the alluvial and bedrock aquifers are hydraulically connected.

5.2.3 Land and Resource Use

Currently, Site 5 is not used and the landfill is covered and closed and no longer receives wastes. Groundwater is not currently used as a potable water supply at Site 5. Current and future land use of the site is not expected to change. LUCs are currently maintained within the area of restricted groundwater use at Site 5 (**Figure 5-1**). LUCs restrict exposure to groundwater until concentrations of VOCs are reduced to levels that allow for unlimited use and unrestricted exposure. Land access to the site is currently restricted to onsite workers through the facility security system (Navy, 2005a). Institutional controls including a deed notice restricting construction and excavation activities. It is possible to access the site via the North Branch Potomac River, which is used for recreational purposes, but perimeter fencing and “No Trespassing” signs are in place to discourage this activity.

The land use immediately surrounding Site 5 is industrial to the north (Plant 2) and undeveloped mountainous woodland to the south and east. Farmland is immediately across the river to the west. The closest potable groundwater supply is located approximately 2,000 feet upgradient (south) of Site 5.

5.2.4 History of Contamination

The primary COCs detected in groundwater at Site 5 are VOCs, iron, and manganese, with TCE being the most-prevalent VOC and detected at the highest concentrations. The surface soil COCs include SVOCs, arsenic, manganese, chromium, lead, and mercury. The landfill contents are considered to be the primary source of VOCs and inorganic contamination in soil and groundwater (Navy, 2005a). Risk assessments determined there are no COCs in surface water or sediment in the North Branch Potomac River adjacent to and attributable to Site 5. Because no unacceptable potential risk to human health or the environment was identified for the surface water and sediment, No Further Action was warranted for these media.

As a result, potential risks associated with the landfill contents, associated surface soils, and groundwater have been evaluated and RAs have been conducted at Site 5. A ROD for OU-1, which addressed the landfill contents remaining in place and surface soil, was signed in February 1997 (Navy, 1997a). The selected remedy for OU-1 was to install a landfill cap that consisted of a geosynthetic clay liner and a flexible membrane cap to mitigate potential risks posed by the landfill contents and surface soil, including continued migration of landfill contents to the underlying aquifers. A ROD for OU-2 that addressed the alluvial and bedrock groundwater, surface water, and sediment was signed in February 2006 (Navy, 2005a). The remedy for OU-2 consisted of installing a PRB to reduce TCE in the alluvial aquifer as groundwater passes through the PRB and continues downgradient, and monitored natural attenuation (MNA) to address iron, manganese, and TCE both the alluvial and bedrock aquifers outside the influence of the PRB. The ROD also selected long term monitoring of the groundwater and river and no action for surface water and sediment.

5.2.5 Site Risks

Human health risks associated with exposure to OU-1, including the landfill contents and surface soil, and OU-2, including groundwater, surface water, and sediment, were initially evaluated and discussed in the Phase II RI Report (CH2M HILL, 1994) and FFS report for Site 5 (CH2M HILL, 1996c). A baseline HHRA was conducted for current and potential future land use scenarios. A BERA was conducted during the Phase II RI (CH2M HILL, 1994) to assess the risk to potential ecological receptors from exposure to Site 5 surface soil. A terrestrial reconnaissance was performed as part of the BERA. Habitat types included in the area of Site 5 include a riparian forested land along the river, an upland forested floodplain, and a grassy meadow (Navy, 1997a). The receptors most likely to be present in these habitats include mice, voles, rabbits, earthworms, other ground insects, and a variety of birds (Navy, 1997a). The summary of risks associated with landfill contents and surface soil as documented in the ROD for Site 5, OU-1 (Navy, 1997a) and associated with groundwater, surface water, and sediment as documented in the ROD for Site 5, OU-2 (Navy, 2005b) are presented in the following subsections.

Human Health Risks

- Current exposure scenarios evaluated consisted of onsite workers. Potential future exposure scenarios evaluated consisted of construction workers and hypothetical adult and child residents. The exposure pathways evaluated were incidental ingestion, dermal contact, and inhalation of vapors and dust of surface soil and inhalation of VOCs while showering, dermal contact with, and ingestion of groundwater.
- Historical investigations (CH2M HILL, 1996c) concluded that there were no COPCs identified for sediment and surface water associated with Site 5; therefore, exposure scenarios for sediment and surface water were not evaluated. However, these investigations did not adequately assess potential risks associated with surface water and sediment. Therefore, the Focused RI (CH2M HILL, 2004e) revised estimates of potential human health risks from the adjacent North Branch Potomac River based on a more-comprehensive set of data and updated risk assessment guidance, and evaluated current/future adult and adolescent recreator exposure pathways to surface water and sediment.
- No carcinogenic or non-carcinogenic hazards associated with current onsite workers or future construction workers were identified. The only scenario where potential risk was identified was in the unlikely residential scenario. The total non-cancer hazard for the future adult and child resident exceeded 1. Exposure to groundwater at Site 5 contributes the majority of the total non-cancer hazard for future adult and child residents, and manganese is the primary risk driver.

Since the landfill cap isolated the contents of the landfill and minimized leaching of contaminants to groundwater, additional samples were collected and the HHRA was updated for OU-2 media (groundwater, surface water, and sediment) (Navy, 2005a). The updated HHRA is discussed in full in the Focused RI/FS Report for Site 5 (CH2M HILL, 2004d).

- The exposure pathways evaluated were ingestion of groundwater, dermal contact with groundwater, and inhalation of VOCs during showering (Navy, 2005a). Currently, there is no complete groundwater exposure pathway for potential human receptors at Site 5; therefore, current exposure scenarios were not evaluated. Future construction worker and future adult and child resident scenarios were evaluated for groundwater. Recreational use was evaluated for surface water and sediment in the North Branch Potomac River.
- There were no potential human health risks associated with surface water or sediment.
- Potential risk to human health, driven by exposure to TCE, iron, and manganese in groundwater, was identified for future adult and child resident, lifetime resident, and construction worker scenarios from exposure to alluvial groundwater, and future adult and child resident, and lifetime resident from exposure to bedrock groundwater.

Ecological Risks

- The exposure pathways evaluated for ecological receptors included dermal absorption, ingestion, and inhalation of volatile chemicals from surface soil, absorption of chemicals from soil by plants, and bioaccumulation of chemicals through the food chain (CH2M HILL, 1994). Exposure assessments were completed for ecological receptors exposure to surface water, sediment, and surface soil. Environmental effects quotients (EEQs) were calculated to qualify environmental risk. EEQs were determined for each sample by dividing the concentration of particular contaminants by the chemical-specific screening level.
- Several SVOCs, particularly PAHs, and inorganics were detected in surface water and sediment samples at concentrations that exceeded background levels and screening level criteria (CH2M HILL, 1994). However, due to the size of the aquatic habitat, environmental risk related to exposure to SVOCs and inorganics in surface water and sediment is low.
- Environmental risk for receptors exposed to site soil was identified, particularly from potential ecological receptor exposure to chromium, aluminum, and lead, which had EEQs that represented substantial risk

(CH2M HILL, 1994). The ERA concluded that SVOCs, mercury, chromium, and lead detected in the surface soil at Site 5 posed potential risk to ecological receptors (Navy, 1997a).

A separate ERA was conducted in 2004 for OU-2 media (groundwater, surface water, and sediment).

- Groundwater was evaluated in the 2004 ERA only as a potential transport medium of historical contamination because the landfill cap significantly reduces infiltration of precipitation into groundwater. Groundwater was not evaluated as an exposure pathway.
- Surface soil was not evaluated in the 2004 ERA because the landfill cap prevented a complete exposure pathway to soils on the site. The complete ERA is presented in the Focused RI/FS Report for Site 5 (CH2M HILL, 2004d).
- The results from the 1996 ERA were not quantitatively considered in the 2004 ERA. The 2004 ERA for Site 5 determined that there were no unacceptable potential risks from ecological receptors exposure to surface water and sediment (Navy, 2005a).

5.2.6 Initial Response

Site 5 was initially identified in the IAS performed at ABL in 1983 (NACIP, 1983). Site 5 was investigated based on historical records, photographs, site inspections, and personnel interviews. The IAS concluded that this site did not pose an immediate threat, but recommended a Confirmation Study to assess potential suspected contamination (Navy, 2005a). The Site 5 landfill stopped accepting waste in 1985. In June 1993, the USEPA proposed adding the Plant 1 portion of ABL (including Site 5) to the NPL based upon potential risk to human health and the environment. The Plant 1 portion of ABL was added to the NPL as documented in the *Federal Register*, Volume 59, Number 27989, on May 31, 1994, and Site 5 has since been investigated following the guidelines and regulations established under CERCLA and Superfund Amendments and Reauthorization Act of 1986 (SARA) by the USEPA (Navy, 2005a). No RAs or response measures occurred at Site 5 for either OU-1 (Landfill Contents and Surface Soil) or OU-2 (Groundwater, Surface Water, and Sediment) prior to signatures of the RODs in February 1997 and February 2006, respectively.

5.2.7 Basis for Remedial Action

Based on the results of previous investigations, human health, and ERAs, potential exposed landfill contents and surface soil may pose an unacceptable risk to human and ecological receptors. In addition, landfill contents are the likely source for VOCs contamination in groundwater (OU-2) through infiltration and leaching. Unacceptable human health risks were identified for future receptors (residents and construction workers) in alluvial and bedrock aquifer groundwater with TCE as the primary risk driver. No unacceptable human health or ecological risks were identified for the OU-2 surface water and sediment.

5.3 Remedial Actions

5.3.1 Selected Remedy

The remedy selection decision process for Site 5 is addressed through separate RODs for OU-1 (Landfill Contents and Surface Soil) and OU-2 (Groundwater, Surface Water, and Sediment). Additional detail regarding the remedy selection and ROD for each OU is provided as follows.

5.3.1.1. Landfill Contents and Surface Soil (OU-1)

The ROD for Site 5 (OU-1) was signed on February 12, 1997. The selected RA, an impermeable landfill cap, was designed primarily to reduce the potential exposure risks and to prevent groundwater, surface water, and sediment contamination from infiltration and leaching of landfill contents.

The RAOs for this ROD are defined as follows:

- Prevent or minimize infiltration and any resulting leaching of contaminants from the landfill into groundwater
- Prevent or minimize direct contact of human and ecological receptors with landfill contents
- Prevent surface water run-on and control surface water runoff erosion

To achieve these RAOs, the selected remedy for OU-1 comprises the following major components:

- Deed notification along with property use and limited access restrictions
- Installation of a composite geosynthetic clay liner and flexible membrane cap covering the landfill
- Installation of a drainage layer using a geonet
- Revegetation of the capped area and
- Post-closure requirements
- Installation of a passive landfill gas venting system

Specific standards for the landfill cap discussed in the ROD for performance evaluation include the following:

- Surface water drainage controls to prevent erosion of the cap
- Vegetative support layer containing sufficient organic materials and nutrients to sustain a cover of perennial species with a minimum thickness of 24 inches
- Drainage layer with hydraulic conductivity greater than 10^{-2} centimeters per second
- The flexible membrane cap, a synthetic barrier consisting of a flexible geomembrane designed to prevent infiltration
- The geosynthetic clay liner with hydraulic conductivity less than 10^{-7} centimeters per second
- A landfill gas management system
- A base layer comprised of unclassified fill material
- Side slopes of the landfill cap are not to exceed 4 (horizontal):1 (vertical)

Compliance with ARARs includes additional requirements, such as the following:

- Surface water drainage controls to prevent erosion of the cap
- O&M of the landfill cover and vegetation
- Long-term sampling and analysis of landfill gas and groundwater

ICs to restrict construction and excavation activities are being implemented pursuant to a LUC RD document. A deed notification (Notice of Inactive Hazardous Substance or Waste Disposal Site) for the landfill at Site 5 (OU-1) was filed with Mineral County, West Virginia on August 25, 1999.

Performance standards and expected outcomes for evaluating the overall performance of the remedy were established in the OU-1 ROD and are summarized in **Table 5-1**.

5.3.1.2. Groundwater, Surface Water, and Sediment (OU-2)

The ROD for Site 5 (OU-2) was signed on February 9, 2006. The selected RA, a PRB, was designed primarily to reduce the potential human health exposure risks for groundwater and to prevent the migration of TCE contamination in groundwater.

The site-specific RAOs for this ROD are defined as follows:

- Prevent or minimize exposure of potential future onsite residents and construction workers to contaminated groundwater originating from Site 5 at concentrations exceeding MCLs or, in the absence of MCLs, an excess lifetime cancer risk of 1×10^{-4} or an HI = 1
- Prevent or minimize river media from becoming impacted by the Site 5 groundwater COCs such that resulting concentrations present an unacceptable risk to human health or the environment
- Restore groundwater beyond the landfill boundaries to MCLs, or, in the absence of MCLs, risk-based levels

To achieve these RAOs, the selected remedy comprises the following major components:

- A PRB wall to treat TCE in the alluvial aquifer
- MNA to address TCE in the alluvial aquifer outside of the influence of the PRB, TCE in the bedrock, and iron and manganese in both aquifers
- LTM of the groundwater and river to monitor the progress of the PRB and MNA toward meeting the RAOs and cleanup levels
- Groundwater use restrictions to prohibit the use of groundwater from the alluvial and bedrock aquifers for potable use until LTM demonstrates that the cleanup levels have been achieved
- No action for sediment and surface water

LTM of surface water and sediment was discontinued after the October 2005 LTM event since prior sediment and surface water sampling data indicated no unacceptable risks to human health or the environment. These data are consistent with the RI (CH2M HILL, 2004d) recommendation of no action for these media. However, analyses of the post-RI surface water, sediment, and groundwater data have been conducted to determine the effects of groundwater discharging to the river since the RI was conducted. Summaries of these analyses are presented in Section 5.4. In addition, a recommendation has been made to continue to evaluate the future groundwater data for protectiveness of the river media. This recommendation is presented in Section 5.6. Preliminary Remediation Goals (PRGs) were developed based on the RAOs. The projected duration of the remedy in the ROD is 16 years. ICs are being implemented to meet the following LUC objectives:

- Ensure no extraction of groundwater, except for monitoring purposes, in the restricted area at Site 5, until the RAOs for OU-2 are met and risks from groundwater use are shown to be reduced to acceptable levels.
- Ensure no construction, maintenance work, or land use in or access to the restricted area without protection from groundwater contaminants, including vapors.
- Maintain the integrity of any current or future remedial equipment or remedial monitoring operation in the restricted area.

Performance standards and expected outcomes for evaluating the overall performance of the remedy were established in the OU-2 ROD and are summarized in **Table 5-1**.

The site risk analysis resulted in the following COCs being targeted for direct remediation:

- Site 5 alluvial and bedrock aquifer: TCE, iron, and manganese

The site remediation goals (SRGs) for these COCs are presented in **Table 5-2**. The SRG for TCE is based on the federal MCL for drinking water. The iron and manganese SRGs are risk-based concentrations based on exposure to the future child resident for non-carcinogenic risk-based concentrations. While groundwater concentrations are above SRGs, the ROD requires Site 5 be designated as a “restricted use” area.

TABLE 5-2
Site 5 Site Remediation Goals for Groundwater
Allegany Ballistics Laboratory

Contaminants Targeted for Direct Remediation	SRG (µg/L)
Groundwater	
TCE	5
Iron	4,000
Manganese	260

5.3.2 Remedy Implementation

The RD for the landfill cap at Site 5 (OU-1) was completed in March 1997. The design engineering firm of record for this project was CH2M HILL. OHM was the Remedial Action Contractor (RAC) retained by the Navy to furnish and install the multilayer landfill cap of approximately 2 acres over Site 5 (OU-1). The remedy for Site 5 (OU-1) was initiated in July 1997 and completed in October 1997.

The RD and pre-construction work package for the PRB at Site 5 (OU-2) was finalized in March 2006. The pre-construction work package author and construction contractor for the PRB installation was the AGVIQ—CH2M HILL Joint Venture I. The PRB consists of a wall of reactive media (zero valent iron) approximately 200 feet long, 2 feet wide, and 17 feet deep installed through the alluvial aquifer and keyed into the bedrock (**Figure 5-2**). The remedy for Site 5 (OU-2) was initiated in April 2006 and installation of the PRB was completed in June 2006.

5.3.2.1. Summary of Monitoring Activities for Site 5, OU-1 and OU-2

LTM at Site 5 (OU-1 and OU-2) is currently performed in accordance with the *Final Sampling and Analysis Plan for Long-Term Monitoring for Sites 1, 5, and 10* (CH2M HILL, 2012b). The major components of the LTM at Site 5 consist of the following items (**Figure 5-1**):

- **Landfill Gas Sampling (Quarterly and Annually)** – Landfill gas sampling for methane, lower explosive limit, and oxygen and carbon dioxide is being performed on a quarterly basis at seven locations (four landfill gas monitoring wells and three landfill gas vents) to determine whether explosive gas is migrating toward nearby facility structures or beyond the facility property boundary. Emissions of VOCs are also measured annually at the three landfill gas vents to ensure that emissions do not exceed 3,000 pounds per year.
- **Leachate Monitoring** – Visual leachate monitoring is conducted on a quarterly basis to assess the presence of any leachate migrating from the landfill.
- **Stormwater Sampling** – Stormwater runoff associated with the landfill is monitored on a quarterly basis (as precipitation events allow) with the collection of precipitation-dependent samples at the North Branch Potomac River outfall, which are analyzed for general chemistry, metals, and VOCs.
- **Groundwater Sampling** – Groundwater monitoring is conducted at Site 5 to evaluate the effectiveness of both the landfill cap (OU-1) and the PRB wall (OU-2). As part of the monitoring, four alluvial monitoring wells are sampled on a tri-quarterly basis for the analysis of VOCs, iron, and manganese. In addition, VOCs are analyzed at six additional wells every 5 years in support of each Five-Year Review.
- **Groundwater Hydraulic Head Monitoring** – Groundwater elevation data were collected and evaluated for several years after the installation of the PRB to confirm that the PRB wall was not adversely affecting the potentiometric surface and groundwater flow direction in the alluvial aquifer.

5.3.3 Operation and Maintenance

The Navy retains the responsibility for overseeing the administrative and substantive requirements of O&M for the Site 5 landfill cap (OU-1). An O&M plan is not required for the remedy (PRB) at Site 5 (OU-2), as the PRB is a passive remedy and should not require routine maintenance. Therefore, an O&M plan has not been developed. Guidelines for conducting O&M activities for Site 5 (OU-1) are provided in the *Final Sampling and Analysis Plan for Long-Term Monitoring Plan for Sites 1, 5, and 10* (CH2M HILL, 2012b). Currently, inspection activities are conducted quarterly. The ICs and LUC inspection requirements are documented in the LUC RD (CH2M HILL, 2013a).

The primary O&M activities for Site 5 (OU-1) consist of the following:

- Inspection for signs of settling, subsidence, displacement, and erosion
- Drainage system inspection for signs of standing water, erosion, and obstructions
- Inspection of the groundwater monitoring system, landfill gas venting system, and landfill gas monitoring well(s) for signs of damage and tampering

- Inspection of signs for damage, fading, and viewing obstructions
- Roadway inspection for signs of erosion, rutting, physical damage, and obstructions

All inspections will be conducted by the CH2M HILL O&M Manager. A Navy contractor will coordinate regular maintenance with a third-party subcontractor to the Navy (such as mowing) or directly subcontract non-routine maintenance (such as cap repair).

5.4 Progress Since Last Five-Year Review

5.4.1 Follow-up Actions Since Last Five-Year Review

The previous Five-Year Review Report included the following protectiveness statement for Site 5, OU-1:

> *The landfill cap remedy at Site 5 (OU-1) prevents direct contact with landfill contents and surface soil. Supporting inspection information and monitoring data indicate the landfill cap is in good condition with no unacceptable conditions observed or repairs recommended during this five-year review. There have been no changes in the physical conditions of the Site that would affect the protectiveness of the remedy. Exposure pathways that could result in an unacceptable risk are being controlled through the existence of the landfill cap and a combination of engineered land use controls (e.g., site security, fencing and signage) and institutional controls.*

Although the 2008 Five-Year Review concluded that the remedy is functioning as intended to be protective of human health and the environment, issues and recommendations for follow-up actions were identified. **Table 5-3** presents the status of these recommendations and follow-up actions.

TABLE 5-3
Site 5 Progress Action Items from 2008 Five-Year Review
Allegany Ballistics Laboratory

Issue from Third Five-Year Review Report, September 2008					Status – December 2012	
Issue	**Recommendations and Follow-up Actions**	**Party Responsible**	**Milestone Date**	**Affects Protectiveness**	**Action Taken and Outcome**	**Date of Action**
Full implementation of a combination of the LUCs and ICs for Site 5 (OU-2) has not been formally completed, as defined in the ROD.	A formal LUC plan covering all media at Site 5 consisting of OU-1 and OU-2 will be completed and implemented in accordance with the requirements of the RODs.	Navy USEPA WVDEP	Nov. 2008	No	LUC RD completed.	August 2013

5.4.2 Results of Implemented Actions

This section is intended to provide a summary of O&M and LTM program activities at Site 5, OU-1 and OU-2, since the last Five-Year Review was completed in September 2008. O&M and LTM are currently performed in accordance with the *Update 02 Sampling and Analysis Plan, Long-term Monitoring for Sites 1, 5, and 10* (CH2M HILL, July 2012b).[4] In order to assess the performance of the RA, data and information were reviewed with respect to each of the performance metrics identified in the RODs, as presented in **Table 5-1**.

[4] The July 2012 LTM UFP SAP Update, which is the second update of the 2011 LTM UFP SAP, supersedes the previous LTM plans for Site 1.

Data and information were reviewed to assess the performance of the RAs at Site 5 (OU-1 and OU-2) in accordance with the following performance standards as presented in Section 5.3:

- Site Inspection – To ensure that the landfill cap is being maintained in accordance with the requirements of the ROD
- Stormwater Monitoring – To ensure that stormwater runoff from drainage areas associated with the landfill complies with West Virginia Specific Water Quality Criteria
- Landfill Gas Emissions – To ensure that landfill gas emissions of methane and VOCs are not above acceptable limits
- Achievement of Groundwater PRGs Outside of Landfill Boundaries – To assess achievement of PRGs in the area outside of the landfill boundaries including potential discharge to the North Branch Potomac River

Data and information considered in this Five-Year Review previously provided to USEPA Region III and WVDEP through reports (LTM reports) or the ABL Tier 1 Partnering Team web site (Discharge Monitoring Reports) are not included in this document. Data from the Five-Year Review sampling event is provided in **Appendix E**. This Five-Year Review document provides the interpretation of data previously presented and the 2012 Five-Year Review data and information to evaluate the performance of the remedy.

As the primary COC at Site 5 based on previous investigations and risk assessments previously summarized in Section 5.2, TCE is the representative contaminant considered with regard to historical trends and achievement of PRGs. However, TCE degradation products are discussed in this report in regards to the PRB effectiveness at reducing TCE to ethene and carbon dioxide. Further analysis of TCE degradation products in future reports may be added at the Partnering Team's consensus. Detected concentrations of degradation products have coincided with concentrations of TCE that exceeded the PRG.

5.4.2.1. Site Inspections

A post-closure plan was developed to outline operations and maintenance responsibilities following installation of the cap (CH2M HILL, 1998b). Site inspections are performed regularly and thoroughly in accordance with this plan and the UFP-SAP (CH2M HILL, 2012b). Site inspections were performed quarterly from January 2008 through December 2012, and the results of these site inspections indicated the cap is in good condition. However, on the outside of the cap beyond the drainage ditch are some disturbances or cave-ins and erosion, possibly caused by animal activity. In addition, some trees north of landfill cap have blown over or have been uprooted, which may contribute to future erosion of this area.

5.4.2.2. Stormwater Monitoring

Stormwater is collected from the perimeter drainage channel on the western side of the landfill as part of the LTM program; samples are collected by an automatic sampler during a storm event of greater than 1.0 inch rainfall and a minimum of 72 hours after the previous measurable storm event. However, due to the lack of stormwater runoff, which is a result of insufficient pooling of water at the autosampler location, samples have not been collected on a regular basis. During the seven events completed during the previous 5-year period between 2003 and 2007, there were no exceedances of West Virginia Specific Water Quality Criteria for organic constituents (including VOCs) and wet chemistry parameters (such as nitrate and chemical oxygen demand). Three inorganic constituents (aluminum, iron, and zinc) were detected above the state water quality criteria in three of the eight events. In the most-recent sampling, completed on March 5, 2008 (during this Five-Year Review period), aluminum was the only constituent detected above criteria. March 5, 2008, was the last qualifying storm event (>1 inch after 72 hours) that resulted in sufficient stormwater runoff that could adequately be sampled. The entire drainage ditch is lined with rip-rap and gravel, which does not allow water to pool in any one area of the drainage ditch. It is unlikely that these constituents are associated with releases from the landfill, as these were only intermittent exceedances, and contributions of these naturally occurring metals were likely from background soil conditions, especially considering the stormwater collected for analysis cannot come into contact with the landfilled material. Furthermore, aluminum and zinc were not identified in either ROD as a COC.

5.4.2.3. Landfill Gas Emissions

Methane concentrations were below detection limits in landfill gas samples collected quarterly from January 2008 through December 2012, as measured by a handheld landfill gas analyzer, such as a GEM-2000, with a detection limit of 0.1 percent methane. Methane vented from the landfill is required to be less than 25 percent of the lower explosive limit (5 percent for methane), or 1.25 percent. In addition, VOC concentrations in landfill gas were analyzed in 2008 and 2012. The maximum total VOC concentration was approximately 665 micrograms per cubic meter (µg/m^3) in February 2012, nearly all of which was due to TCE. Based on a recent maximum velocity of 30 feet per minute through a passive landfill gas vent, the amount of VOCs released from the vent was approximately 2.3×10^{-3} pounds per day. Based on the maximum total VOC concentrations from the landfill and the average flow rates from the landfill vents, the WVDEP emissions standard of 3,000 pounds per day of VOCs specified in the ROD was not exceeded. Further, the emission limits for individual VOCs specified in the ROD were not exceeded.

5.4.2.4. Achievement of PRGs Outside of Landfill Boundaries

TCE concentrations in groundwater have been reviewed from August 2000 (Baseline Sampling Event) through August 2012 (recent groundwater sampling event)[5] to assess the achievement of the PRG in groundwater outside of the landfill boundaries at Site 5. The TCE concentrations in the alluvial aquifer have been evaluated both spatially and temporally through the use of selected TCE concentration contour figures and time series charts of TCE concentration trends for select monitoring wells. **Figure 5-4** presents the TCE concentration contours at Site 5 for the baseline event (August 2000). **Figure 5-5** presents the most recent sampling event, 6 years after the installation of the PRB (August 2012). **Figure 5-5** also includes a trend graph for 5GW23, which has not been sampled since 2005.

The Baseline TCE groundwater concentrations at Site 5 in August 2000 demonstrate a plume of TCE groundwater (greater than the MCL of 5 µg/L) generally extending from the northern portion of the landfill toward the north-northwest, bounded by wells 5GW20 and 5GW21. The post-PRB TCE concentration contours from August 2012 indicate a much narrower plume driven in large part by the non-detect at well 5GW25, which was installed downgradient of the PRB at the time of construction. In general, the TCE concentrations at the site are decreasing both upgradient (5GW13 and 5GW09) and further downgradient (5GW22) of the PRB. Although there was an increase in the TCE concentration at 5GW20 from 3.6 to 15 µg/L between 2000 and 2002, the TCE concentrations at 5GW20 have since decreased slightly to 12.1 µg/L in 2012.

TCE concentrations at 5GW21 have not been above the MCL, including both before and after the PRB was installed. TCE concentrations at 5GW22 fluctuated between 82 and 150 µg/L before the PRB was installed in 2006, but have not been above 71 µg/L during the two events in which 5GW22 was sampled since that time. The maximum TCE concentration detected at 5GW23 was 11 µg/L in 2003; the well has not been sampled since 2005, before the PRB was installed.

Total iron and manganese have been detected regularly at the four wells sampled every sampling event (5GW13, 17, 18, and 25). In addition, total iron exceeded the tap water RSL (11,000 µg/L) during two of seven sampling events at both 5GW17 and 5GW18. There are no other exceedances of total iron at any other wells during this time period. The tap water RSL for manganese (320 µg/L) was exceeded for three to six of the seven sampling events at all four wells. The maximum concentration of iron at these wells was 80,300 µg/L, which occurred at 5GW17 in 2008. The maximum concentration of manganese at these wells was 3,450 µg/L, which occurred at 5GW13 in 2011. However, in the downgradient wells (5GW19, 20, 21, and 22) beyond the reducing conditions of the landfill and the PRB, there was only one exceedance of manganese (459 µg/L), which occurred at 5GW19. There were no exceedances of iron. These wells were only sampled in 2012 in support of this Five-Year Review.

Figure 5-5 presents the time-series TCE concentrations for two wells located upgradient of the PRB (5GW09 and 5GW13), one well located laterally gradient to the PRB (5GW17), and two wells located immediately downgradient of

[5] Although groundwater data exist prior to 2000 (back to December 1994), August 2000 has been selected as the baseline sampling event for this discussion since: (1) TCE groundwater data and contours are available for almost all the Site 5 wells for August 2000 and (2) August 2000 is prior to the installation of the PRB in June 2006 and therefore is a reasonable baseline date.

PRB (5GW18 and 5GW25). There are also time-series shown for two wells further upgradient (5GW07 and 5GW11) and one well further downgradient (5GW19). Since the PRB was installed 6 years ago, the TCE concentrations at one immediately downgradient well, 5GW25, have been either less than 1 µg/L or non-detect. The concentrations at the other immediately downgradient well, 5GW18, have stabilized around 35 µg/L, after an initial decrease from 80 µg/L in October 2005 to 12 µg/L in August 2006. **Figure 5-6** shows oxidation-reduction potential (ORP), a geochemistry parameter, from these four wells surrounding the PRB from October 2005 and August 2012. The ORP at both 5GW18 and 5GW25 has been between 30 and 400 millivolts lower than the respective ORP at both the upgradient and lateral wells during every sampling event since the PRB was installed. This consistent difference suggests that the PRB is fostering the reducing conditions, as desired, that indicate TCE reduction at both locations in the PRB (Interstate Technology & Regulatory Council, 2011).

Between 2008 and 2012, the concentrations of VC at 5GW18 have ranged from non-detect to 3 µg/L for a total of six detections in seven sampling events, including two exceedances in 2008 of the VC MCL of 2 µg/L during those sampling events. There have been no exceedances in 5GW18 or any other well during this Five-Year Review time period since 2008. The only other detections of VC include at 5GW13 in 2011 (0.312 µg/L) and at 5GW25 in 2012 (0.264 µg/L). There have been no exceedances of the MCL of 70 µg/L for cis-1,2- DCE at any wells during this time period. The maximum detection of cis-1,2-DCE was 11 µg/L, which occurred at 5GW18 in 2008. Detected concentrations of degradation products have coincided with concentrations of TCE that exceeded the PRG.

As of December 2012, after 6.5 years of operation, the remedy for Site 5, OU-2, has not achieved the PRG for TCE of 5 µg/L outside the landfill boundaries. However, it appears that TCE concentrations at most wells immediately and further downgradient from the landfill and PRB either continue to be below the PRG or have exhibited overall downward trends due to a combination of MNA and the PRB. As discussed previously in this subsection, TCE concentrations at MW-20 are slowly decreasing after an initial increase (prior to installation of the PRB) between 2000 and 2002. Additional data may be needed to isolate the contributions of MNA and the PRB at the site to determine why TCE is still being detected downgradient of the PRB at 5GW18 and evaluate if the remedy can restore the aquifers to beneficial use by 2021 as projected by the ROD. Regardless of the results of the additional data collection, the remedies will remain protective of human health and the environment as long as the landfill cap is maintained and groundwater LUCs are enforced.

The area of restricted groundwater use shown in **Figure 5-1** is geometrically congruent to the area of restricted groundwater use illustrated in the ROD. However, the plotting algorithms for both the 2000 TCE data and 2008 TCE data indicate that lower concentrations of TCE plume exist to the northeast outside of the area of restricted groundwater. Additional data may be needed from the region northeast of 5GW22 to better refine the plume boundaries and determine if the area of restricted groundwater needs to be adjusted.

Finally, as stated in Section 5.3, analyses of the post-RI surface water, sediment, and groundwater data have been conducted to determine the effects of groundwater discharging to the river since the RI was conducted. The summaries of these analyses are presented as follows.

No unacceptable site-related ecological risks were found in the river adjacent to Site 5 as reported in the 2004 RI. In addition, post-RI concentrations of ecological COPCs, as identified in the 2004 RI, in sediment adjacent to/downgradient of Site 5 were not significantly elevated relative to the concentrations used in the RI and/or the post-RI upgradient concentrations. A similar comparison for surface water COPCs was not possible because dissolved metals concentration data were unavailable in post-RI samples. Further, TCE and its daughter products were not detected in post-RI surface water or sediment samples and the concentrations of these VOCs in groundwater from the latest sampling round (August 2012) in wells located along the river were below ecological surface water screening values. Finally, a comparison of benthic macroinvertebrate data (collected as part of the Site 1 LTM) from river locations upstream and downstream of Site 5 indicate no significant or systematic impairment to the benthic community in this reach of the river. Therefore, groundwater VOC concentrations do not pose unacceptable risks to river media, as the landfill cap, the PRB, and MNA continue to prevent Site 5 contamination from impacting these media.

There have been toxicological updates since the 2004 RI HHRA and 2008 Five-Year Review that may result in identification of additional constituents above human health screening levels (COPCs) and changes to the specific constituents included in the previous evaluations. Therefore, a more-detailed comparison of post-RI groundwater data to current screening parameters is warranted. However, a preliminary review of available post-RI sampling from 2002 to 2012 (surface water and sediment adjacent to Site 5, pore water, and groundwater) indicates that concentrations are similar to RI concentrations and the remedies implemented at Site 5 remain protective of human health (Appendix E).

5.4.2.5. Operation and Maintenance

No substantial modifications or changes within the O&M and LTM programs at Site 5 (OU-1 and OU-2) have been made since September 2008 when the last Five-Year Review was completed. However, no stormwater samples were able to be collected since March 2008. The outfall is stabilized with gravel and rip-rap, causing the water level to rarely reach a level that triggers the automatic sampler.

5.4.3 Costs Associated with Site Operations/O&M Modifications

Table 5-4 presents annual O&M and LTM costs for Site 5 (OU-1 and OU-2). For this Five-Year Review period (2008 through 2013), total O&M and LTM costs were on average $37,000, whereas the total average costs for the previous Five-Year Review were $49,000. The average annual costs for the current Five-Year Review period are 24 percent lower than the previous period because the monitoring well sampling program was optimized near the end of the previous Five-Year Review.

As stated in Section 5.3.3, there are no O&M requirements for groundwater, surface water, and sediment at Site 5 (OU-2). LTM associated with OU-2 is included within the costs in **Table 5-4**. **Figure 5-7** shows the overall costs of O&M and LTM at Site 5 since the landfill cap was installed. During the current 5-year period, costs have been below the low range of cost expectations stated in the RODs. Costs were higher than expected during the 1997 through 2002 period because of access repair work, installation of automatic stormwater runoff samplers, and other enhancements and corrective measures stated in previous Five-Year ROD Reviews.

TABLE 5-4
Estimated Annual O&M and LTM Costs for Site 5 (OU-1 and OU-2)
Allegany Ballistics Laboratory

Year	O&M Cost	LTM Cost	Total O&M and LTM Cost
1997 (3 months)	$1,100*	--	$1,100*
1998	$73,300*	--	$73,300*
1999	$64,000*	--	$64,000*
2000	$69,500*	--	$69,500*
2001	$74,000*	--	$74,000*
2002	$117,000*	--	$117,000*
2003	$6,500	$34,000	$40,500
2004	$7,000	$63,500	$70,500
2005	$7,500	$37,000	$44,500
2006	$7,500	$37,000	$44,500
2007	$9,000	$44,000	$53,000
2008	$10,000	$27,000	$37,000

TABLE 5-4
Estimated Annual O&M and LTM Costs for Site 5 (OU-1 and OU-2)
Allegany Ballistics Laboratory

Year	O&M Cost	LTM Cost	Total O&M and LTM Cost
2009	$13,500	$16,500	$30,000
2010	$15,000	$15,500	$30,500
2011	$15,500	$34,000	$49,500
2012	$11,000	$9,000	$20,000

Notes:
All costs rounded to the nearest $500.
*O&M Costs from 1998 to 2002 reflect the total of both O&M and LTM costs.

5.5 Technical Assessment

This section presents the answers to the three questions defined for the technical assessment for Site 5 (OU-1 and OU-2) based primarily on information presented in Section 5.4.

5.5.1 Site 5 (OU-1) Landfill Contents and Surface Soil

5.5.1.1. Question A – Is the remedy functioning as intended by the ROD?

Remedial Action Performance

The landfill cap at Site 1 (OU-1) is in good condition based on inspections performed from January 2008 through December 2012. No unacceptable conditions were observed or repairs are recommended and no leachate has been observed during this Five-Year Review period. Stormwater and landfill gas monitoring do not indicate concerns with emissions from the landfill or degradation of the landfill cap.

System Operations and O&M

Current O&M procedures, as implemented, will maintain the effectiveness of the RA, specifically related to the maintenance of the landfill cap. However, the passive gas vent VOC samples must be collected on an annual basis, as agreed by the Partnering Team.

Total O&M and LTM costs for this Five-Year Review period (2008 through 2012) were approximately 24 percent lower than the costs from the previous Five-Year Review. The reduction in cost is primarily attributed to optimizing the LTM program near the end of the previous Five-Year Review period.

Opportunities for Optimization

No areas of optimization related to the RA were observed during this Five-Year Review.

Early Indicators of Potential Issues

No indicators of potential issues (such as cap erosion) or problems were found that could place the protectiveness of the Site 5 (OU-1) RA at risk. The issues associated with settling upgradient of the landfill do not currently impact remedy protectiveness; however, these observations will be recorded in the event impacts to protectiveness in the future occur.

Implementation of Land Use Controls and Other Measures

LUCs are being implemented to prevent construction, maintenance work, and land use within the restricted area of Site 5 in accordance with the Construction, Excavation, and Groundwater Use Restriction Plan for ABL (CH2M HILL, 2002c). Access to Site 5 is restricted to authorized personnel only, and signs are present prohibiting construction and land use at Site 5 (CH2M HILL, 2013a). Furthermore, a deed notification (Notice of Inactive

Hazardous Substance or Waste Disposal Site) for the landfill at Site 5 (OU-1) was filed with Mineral County, West Virginia, on August 25, 1999, as required by the ROD.

A site inspection conducted on October 22, 2012, verified the engineered LUC signs are appropriate and in good condition.

5.5.1.2. Question B – Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?

The exposure assumptions used to develop the HHRA are reasonable given the consistency in land use at Site 5. The vapor intrusion pathway was not fully evaluated within the Site 5 HHRA. This pathway is currently incomplete since there are no buildings (or building occupants) overlying the landfill and TCE groundwater plume at Site 5. Construction of buildings in this area is not planned based on the LUCs associated with the landfill.

5.5.1.3. Question C –Has any other information come to light that could question the protectiveness of the remedy?

There is no other information that calls into question the protectiveness of the remedy.

5.5.2 Site 5 (OU-2) Groundwater, Surface Water, and Sediment

5.5.2.1. Question A – Is the remedy functioning as intended by the ROD?

Reductions in the concentrations of TCE in the immediate vicinity of and further downgradient from the PRB indicate the remedy is performing as intended, although concentrations remain above the TCE PRG of 5 µg/L. Geochemical parameters from the immediately downgradient wells suggest that the PRB is fostering reducing conditions that are amenable for TCE reduction. However, more data may be collected to isolate contributions from MNA and the PRB, and to determine why TCE is still being detected at 5GW18, and to re-evaluate the ability of the remedy to restore groundwater to beneficial use by 2021 as projected in the ROD.

System Operations and O&M

An O&M plan is not required for the remedy (PRB) at Site 5 (OU-2).

Opportunities for Optimization

No areas of optimization related to the RA and the treatment of contaminated groundwater by the PRB have been identified during this Five-Year Review. However, additional data collection efforts to better assess and forecast the long-term performance of the PRB may be necessary.

Early Indicators of Potential Issues

More data is needed to determine why there is a persistence of TCE at 5GW18, immediately downgradient of the PRB.

Implementation of Land Use Controls and Other Measures

LUCs are being implemented to prohibit the use of untreated groundwater and to prevent construction, maintenance work, and land use within the restricted area of Site 5 in accordance with the LUC RD document (CH2M HILL, 2013a).

The area of restricted groundwater use shown in **Figure 5-1** is geometrically congruent to the area of restricted groundwater use illustrated in the ROD. However the plotting algorithms for both the 2000 TCE data and 2008 TCE data indicate that lower concentrations of TCE plume exist to the northeast outside of the area of restricted groundwater. Additional data may be needed from the region northeast of 5GW22 to better refine the plume boundaries and determine if the area of restricted groundwater needs to be adjusted. However this has not affected the protectiveness of the remedy.

A site inspection conducted on October 22, 2012, verified the engineered LUC signs are appropriate and in good condition.

5.5.2.2. Question B – Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?

The exposure assumptions used to develop the HHRA are reasonable given the consistency in land use at Site 5. Additional changes to toxicity and RSL values have been made during this Five-Year Review period (**Table 4-5**). VOCs, iron, and manganese are sampled as part of ongoing LTM. No changes in toxicity associated with VOCs have occurred that would impact the protectiveness of the remedy as a majority of the constituents with changes were not detected in the last 5 years (Appendix F). Those that were detected are below the MCL and/or the revised RSL.

SVOCs, pesticides, PCBs, and metals (except for iron and manganese) have not been analyzed in groundwater since ROD signature. The most-recent pre-ROD data for these constituents is provided on **Table 5-5**. SVOCs, pesticides, and PCBs were not detected in groundwater prior to the ROD and therefore toxicity changes to these constituent groups would not affect the protectiveness of the remedy.

Although not all explosives with toxicity changes in the last 5 years were sampled prior to the ROD, those explosives that were analyzed in groundwater were not detected and therefore there is no indication that changes in toxicity associated with explosives would impact protectiveness at Site 5.

There have been changes in toxicity associated with metals that were not retained as COCs prior to the ROD. For the most part, the changes in toxicity would not impact protectiveness because the metals concentrations at the time of sample collection were just at or below the MCL (arsenic, barium, beryllium, cadmium, and chromium). There were some metals constituents without an MCL that were detected in pre-ROD samples (cobalt, copper, nickel, vanadium, and zinc) above current RSLs. Groundwater has not been analyzed for these constituents since 2005. However, with the landfill cover in place and LUCs to prevent unrestricted use, there is no exposure pathway. Therefore changes to the toxicity values in the last five years do not impact the protectiveness of the remedy.

The vapor intrusion pathway was not fully evaluated within the Site 5 HHRA. This pathway is currently incomplete since there are no buildings (or building occupants) overlying the landfill and TCE groundwater plume at Site 5. Construction of buildings in this area is not planned based on the LUCs associated with the landfill.

The performance metrics identified in the Site 5 (OU-2) ROD are being met, including groundwater monitoring to monitor progress of the remedies toward meeting RAOs and enforcement of LUCs. Although the PRGs beyond the PRB have not been met, the PRB continues to foster the conditions necessary for TCE reduction, and TCE concentrations continue to decrease further downgradient of the landfill as a result of the landfill cap, PRB, and MNA.

5.5.2.3. Question C – Has any other information come to light that could question the protectiveness of the remedy?

No other information calls into question the protectiveness of the remedy. Since the implementation of the remedy in 2006, TCE concentrations further downgradient of the PRB have continued to decrease.

5.5.3 Technical Assessment Summary

Based on the information presented herein, the remedy for Site 5 (OU-1 and OU-2) is functioning as intended by the ROD with the installation of a landfill cap and treatment of contaminated groundwater by a PRB. Additional data may be needed to isolate the contributions of MNA and the PRB at the site and to determine why TCE is being detected downgradient of the PRB at 5GW18. The additional data collected may be used to assess and evaluate the effectiveness of the PRB. Also, a data evaluation of groundwater concentrations as compared to human health and ecological screening values may be conducted as part of future LTM reports to ensure that groundwater discharging to the river media continue to pose no unacceptable risks to the river ecosystem or recreational users.

No changes in the physical conditions of the Site have occurred that would affect the protectiveness of either remedy. There have been no changes to the exposure assumptions that were used in the HHRAs, and there have

been no changes to the standardized risk assessment methodologies that could affect the protectiveness of the remedies. No other information calls into question the protectiveness of the remedies.

5.6 Issues, Recommendations, and Follow-up Actions

Based on this Five-Year Review, **Table 5-6** shows the issues and recommendations for Site 5 (OU-1 and OU-2).

TABLE 5-6
Recommendations and Follow-up Actions for Site 5 (OU-1 and OU-2)
Allegany Ballistics Laboratory

Issue	Recommendations and Follow-up Actions	Party Responsible	Milestone Date	Affects Protectiveness	
				Current	Future
Additional data may be needed to determine the contributions of MNA, the effectiveness of the PRB, and to evaluate why TCE is being detected at 5GW18.	Collect additional data including chemical analyses and geochemical parameters from monitoring wells and/or the PRB. Discuss the path forward in a future scoping session.	Navy USEPA WVDEP	April 2014	N	Y
Confirm that groundwater concentrations discharging to the river do not pose an unacceptable risk to human health and the environment.	Conduct periodic data evaluation of groundwater LTM data in comparison to human health and ecological screening values to assess effect on river media. Discuss path forward in a future scoping session.	Navy USEPA WVDEP	April 2014	N	Y
The 2005 ROD estimates that the remedy will restore the aquifers at Site 5 to beneficial use in 16 years.	The remedy construction was completed in 2006. Considering that the remedy has been operating for nearly 50% of the projected duration, a time of remediation analysis is recommended to refine the remedy life cycle and determine if the existing substrate will continue to operate until the RAO is achieved.	Navy USEPA WVDEP	June 2014	N	Y
TCE concentrations exceeding the PRG may exist to the northeast outside the area of restricted groundwater use	Collect additional data northeast of Monitoring Well 5GW22 to refine the TCE plume. Re-evaluate if the shape of the area of restricted groundwater use needs to be changed.	Navy USEPA WVDEP	June 2014	N	Y

5.7 Protectiveness Statement

The landfill and soil remedy at Site 5 (OU-1) is protective of human health and the environment. The landfill cap prevents direct contact with landfill contents and surface soil. Supporting inspection information and groundwater monitoring data indicate that infiltration is being minimized and surface water run-off is being controlled. The landfill cap is in good condition and as a result, no repairs are recommended as part of this Five-Year Review. No changes in the physical conditions of the site that would affect the protectiveness of the remedy.

The groundwater remedy at Site 5 (OU-2) is currently protective of human health and the environment. The PRB consists of a vertical zone of reactive media (zero-valent iron) that was installed in June 2006. The PRB is designed to reduce chlorinated compounds as alluvial groundwater passes through the reactive media under a natural gradient. The monitoring data indicate that the PRB continues to foster the reducing conditions that enhance TCE reduction. In addition, the TCE concentrations at wells further downgradient from the PRB either continue to be below the PRG or have exhibited downward trends, due to MNA and the PRB, since the last Five-Year Review.

Exposure pathways that could result in an unacceptable risk are currently being controlled by the landfill cap and LUCs (such as site security and signage) (CH2M HILL, 2013a). However, for the OU-2 remedy to be protective in the long term, the following actions need to be taken to ensure protectiveness: (1) collect additional data including chemical analyses and geochemical parameters from monitoring wells and/or the PRB to determine the contributions of MNA, the effectiveness of the PRB, and to evaluate the TCE plume configuration; (2) conduct periodic data evaluation of groundwater LTM data in comparison to human health and ecological screening values to assess effect on river media; (3) perform a time of remediation analysis to refine the remedy life cycle and determine if the

existing substrate will continue to operate until the RAO is achieved; and (4) modify the LUC boundary to include the current TCE plume configuration.

TABLE 5-1
Expected Outcomes for Site 5 (OU-1 and OU-2)
Five Year ROD Review
Allegany Ballistics Laboratory
Rocket Center, West Virginia

Risk								
Human Health	**Ecological**	**COC Requiring Action**	**Basis for Action**	**RAO**	**Remedy Component**	**Exit Strategy**	**Performance Metric/Clean-up Level**	**Expected Outcomes**
				Landfill Contents/Soil (OU-1)				
All potential receptors for human health risks had associated hazard indices less than 1 and cancer risks within EPA's target risk range of 1x10E-6 and 1x10E-4.	Environmental effects quotients (EEQs) were calculated to qualify environmental risk. EEQs were determined for each sample by dividing the concentration of particular contaminants by the chemical-specific screening level. Ratios greater than 1 indicate a potential for risk, greater than 10 represent potential moderate adverse effects, and greater than 100 represent a significant potential for adverse effects.	1,2-DCE, Dibenzo(a,h)anthracene, Pyrene, Arsenic, Chromium, Lead, Manganese, Mercury	EEQs = 1-10 for 1,2-DCE and SVOCs; EEQs = 10-3,000 for inorganics	-Prevent or minimize infiltration and any resulting leaching of contaminants from the landfill into groundwater -Prevent or minimize direct contact of human and ecological receptors with landfill contents -Prevent surface water run-on and control surface water runoff erosion	LUCs	Enforce LUCs while landfill is active	Compliance with LUCs	Maintain landfill and enforce LUCs.
					RCRA Subtitle C Landfill Cap	Maintain landfill cap per post-closure requirements	Minimize infiltration, collect and monitor landfill gas, control surface water run on/runoff.	
					O&M	Inspect and maintain landfill cap per post-closure requirements	Conduct O&M and report results while landfill is active	
				Groundwater, Surface Water, and Sediment (OU-2)				
Ingestion of, dermal contact with, and inhalation of chlorinated VOCs in groundwater under future potable use scenario. No human health risk from surface water or sediment.	No exposure pathway. No ecological risk from surface water or sediment.			- Prevent or minimize exposure of potential future onsite residents and construction workers to contaminated groundwater originating from Site 5 at concentrations exceeding Maximum Contaminant Levels (MCLs) or, in the absence of MCLs, an excess lifetime cancer risk of 1x10E-4 or a Hazard Index = 1 - Prevent or minimize river media from becoming impacted by the Site 5 groundwater COCs such that resulting concentrations present an unacceptable risk to human health or the environment -Restore groundwater beyond the landfill boundaries to MCLs, or, in the absence of MCLs, risk-based levels	LUCs	Enforce LUCs until COCs achieve lean up levels	Compliance with LUCs	Removal of groundwater LUCs beyond landfill boundaries
		TCE, Iron, and Manganese	Cancer risk above 10-4 and/or non-cancer hazard above 1		Permeable Reactive Barrier and Monitored Natural Attenuation	Passive groundwater treatment and monitoring in the alluvial aquifer; groundwater monitoring in the bedrock aquifer until groundwater COCs achieve clean up levels	Monitor groundwater concentrations in the alluvial and bedrock aquifers until concentrations are below MCLs, or, in the absence of MCLs, an excess lifetime cancer risk of 1x10E-4 or a Hazard Index = 1.	
					LTM	Conduct groundwater LTM until groundwater COCs are below clean up levels	Federal MCLs, or, in the absence of MCLs, an excess lifetime cancer risk of 1x10E-4 or a Hazard Index = 1.	

TABLE 5-5

Data Summary for Non-COCs Prior to the ROD with Toxicity Changes From 2008 to 2013

Five-Year ROD Review

Allegany Balisitcs Laboratory

Rocket Center, West Virginia

Chem Group	Analyte	CAS	Analyzed at Site 5? (Y/N)	Most Recent Result	Units	Location of Most Recent Result	Date of Most Recent Result
Explo	1,3,5-Trinitrobenzene (1,3,5-TNB)	99-35-4	Y	10 U	UG/L	5GW01	10/21/1999
Explo	1,3-Dinitrobenzene (1,3-DNB)	99-65-0	Y	10 U	UG/L	5GW01	10/21/1999
Explo	2,4,6-Trinitrotoluene (2,4,6-TNT)	118-96-7	Y	0.78 U	UG/L	5GW01, 5GW02	7/28/1987
Explo	2,4-Dinitrotoluene (2,4-DNT)	121-14-2	Y	10 U	UG/L	5GW01	10/21/1999
Explo	2,6-Dinitrotoluene (2,6-DNT)	606-20-2	Y	10 U	UG/L	5GW01	10/21/1999
Explo	2-Amino-4,6-dinitrotoluene (2-Am-DNT)	35572-78-2	Y	3.24 U	UG/L	5GW01, 5GW02	7/28/1987
Explo	2-Nitrotoluene (2-NT)	88-72-2	N	-	-	-	-
Explo	3-Nitrotoluene (3-NT)	99-08-1	N	-	-	-	-
Explo	4-Amino-2,6-dinitrotoluene (4-Am-DNT)	19406-51-0	Y	2.48 U	UG/L	5GW01, 5GW02	7/28/1987
Explo	4-Nitrotoluene (4-NT)	99-99-0	N	-	-	-	-
Explo	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	121-82-4	Y	1 U	UG/L	5GW01, 5GW02	7/28/1987
Explo	Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	479-45-8	N	-	-	-	-
Explo	Nitrobenzene (NB)	98-95-3	Y	10 U	UG/L	5GW01	10/21/1999
Explo	Nitroglycerin	55-63-0	Y	10,000 U	UG/L	5GW01, 5GW02	7/28/1987
Explo	Nitroguanadine	556-88-7	N	-	-	-	-
Explo	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	2691-41-0	Y	1.3 U	UG/L	5GW01, 5GW02	7/28/1987
Explo	Perchlorate	14797-73-0	N	-	-	-	-
Explo	PETN	78-11-5	N	-	-	-	-
Metal	Aluminum	7429-90-5	Y	11,500 U	UG/L	5GW01	10/12/2005
Metal	Antimony	7440-36-0	Y	5 U	UG/L	SEVERAL WELLS	10/05
Metal	Arsenic	7440-38-2	Y	11.4	UG/L	5GW07	10/13/2005
Metal	Barium	7440-39-3	Y	601	UG/L	5GW22	10/26/2005
Metal	Beryllium	7440-41-7	Y	0.47 J	UG/L	5GW01	10/12/2005
Metal	Cadmium	7440-43-9	Y	3.2 J	UG/L	5GW07	10/13/2005
Metal	Calcium	7440-70-2	Y	168,000	UG/L	5GW13	10/26/2005
Metal	Chromium	7440-47-3	Y	19	UG/L	5GW01	10/12/2005
Metal	Chromium(III)	16065-83-1	N	-	-	-	-
Metal	Chromium(VI)	18540-29-9	Y	22	UG/L	5GW01	7/29/1987
Metal	Cobalt	7440-48-4	Y	44.1 J	UG/L	5GW07	10/13/2005
Metal	Copper	7440-50-8	Y	12.8 J	UG/L	5GW01	10/12/2005
Metal	Cyanide	57-12-5	Y	5 U	UG/L	SEVERAL WELLS	10/05
Metal	Lead	7439-92-1	Y	12.2	UG/L	5GW01	10/12/2005
Metal	Magnesium	7439-95-4	Y	33,100	UG/L	5GW13	10/26/2005
Metal	Mercury	7487-94-7	Y	0.1 U	UG/L	SEVERAL WELLS	10/05
Metal	Nickel	7440-02-0	Y	109	UG/L	5GW07	10/13/2005
Metal	Potassium	7440-09-7	Y	3530 J	UG/L	5GW03	10/14/2005
Metal	Selenium	7782-49-2	Y	2.3 U	UG/L	SEVERAL WELLS	10/05
Metal	Silver	7440-22-4	Y	1.8 U	UG/L	SEVERAL WELLS	10/05
Metal	Sodium	7440-23-5	Y	116,000	UG/L	5GW24	10/25/2005
Metal	Thallium	7440-28-0	Y	3.8 U	UG/L	SEVERAL WELLS	10/05
Metal	Vanadium	7440-62-2	Y	19.8 J	UG/L	5GW01	10/12/2005
Metal	Zinc	7440-66-6	Y	342	UG/L	5GW07	10/13/2005
PCB	Aroclor-1016	12674-11-2	Y	1 U	UG/L	SEVERAL WELLS	10/05
PCB	Aroclor-1221	11104-28-2	Y	2 U	UG/L	SEVERAL WELLS	10/05
PCB	Aroclor-1232	11141-16-5	Y	1 U	UG/L	SEVERAL WELLS	10/05
PCB	Aroclor-1242	53469-21-9	Y	1 U	UG/L	SEVERAL WELLS	10/05
PCB	Aroclor-1248	12672-29-6	Y	1 U	UG/L	SEVERAL WELLS	10/05
PCB	Aroclor-1254	11097-69-1	Y	1 U	UG/L	SEVERAL WELLS	10/05
PCB	Aroclor-1260	11096-82-5	Y	1 U	UG/L	SEVERAL WELLS	10/05
Pest	4,4'-DDD	72-54-8	Y	0.1 U	UG/L	SEVERAL WELLS	5/98
Pest	4,4'-DDE	72-55-9	Y	0.1 U	UG/L	SEVERAL WELLS	5/98
Pest	4,4'-DDT	50-29-3	Y	0.1 U	UG/L	SEVERAL WELLS	5/98
Pest	Aldrin	309-00-2	Y	0.5 U	UG/L	SEVERAL WELLS	5/98
Pest	alpha-BHC	319-84-6	Y	0.5 U	UG/L	SEVERAL WELLS	5/98
Pest	alpha-Chlordane	12789-03-6	Y	0.5 U	UG/L	SEVERAL WELLS	5/98
Pest	beta-BHC	319-85-7	Y	0.5 U	UG/L	SEVERAL WELLS	5/98
Pest	delta-BHC	319-86-8	Y	0.5 U	UG/L	SEVERAL WELLS	5/98
Pest	Dieldrin	60-57-1	Y	0.1 U	UG/L	SEVERAL WELLS	5/98
Pest	Endosulfan I	115-29-7	Y	0.05 U	UG/L	SEVERAL WELLS	5/98
Pest	Endosulfan II	115-29-7	Y	0.1 U	UG/L	SEVERAL WELLS	5/98
Pest	Endosulfan sulfate	1031-07-8	Y	0.1 U	UG/L	SEVERAL WELLS	5/98
Pest	Endrin	72-20-8	Y	0.1 U	UG/L	SEVERAL WELLS	5/98
Pest	Endrin aldehyde	7421-93-4	Y	0.1 U	UG/L	SEVERAL WELLS	5/98
Pest	Endrin ketone	53494-70-5	Y	0.1 U	UG/L	SEVERAL WELLS	5/98
Pest	gamma-BHC (Lindane)	58-89-9	Y	0.05 U	UG/L	SEVERAL WELLS	5/98
Pest	gamma-Chlordane	12789-03-6	Y	0.05 U	UG/L	SEVERAL WELLS	5/98

TABLE 5-5

Data Summary for Non-COCs Prior to the ROD with Toxicity Changes From 2008 to 2013

Five-Year ROD Review

Allegany Balisitcs Laboratory

Rocket Center, West Virginia

Chem Group	Analyte	CAS	Analyzed at Site 5? (Y/N)	Most Recent Result	Units	Location of Most Recent Result	Date of Most Recent Result
Pest	Heptachlor	76-44-8	Y	0.05 U	UG/L	SEVERAL WELLS	5/98
Pest	Heptachlor epoxide	1024-57-3	Y	0.05 U	UG/L	SEVERAL WELLS	5/98
Pest	Methoxychlor	72-43-5	Y	0.5 U	UG/L	SEVERAL WELLS	5/98
Pest	Toxaphene	8001-35-2	Y	5 U	UG/L	SEVERAL WELLS	5/98
SVOC	1,1-Biphenyl	92-52-4	N	-	-	-	-
SVOC	1,2,4,5-Tetrachlorobenzene	95-94-3	Y	10 U	UG/L	5GW01	10/21/1999
SVOC	2,2'-Oxybis(1-chloropropane)	108-60-1	Y	10 U	UG/L	5GW01	10/21/1999
SVOC	2,3,4,6-Tetrachlorophenol	58-90-2	Y	10 U	UG/L	5GW01	10/21/1999
SVOC	2,4,5-Trichlorophenol	95-95-4	Y	50 U	UG/L	5GW01	10/21/1999
SVOC	2,4,6-Trichlorophenol	88-06-2	Y	10 U	UG/L	5GW01	10/21/1999
SVOC	2,4-Dichlorophenol	120-83-2	Y	10 U	UG/L	5GW01	10/21/1999
SVOC	2,4-Dimethylphenol	105-67-9	Y	10 U	UG/L	5GW01	10/21/1999
SVOC	2,4-Dinitrophenol	51-28-5	Y	50 U	UG/L	5GW01	10/21/1999
SVOC	2,4-Dinitrotoluene	121-14-2	Y	10 U	UG/L	5GW01	10/21/1999
SVOC	2,6-Dinitrotoluene	606-20-2	Y	10 U	UG/L	5GW01	10/21/1999
SVOC	2-Chloronaphthalene	91-58-7	Y	10 U	UG/L	5GW01	10/21/1999
SVOC	2-Chlorophenol	95-57-8	Y	10 U	UG/L	5GW01	10/21/1999
SVOC	2-Methylnaphthalene	91-57-6	Y	10 U	UG/L	5GW01	10/21/1999
SVOC	2-Methylphenol	95-48-7	Y	10 U	UG/L	5GW01	10/21/1999
SVOC	2-Nitroaniline	88-74-4	Y	50 U	UG/L	5GW01	10/21/1999
SVOC	2-Nitrophenol	88-75-5	Y	10 U	UG/L	5GW01	10/21/1999
SVOC	3,3'-Dichlorobenzidine	91-94-1	Y	20 U	UG/L	5GW01	10/21/1999
SVOC	3-Nitroaniline	99-09-2	Y	50 U	UG/L	5GW01	10/21/1999
SVOC	4,6-Dinitro-2-methylphenol	534-52-1	Y	50 U	UG/L	5GW01	10/21/1999
SVOC	4-Bromophenyl-phenylether	101-55-3	Y	10 U	UG/L	5GW01	10/21/1999
SVOC	4-Chloro-3-methylphenol	59-50-7	Y	20 U	UG/L	5GW01	10/21/1999
SVOC	4-Chloroaniline	106-47-8	Y	20 U	UG/L	5GW01	10/21/1999
SVOC	4-Chlorophenyl-phenylether	7005-72-3	Y	10 U	UG/L	5GW01	10/21/1999
SVOC	4-Methylphenol	106-44-5	Y	10 U	UG/L	5GW01	10/21/1999
SVOC	4-Nitroaniline	100-01-6	Y	50 U	UG/L	5GW01	10/21/1999
SVOC	4-Nitrophenol	100-02-7	Y	50 U	UG/L	5GW01	10/21/1999
SVOC	Acenaphthene	83-32-9	Y	10 U	UG/L	5GW01	10/21/1999
SVOC	Acenaphthylene	208-96-8	Y	10 U	UG/L	5GW01	10/21/1999
SVOC	Acetophenone	98-86-2	Y	10 U	UG/L	5GW01	10/21/1999
SVOC	Anthracene	120-12-7	Y	10 U	UG/L	5GW01	10/21/1999
SVOC	Atrazine	1912-24-9	N	-	-	-	-
SVOC	Benzaldehyde	100-52-7	N	-	-	-	-
SVOC	Benzo(a)anthracene	56-55-3	Y	10 U	UG/L	5GW01	10/21/1999
SVOC	Benzo(a)pyrene	50-32-8	Y	10 U	UG/L	5GW01	10/21/1999
SVOC	Benzo(b)fluoranthene	205-99-2	Y	10 U	UG/L	5GW01	10/21/1999
SVOC	Benzo(g,h,i)perylene	191-24-2	Y	10 U	UG/L	5GW01	10/21/1999
SVOC	Benzo(k)fluoranthene	207-08-9	Y	10 U	UG/L	5GW01	10/21/1999
SVOC	bis(2-Chloroethoxy)methane	111-91-1	Y	10 U	UG/L	5GW01	10/21/1999
SVOC	bis(2-Chloroethyl)ether	111-44-4	Y	10 U	UG/L	5GW01	10/21/1999
SVOC	bis(2-Ethylhexyl)phthalate	117-81-7	Y	10 U	UG/L	5GW01	10/21/1999
SVOC	Butylbenzylphthalate	85-68-7	Y	10 U	UG/L	5GW01	10/21/1999
SVOC	Caprolactam	105-60-2	N	-	-	-	-
SVOC	Carbazole	86-74-8	Y	10 U	UG/L	5GW01	10/21/1999
SVOC	Chrysene	218-01-9	Y	10 U	UG/L	5GW01	10/21/1999
SVOC	Dibenz(a,h)anthracene	53-70-3	Y	10 U	UG/L	5GW01	10/21/1999
SVOC	Dibenzofuran	132-64-9	Y	10 U	UG/L	5GW01	10/21/1999
SVOC	Diethylphthalate	84-66-2	Y	10 U	UG/L	5GW01	10/21/1999
SVOC	Dimethyl phthalate	131-11-3	Y	10 U	UG/L	5GW01	10/21/1999
SVOC	Di-n-butylphthalate	84-74-2	Y	10 U	UG/L	5GW01	10/21/1999
SVOC	Di-n-octylphthalate	117-84-0	Y	10 U	UG/L	5GW01	10/21/1999
SVOC	Fluoranthene	206-44-0	Y	10 U	UG/L	5GW01	10/21/1999
SVOC	Fluorene	86-73-7	Y	10 U	UG/L	5GW01	10/21/1999
SVOC	Hexachlorobenzene	118-74-1	Y	10 U	UG/L	5GW01	10/21/1999
SVOC	Hexachlorobutadiene	87-68-3	Y	10 U	UG/L	5GW01	10/21/1999
SVOC	Hexachlorocyclopentadiene	77-47-4	Y	10 U	UG/L	5GW01	10/21/1999
SVOC	Hexachloroethane	67-72-1	Y	10 U	UG/L	5GW01	10/21/1999
SVOC	Indeno(1,2,3-cd)pyrene	193-39-5	Y	10 U	UG/L	5GW01	10/21/1999
SVOC	Isophorone	78-59-1	Y	10 U	UG/L	5GW01	10/21/1999
SVOC	Naphthalene	91-20-3	Y	10 U	UG/L	5GW01	10/21/1999
SVOC	Nitrobenzene	98-95-3	Y	10 U	UG/L	5GW01	10/21/1999
SVOC	n-Nitroso-di-n-propylamine	621-64-7	Y	10 U	UG/L	5GW01	10/21/1999

TABLE 5-5

Data Summary for Non-COCs Prior to the ROD with Toxicity Changes From 2008 to 2013

Five-Year ROD Review

Allegany Balisitcs Laboratory

Rocket Center, West Virginia

Chem Group	Analyte	CAS	Analyzed at Site 5? (Y/N)	Most Recent Result	Units	Location of Most Recent Result	Date of Most Recent Result
SVOC	n-Nitrosodiphenylamine	86-30-6	Y	10 U	UG/L	5GW01	10/21/1999
SVOC	Pentachlorophenol	87-86-5	Y	50 U	UG/L	5GW01	10/21/1999
SVOC	Phenanthrene	85-01-8	Y	10 U	UG/L	5GW01	10/21/1999
SVOC	Phenol	108-95-2	Y	10 U	UG/L	5GW01	10/21/1999
SVOC	Pyrene	129-00-0	Y	10 U	UG/L	5GW01	10/21/1999

R:\USNAVFACENGCOM405450\ABL\MAPFILES\430115_5_YEAR_ROD_REVIEW_REPORT\FIG5_1_SITE5_AERIAL.MXD BALDRIDGE 8/20/2013 11:05:42 AM

Legend

- Monitoring Well - Alluvial
- Monitoring Well - Bedrock
- Alluvial Groundwater Flow
- Water Body
- PRB
- Edge of Landfill Cap
- Edge of Waste
- Buildings
- Area of Restricted Groundwater Use
- Site 5 Boundary

N

0 50 100 Feet

1 inch = 100 feet

Figure 5-1
Site Layout
5 Year ROD Review Report
Allegany Ballistics Laboratory
Rocket Center, West Virginia

CH2MHILL

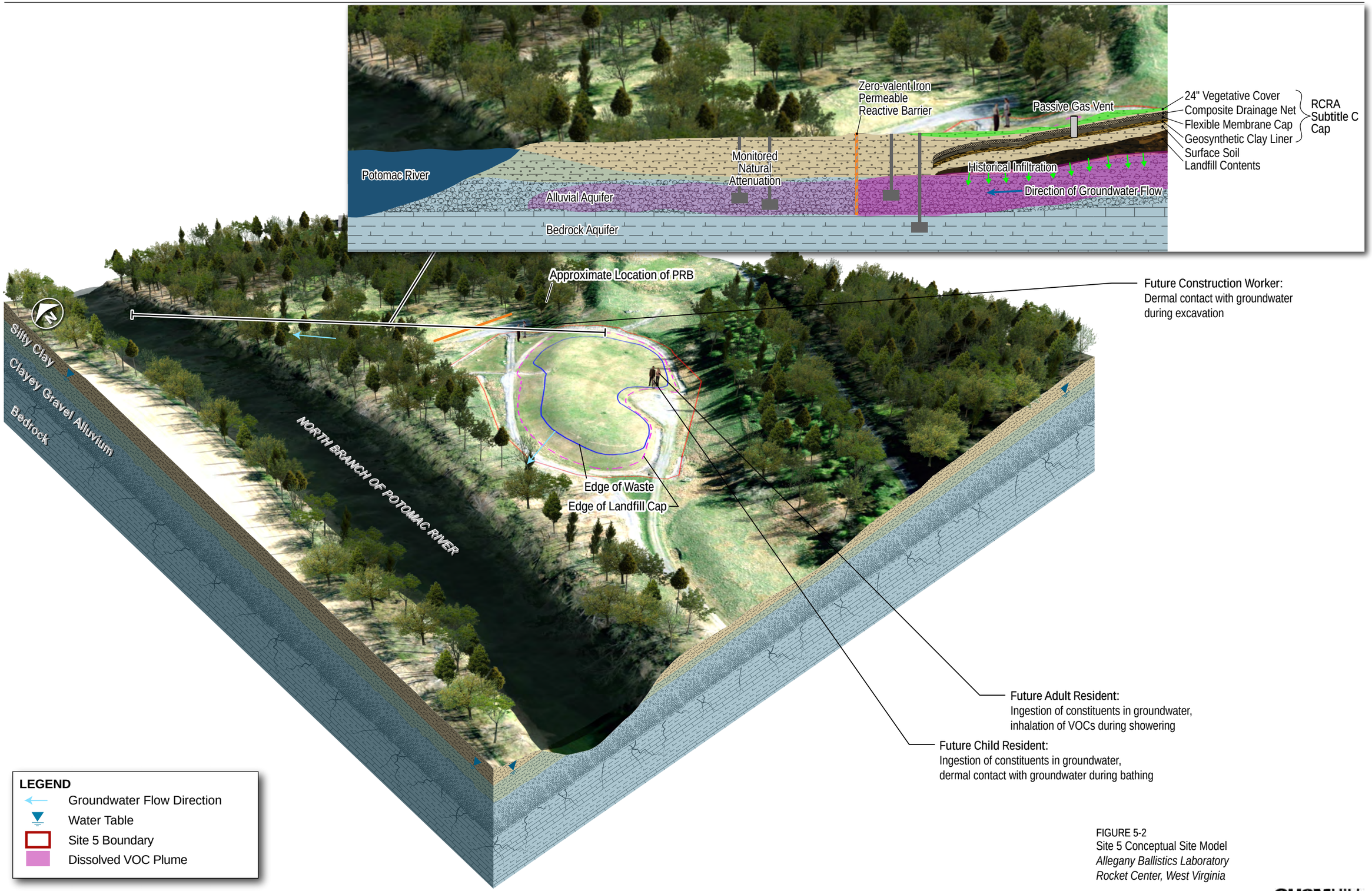

FIGURE 5-2
Site 5 Conceptual Site Model
Allegany Ballistics Laboratory
Rocket Center, West Virginia

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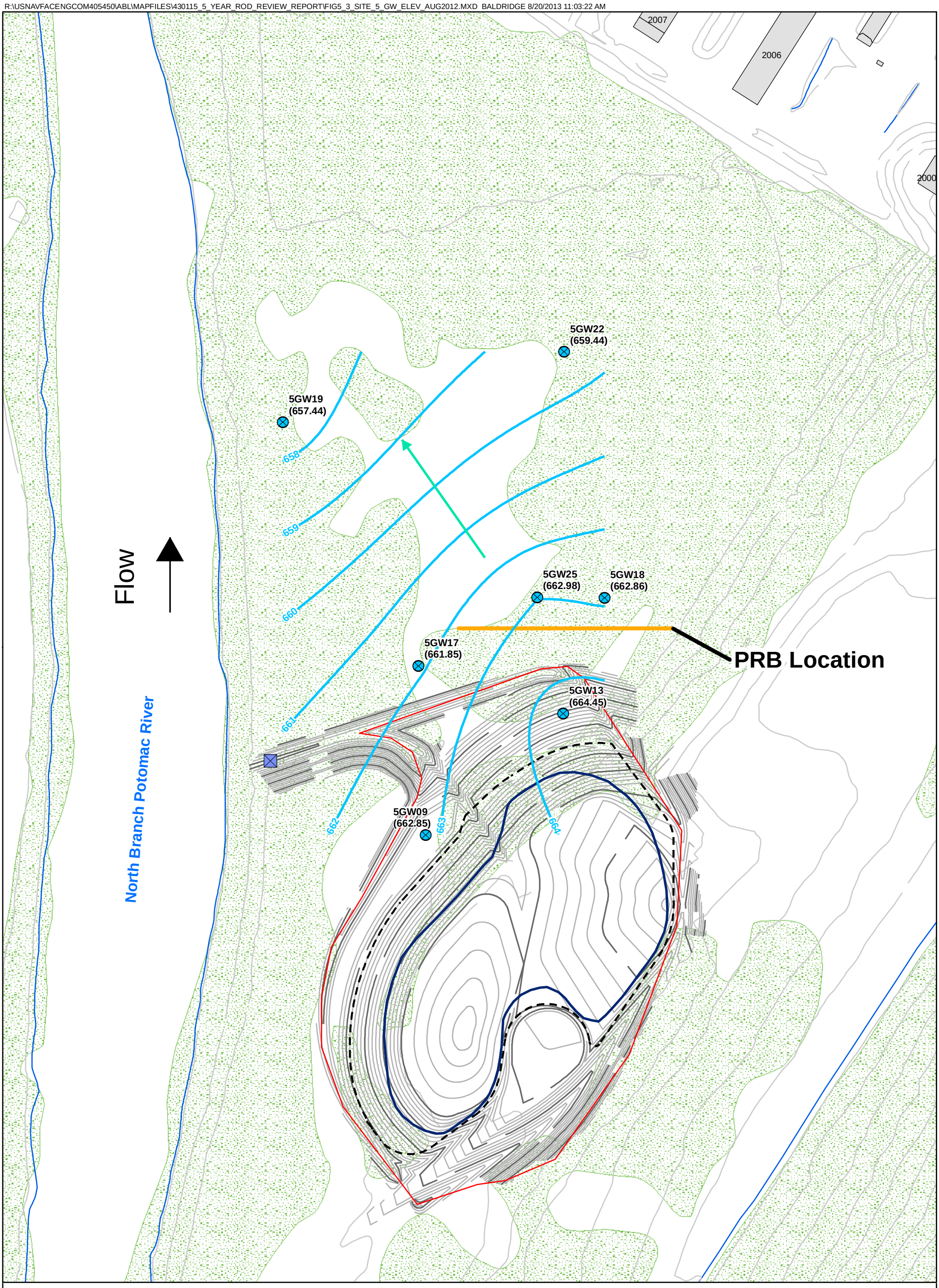
R:\USNAVFACENGCOM405450\ABL\MAPFILES\430115_5_YEAR_ROD_REVIEW_REPORT\FIG5_3_SITE_5_GW_ELEV_AUG2012.MXD BALDRIDGE 8/20/2013 11:03:22 AM



Legend

- Monitoring Well
- Stormwater Sampling Location
- Alluvial Groundwater Flow
- Water Table Elevation Contour
- PRB
- Edge of Waste
- Edge of Landfill Cap
- Water Body
- Buildings
- Site 5 Boundary
- Vegetation

N

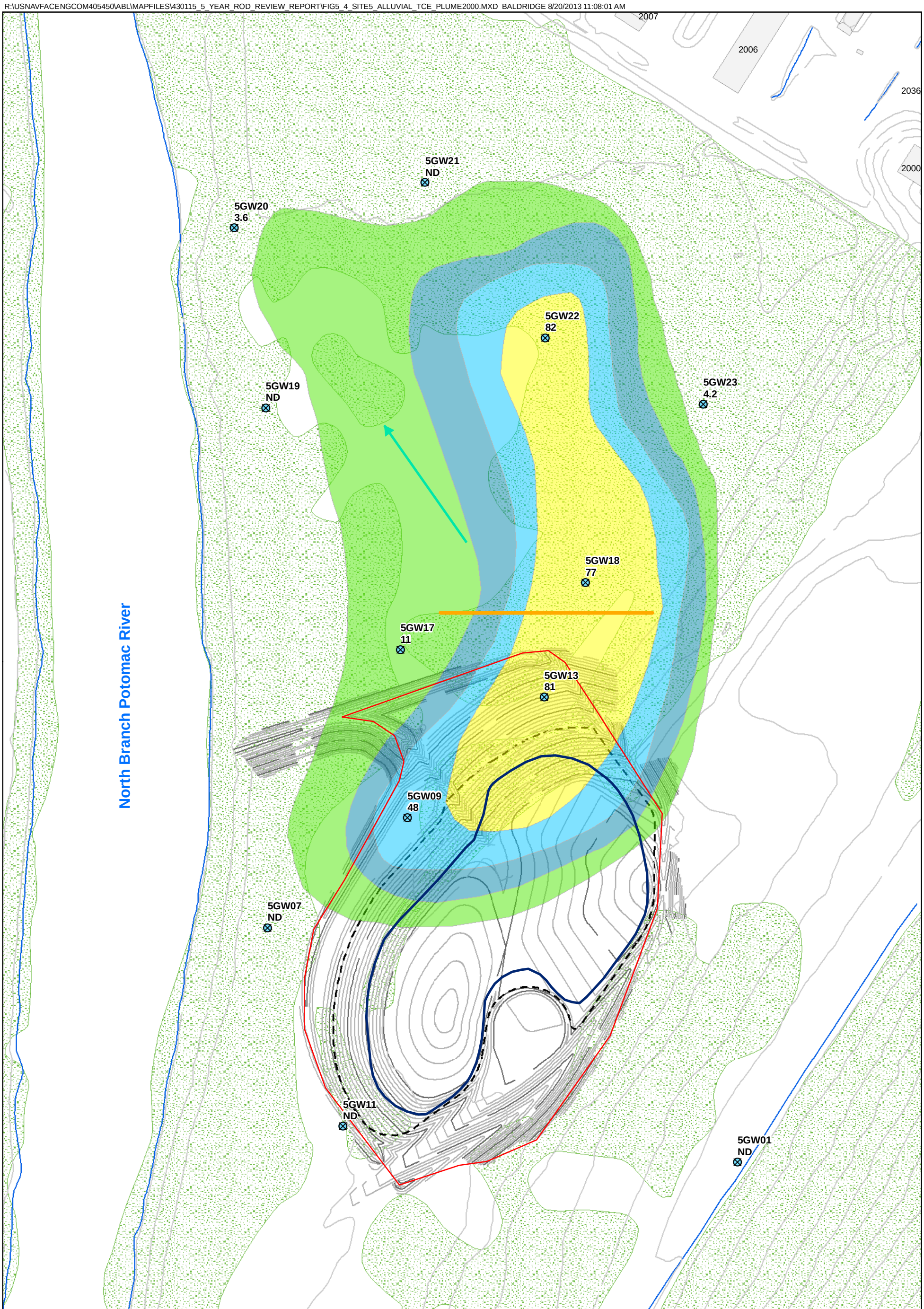
0 50 100 Feet

1 inch = 100 feet

Figure 5-3
Site 5 Water Table Elevations – August 2012
Five Year ROD Review Report
Allegany Ballistics Laboratory
Rocket Center, West Virginia

CH2MHILL

R:\USNAVFACENGCOM405450\ABL\MAPFILES\430115_5_YEAR_ROD_REVIEW_REPORT\FIG5_4_SITE5_ALLUVIAL_TCE_PLUME2000.MXD BALDRIDGE 8/20/2013 11:08:01 AM



Legend

- Monitoring Well - Alluvial
- Alluvial Groundwater Flow
- PRB*
- Edge of Waste
- Edge of Landfill Cap
- Buildings
- Site 5 Boundary
- Vegetation

Estimated TCE Plume

- 5 - 20 µg/L
- 20 - 40 µg/L
- 40 - 60 µg/L
- 60 - 85 µg/L

* PRB installed in June 2006

N

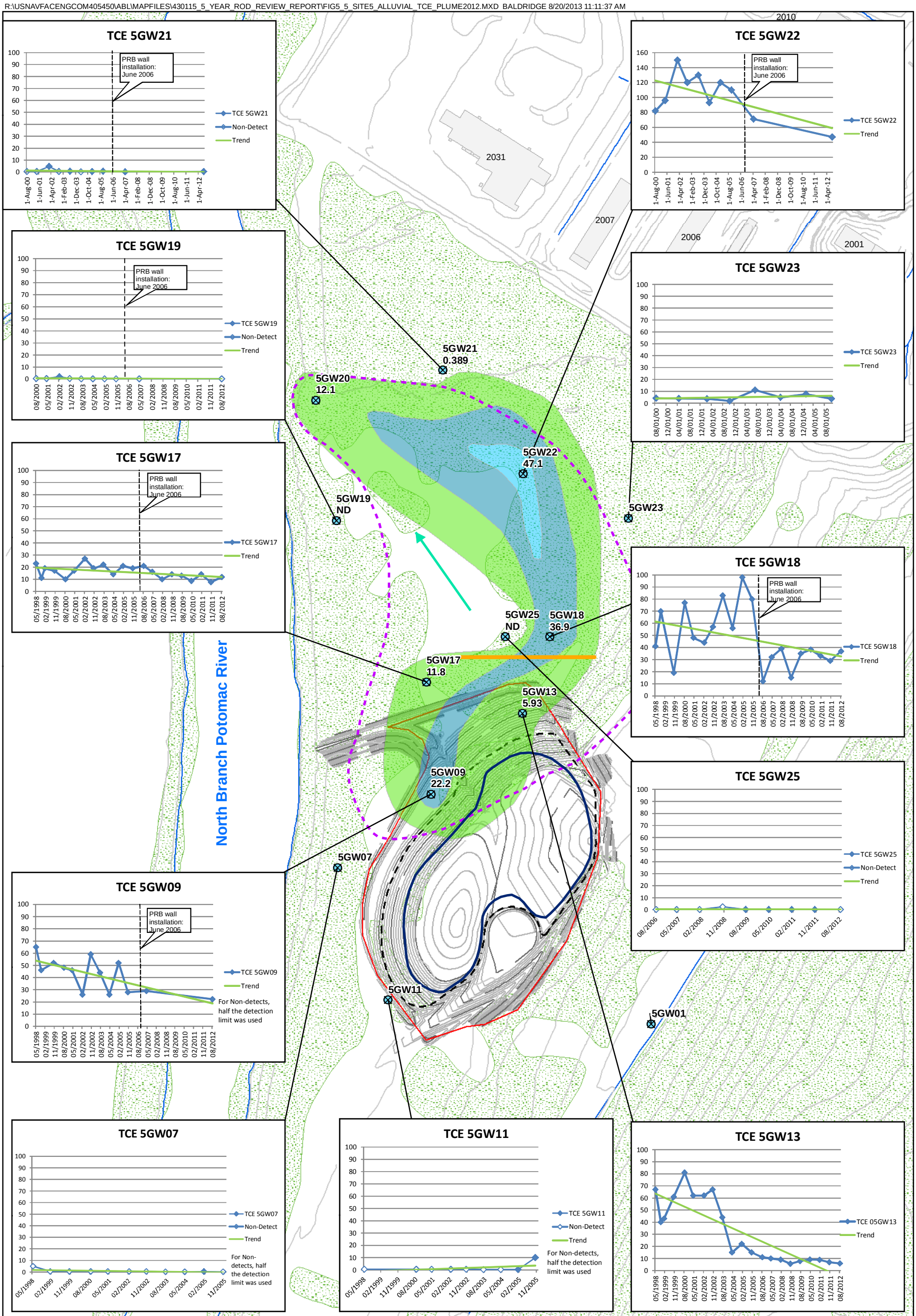
0 50 100 Feet

1 inch = 100 feet

Figure 5-4
Alluvial Aquifer Site 5 Plume - August 2000
5 Year ROD Review Report
Allegany Ballistics Laboratory
Rocket Center, West Virginia

CH2MHILL

R:\USNAVFACENGCOM405450\ABL\MAPFILES\430115_5_YEAR_ROD_REVIEW_REPORT\FIG5_5_SITE5_ALLUVIAL_TCE_PLUME2012.MXD BALDRIDGE 8/20/2013 11:11:37 AM



Legend

- Monitoring Well - Alluvial
- Alluvial Groundwater Flow
- PRB*
- Edge of Waste
- Edge of Landfill Cap
- Buildings
- Vegetation
- Site 5 Boundary
- Area of Restricted Groundwater Use

Estimated TCE Plume

- 5 - 20 µg/L
- 20 - 40 µg/L
- 40 - 60 µg/L

* PRB installed in June 2006

N

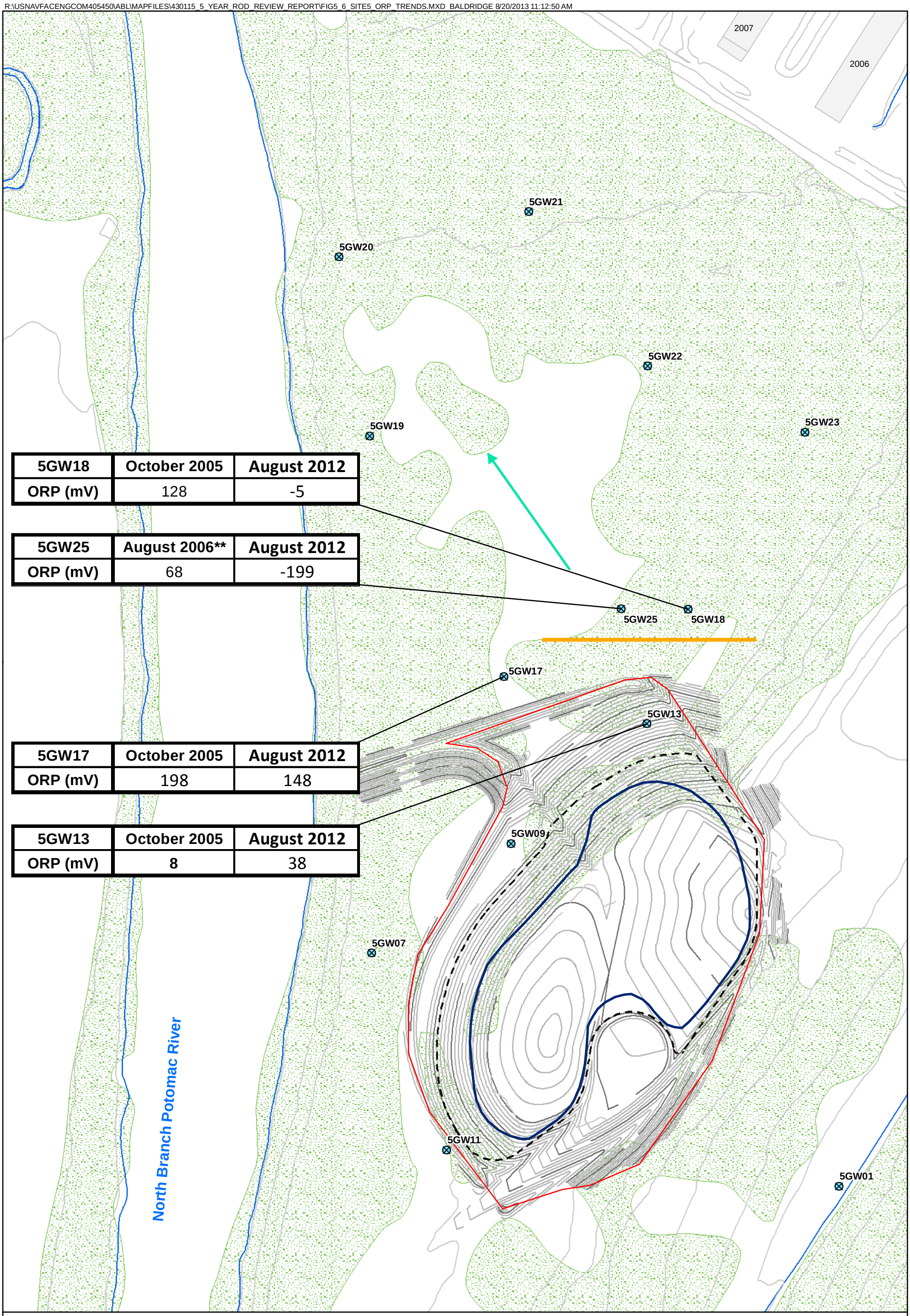
0 75 150 Feet

1 inch = 150 feet

Figure 5-5
Alluvial Aquifer Site 5 Plume - August 2012
5 Year ROD Review Report
Allegany Ballistics Laboratory
Rocket Center, West Virginia

CH2MHILL

R:\USNAVFACENGCOM405450\ABL\MAPFILES\430115_5_YEAR_ROD_REVIEW_REPORT\FIG5_6_SITE5_ORP_TRENDS.MXD BALDRIDGE 8/20/2013 11:12:50 AM



5GW18	October 2005	August 2012
ORP (mV)	128	-5

5GW25	August 2006**	August 2012
ORP (mV)	68	-199

5GW17	October 2005	August 2012
ORP (mV)	198	148

5GW13	October 2005	August 2012
ORP (mV)	8	38

Legend

- Monitoring Well - Alluvial
- Alluvial Groundwater Flow
- PRB*
- Edge of Waste
- Edge of Landfill Cap
- Buildings
- Site 5 Boundary

* PRB installed in June 2006
** No data is available for ORP from October 2005 at 5GW25

N

0 50 100 Feet

1 inch = 100 feet

Figure 5-6
Alluvial Aquifer Site 5 ORP Trends
5 Year ROD Review Report
Allegany Ballistics Laboratory
Rocket Center, West Virginia

CH2MHILL

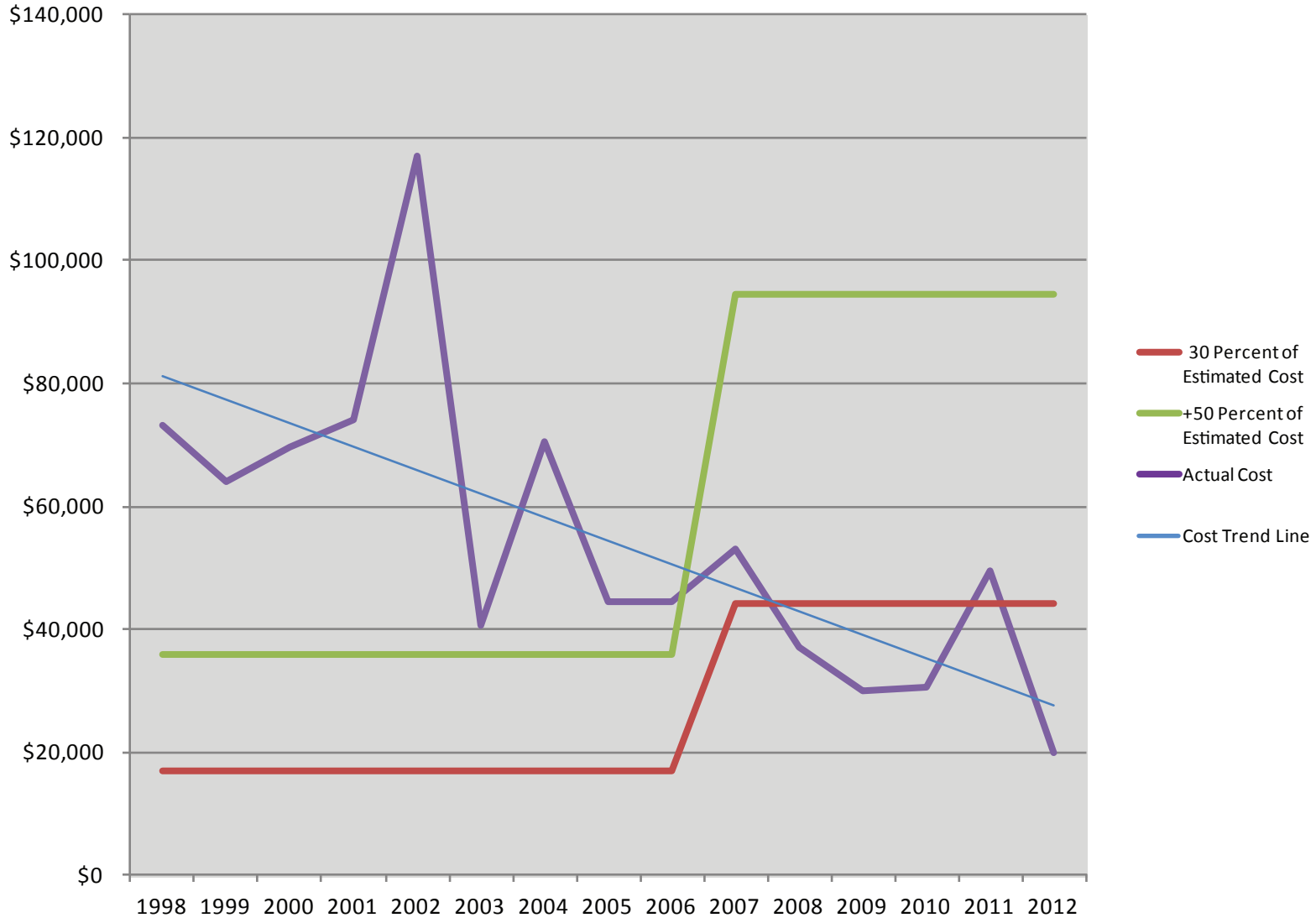


Figure 5-7
Annual O&M and LTM Costs
5 Year ROD Review Report
Allegany Ballistics Laboratory
Rocket Center, West Virginia

SECTION 6

Site 10 – Former TCE Still at Building 157 (Operable Unit 5, Groundwater)

This section provides an overview of the history and RA effectiveness for Site 10.

6.1 Site Chronology

A chronology of major events for Site 10 (OU-5) is provided as follows:

Date	Event/Document
October 1987	CS (Weston, 1987)
October 1989	Interim RI (Weston, 1989)
January 1996	RI (CH2M HILL, 1996a)
August 1996	Phase II RI (CH2M HILL, 1996b)
November 1996	Draft FFS for Site 10 Groundwater and Soil (CH2M HILL, 1996e)
March 1998	Final FFS for Site 10 Groundwater (CH2M HILL, 1998c)
June 1998	RA Design complete (CH2M HILL, 1998a)
August 27, 1998	Interim RA ROD selecting the interim remedy for Site 10 groundwater (OU-5) (Navy, 1998)
March 10, 2000	Contractor Closeout Report for Groundwater Remediation – Site 1 and 10 (OHM, 2000)
June 2000	Supplemental Investigation (CH2M HILL, 2002a)
January 2002	Proposed Remedial Action Plan (PRAP) (Navy, 2002)
July 2002	Construction, Excavation, and Groundwater Use Restriction Plan for IRP Sites (CH2M HILL, 2002c)
September 15, 2003	Five-Year ROD Review Report, Second Five-Year Review (CH2M HILL, 2003a)
March 2004	LTM Report for Sites 1, 5, and 10 (CH2M HILL, 2004a)
April 2004	LTM Report for Sites 1 and 10 (CH2M HILL, 2004b)
September 15, 2005	ROD; Site 10 – Former TCE Still and Plant Production Wells “A” and “C” Groundwater (OU-5) (Navy, 2005a)
June 2006	LTM Plan for Sites 1, 5, and 10 (CH2M HILL, 2006a)
July 18, 2007	Final ROD; Site 10 Soil (OU-6) (Navy, 2007)
September 2007	LTM Report for Sites 1, 5, and 10 (JVI AGVIQ/CH2M HILL, 2007b)
July 2008	LTM Report for Sites 1, 5, and 10 (CH2M HILL, 2008c)
June 2010	SAP, LTM Plan for Sites 1, 5, and 10 (CH2M HILL, 2010b)
June 2010	Construction Work Plan, Sites 1 and 10 GWTP Perchlorate Treatment Upgrade (JVIII AGVIQ/CH2M HILL, 2010)
November 2010	Interim Draft LTM Report for Sites 1, 5, and 10 (SB-RAC AGVIQ/CH2M HILL, 2010)
April 2011	LTM Report for Sites 1, 5, and 10 (CH2M HILL, 2011)
April 2011	Construction Completion Report, Sites 1 and 10 GWTP Perchlorate Treatment Upgrade (JV III AGVIQ/ CH2M HILL, 2011)
October 2011	SAP for Sites 1, 5, and 10 (Update 01) (CH2M HILL, 2011b)
July 2012	Final SAP for Sites 1, 5, and 10 (Update 02) (CH2M HILL, 2012b)
October 2012	Final Interim CERCLA LTM Report for Sites 1, 5, and 10 (SB-RAC AGVIQ/CH2M HILL, 2012b)

6.2 Background

6.2.1 Description and History

Site 10 is an 8-acre area around Building 157 and is located within the south-central developed portion of Plant 1, as shown on **Figure 6-1**. The site comprises the area that includes the former TCE still at Building 157, former Production Well A, and former Production Well C. Building 157 was constructed in the 1950s as a chamber preparation building for the A2 Polaris second-stage rocket motor casing. TCE use at the building involved a solvent recovery still just outside the southeast side of the building, where TCE was recovered by distilling. TCE use and storage at Building 157 began in approximately 1960, but ceased in the early 1960s (facility-wide use of TCE at ABL was discontinued in the early 1990s).

Site 10 was historically called Site Production Well A and had been defined and investigated during the Confirmation Study/Interim RI, RI, and Phase II RI because contamination had been detected in Production Well A, which was used in the past to supply potable, boiler, and fire-fighting water to the plant. Because VOCs were detected in the well as early as 1980, the use of Production Well A as a water source was discontinued. It is now believed that contamination in Production Well A originated, at least in part, from the former TCE still. To maintain consistency with other numbered IRP sites at ABL, Site Production Well A was renamed Site 10 in 1995 (Navy, 2005a)

6.2.2 Physical Characteristics

A CSM (**Figure 6-2**) has been developed to summarize the site conditions, contaminant distribution, transport pathways, potential receptors and exposure pathways, and land use data collected during the site investigations. Site 10 is located approximately 1,200 feet south of Site 1 and approximately 2,000 feet from the North Branch of the Potomac River. The groundwater flows from Site 10 toward Site 1, prior to reaching the North Branch Potomac River (**Figure 6-1**). The site is relatively flat, with land elevations between 665 and 671 feet amsl. Portions of the site are grass covered, but a significant area is covered by ABL facility buildings and roads.

Site 10 is underlain by two distinct lithologies: (1) unconsolidated alluvial deposits of clay, silt, sand, and gravel (alluvial aquifer) and (2) predominantly shale bedrock (bedrock aquifer). There is no intervening hydrogeologic unit separating the alluvial and bedrock aquifers. The depth to bedrock varies from approximately 15 to 25 feet bgs. The depth to groundwater varies across the site, but is generally less than 12 feet bgs except at locations adjacent to extraction wells, where the water table is intentionally being lowered by the pumping system. The groundwater flow direction in both the alluvial and bedrock aquifers is northeast toward the North Branch Potomac River, which is the predominant hydrologic feature in the vicinity of the site (Navy, 2005a).

6.2.3 Land and Resource Uses

Currently, Site 10 and the surrounding area is primarily industrial use. Groundwater extracted at Site 10 is treated at the Site 1 GWTP and either used by the facility's steam generation plant as boiler makeup water or discharged to the North Branch Potomac River. Groundwater is not currently used as a potable water supply at Site 10. Current and future land use of the site is not expected to change. LUCs are currently maintained within the area of restricted groundwater use at Site 10 and are inspected on a quarterly basis (**Figure 6-1**). The LUCs restrict land use and exposure to groundwater until concentrations of VOCs are reduced to levels that allow for unlimited use and unrestricted exposure (CH2MHILL, 2013b). A No Action ROD was signed for soil in 2007, and therefore, no LUCs were required for soil (Navy, 2007).

The land surrounding ABL consists of undeveloped mountainous woodland to the south and east and several residences and farmland across the North Branch Potomac River to the north and west. No perennial surface water bodies exist at Site 10. The closest surface water body is the North Branch Potomac River with the closest point approximately 1,500 feet north northeast of Site 10. The closest potable groundwater production wells to Site 10 are more than 1 mile to the southwest.

6.2.4 History of Contamination

The suspected source of contamination in groundwater at Site 10 was the former TCE still located outside of Building 157. Site 10 was part of a number of investigations conducted at ABL in the 1980s and early 1990s and a supplemental investigation conducted in July 2000. Information gathered during these investigations indicated that VOCs were present in soil in the vicinity of the former TCE still and that a VOC plume (specifically TCE) is present in both the alluvial and bedrock aquifers at Site 10. Based upon the risks identified for Site 10 groundwater during the Phase II RI, an FFS for Site 10 groundwater was completed in March 1998.

The Navy issued the PRAP for groundwater at Site 10 (OU-5) in March 1998 and signed an interim action ROD in August 1998. The selected remedy, which was a modification of one of the alternatives listed in the FFS, involved installation of three alluvial groundwater extraction wells and treatment at the Site 1 GWTP. It was considered an interim action because it did not address the full extent of alluvial and bedrock aquifer contamination. The interim action was intended to contain and remove the most-highly contaminated portion of the alluvial aquifer (TCE contamination greater than 100 μg/L) before further downgradient migration could occur while other remedial actions (such as MNA) were considered for the less-contaminated portion of the aquifers.

As noted in Section 4.3, a treatment facility was designed and constructed to remove hazardous constituents from the extracted groundwater at nearby Site 1. The treatment plant began continuous operation in September 1998. Implementation of the interim remedial action at Site 10 (that is, installation of three alluvial groundwater extraction wells) was completed in February 1999, at which time groundwater extraction at Site 10 with subsequent treatment at the Site 1 treatment plant began.

After several months of groundwater monitoring at Site 10, it became evident that the existing extraction well configuration was capturing all but the northeastern portion of the alluvial aquifer VOC plume. Subsequent to further investigation and delineation efforts, a fourth alluvial extraction well was installed in the northeastern downgradient area of the VOC plume in July 2000. A monitoring well was also installed downgradient of the extraction well to verify hydraulic containment.

Prior to groundwater extraction, the hydraulic head data at Site 10 indicated bedrock groundwater had a tendency to flow upward into the alluvial aquifer. The interim action attempted to take advantage of this condition by pumping only the alluvial aquifer at Site 10. However, hydraulic head data gathered prior to and following extraction system startup at Site 1 indicated that the vertical hydraulic gradient between the alluvium and bedrock at Site 10 reversed (that is, became downward) potentially under the influence of bedrock groundwater extraction at Site 1. To test this hypothesis and to evaluate the need for bedrock extraction at Site 10, an aquifer test was performed in July 2001.

The results of aquifer testing and modeling performed during Phase III Aquifer Testing indicated that bedrock groundwater extraction at Site 1 limits the effectiveness of the Site 10 alluvial extraction wells at capturing the bedrock contamination. A groundwater model was used to evaluate the most effective way to overcome the influence of groundwater pumping at Site 1. It was determined that the addition of four bedrock extraction wells at Site 10 would overcome the Site 1 pumping influence and contain groundwater contamination at the site. These changes to the extraction system were proposed as the final remedial alternative for Site 10 groundwater in a November 2001 Proposed Remedial Action Plan (PRAP). Construction of the Site 10 groundwater extraction system modification was completed and the modified system activated in February 2003 (JVI AGVIQ/CH2M HILL. 2007c). The modified system now comprises four alluvial extraction wells and four new bedrock extraction wells (**Figure 6-1**). The expansion of the extraction well network as the final remedy for Site 10 groundwater (OU-5) was memorialized in a ROD signed on September 15, 2005.

Additional soil sampling was conducted at Site 10 in June 2000 to further delineate the extent of soil contamination associated with the former TCE still. Soil data collected at Site 10 during the RI, Phase II RI, and June 2000 soil sampling event were evaluated to determine the potential ecological and human health risk posed by the site. These data were evaluated and are presented in a Risk Assessment Report (CH2M HILL, 2005b). This report concludes that soil at Site 10 does not present an unacceptable risk to human health or the environment.

In 2006 a PRAP was prepared for Site 10 soil (OU-6) that indicated that the preferred alternative for this media is No Action. A no further action ROD was signed for Site 10 soil (OU-6) in 2007.

6.2.4.1. Site Risks

An HHRA was conducted as part of the 1995 Focused RI to evaluate risks to human health from exposure to soil and groundwater under current and potential land use scenarios (CH2M HILL, 1995b). It was determined that there was no complete exposure pathway to sediment and surface water. A BERA was conducted as part of the Final Risk Assessment to evaluate that the potential ecological risks from exposure to chemicals detected in Site 10 surface soils (CH2M HILL, 2005b) as potentially complete exposure pathways to terrestrial receptors using Site 10 (grassy area) exist, although they are limited. The site, located in a developed area close to Building 157, is very small and has low habitat quality and diversity, comprising periodically mowed grass and other herbaceous plants. The BERA evaluated potential ecological risks for both terrestrial upper trophic-level receptors (via food web exposures) and terrestrial lower trophic level receptors (via direct exposures).

Human Health Risk

- Although the HHRA identified potential unacceptable risk from exposure to soil, as previously noted, additional soil sampling and assessment determined that there was no unacceptable risk to human health or the environment from soil exposure.
- The HHRA evaluated potential risks from exposure to groundwater to the industrial worker via dermal absorption, ingestion, and inhalation. Additionally, the HHRA evaluated potential risks from exposure to groundwater for the hypothetical future residential (child/adult) scenario via dermal absorption during bathing (children only), ingestion (adults and children), and inhalation during showering (adults only).
- It was determined that potential unacceptable risks exist for the most likely water supply (exposure to contaminated bedrock groundwater). For this scenario, the cancer-risk (8×10^{-5}) is within the USEPA acceptable risk range, but the HI for the child resident (1.1) exceeds 1. Furthermore, unacceptable cancer (1.4×10^{-4}) and non-cancer (4 for child and 3 for adult) risk values were calculated for exposure to contaminated alluvial groundwater as the water supply.

Ecological Risk

- The BERA concluded that there were no complete pathways to aquatic receptors because the limit of the TCE groundwater plume was approximately 2,000 feet from the North Branch Potomac River, traveling at an average velocity of 5 feet per year under natural conditions (ecological exposure pathways to groundwater are incomplete until the groundwater reaches and discharges to a surface water body). In addition, the contaminated groundwater is being contained, extracted, and treated via a network of alluvial and bedrock extraction wells.
- The BERA identified no unacceptable risks for any of the ecological receptors evaluated based on limited terrestrial habitat and low frequency and magnitude of detections.
  - Six metals (aluminum, chromium, iron, manganese, vanadium, and zinc) were identified as ecological COCs for direct exposures based on a comparison to surface soil screening values, only vanadium consistently exceeded facility-specific surface soil background concentrations, although the magnitude of the exceedance was relatively low (maximum ratio to background of 1.33).
    - Based on the known site history, vanadium is not likely to be site related and is likely to be attributable to natural variations in the soil. Also, based on updates to the ecological soil screening values since the BERA was completed, vanadium (as well as chromium and zinc) would not be identified as ecological COCs using the most-recent soil screening values.
  - Estimated food web exposure doses did not exceed Lowest Observed Adverse Effect Level (LOAEL)-based ingestion screening values for any receptor.
  - Although arsenic exceeded No Observed Adverse Effect Level (NOAEL)-based ingestion screening values for one receptor, arsenic was present at background concentrations.

6.2.5 Initial Response

Between 1984 and 1987, the CS was conducted under the NACIP at several Plant 1 sites. It was during this investigation that contamination was first discovered in several of the Plant 1 production wells. Production Well A and Production Well C were evaluated and found to contain detectable concentrations of several VOCs, including TCE.

No initial response measures occurred at Site 10 (OU-5) prior to signature of the interim ROD in August 1998.

6.2.6 Basis for Remedial Action

Based on the results of previous investigations (as presented in the HHRA and BERA for Site 10), remedial action is warranted to protect public health, welfare, and the environment from actual or threatened releases of VOCs (TCE being the primary risk driver) in groundwater at Site 10. There is no unacceptable risk attributable to site soil. Remedial action for alluvial and bedrock aquifer groundwater is addressed in the Final ROD (Navy, 2005a).

6.3 Remedial Actions

6.3.1 Selected Remedy

Groundwater contamination at Site 10 was initially addressed through an Interim ROD, signed on August 27, 1998. The ROD selected groundwater extraction from the alluvial aquifer and treatment at the Site 1 GWTP. The interim remedy was intended to contain and remove the most-highly contaminated portion of the alluvial aquifer and avoid further downgradient migration, while additional remedial actions were considered to address the broader area of groundwater contamination.

Following an evaluation period of the effectiveness of alluvial groundwater extraction under the Interim ROD, an expansion of the extraction system was completed in February 2003, including the construction of four bedrock extraction wells. The expansion of the extraction well network as the final remedy for Site 10 groundwater was memorialized in a ROD signed on September 15, 2005.

The RAOs for the Final ROD are defined as follows:

- Prevent or minimize exposure of potential future onsite residents and construction workers to contaminated groundwater originating from Site 10
- Achieve the chemical-specific MCLs, where practical

To achieve these RAOs, the selected remedy consists of the following major components:

- Extraction using an alluvial and bedrock extraction well network to remove contaminated groundwater from both the alluvial and bedrock aquifers
- Piping the extracted groundwater to the Site 1 GWTP for treatment using air stripping
- Discharge of the treated groundwater to the North Branch Potomac River. Waste stream sampling is conducted before and after treatment to ensure that the effluent concentrations do not exceed discharge limits established by the WVDEP. A portion of the treated groundwater is utilized by the ABL facility, on an as needed basis, for steam generation
- Long Term Monitoring of alluvial and bedrock groundwater quality
- Groundwater use restrictions imposed through appropriate administrative mechanisms until the cleanup levels for Site 10 (OU-5) are achieved

The RAOs and the expectation to meet ARARs required the establishment of MCLs as the performance standard for the remedy. Groundwater extraction will continue until groundwater VOC concentrations are below these levels. Expected outcomes for evaluating the overall performance of the remedy were established in the ROD and are summarized in **Table 6-1**.

LUCs are currently maintained within the area of restricted groundwater use at Site 10 and are inspected on a quarterly basis (CH2MHILL, 2013a). The area of groundwater use restriction as noted in the 2005 ROD is shown on

Figure 6-1. Groundwater LTM and reporting will be completed to assess the progress of the remedy over time. The LUC objectives as outlined in the 2005 ROD are as follows:

- Ensure no extraction of groundwater from Site 10 except for purposes of transport to Site 1 for treatment (including no extraction of groundwater for use as drinking water) in the restricted area until the RAOs for OU-5 are met and risks from groundwater use are shown to be reduced to acceptable levels
- Ensure adequate protection to minimize potentially adverse health and environmental effects of work or development in the restricted area
- Ensure adequate protection to maintain the integrity of any current or future remedial equipment or monitoring operation in the restricted area

6.3.2 Remedy Implementation

6.3.2.1. Groundwater Extraction and Treatment

The groundwater extraction system at Site 10 began operation in February 1999 and was expanded in 2000 for additional capture area in the alluvial aquifer and again in 2003 for bedrock groundwater extraction. Groundwater is pumped from the four alluvial extraction wells and four bedrock extraction wells and transported via pipeline to the Site 1 GWTP, which currently treats groundwater from Sites 1 and 10. At present, much of the treated groundwater is utilized by the ABL boiler plant, with excess water being discharged to the North Branch Potomac River (JVI AGVIQ/CH2M HILL. 2007c).

6.3.2.2. Long-Term Monitoring

LTM at Site 10, OU-5, is currently performed in accordance with the *Final Sampling and Analysis Plan for Sites 1, 5, and 10* (CH2M HILL, 2011b).[6] The major components of the LTM at Site 10, OU-5, consist of the following items:

- **Groundwater Hydraulic Head Monitoring** – Water level measurements are collected from alluvial and bedrock extraction and monitoring wells to evaluate the effectiveness of the system to hydraulically contain contaminated portions of the alluvial and bedrock aquifers in order to prevent further migration of contaminated groundwater. Measurements are collected manually on a monthly basis and prior to each groundwater LTM sampling event.
- **Groundwater Sampling –** Groundwater samples are collected in the alluvial and bedrock aquifers in order to assess whether the VOC concentrations in groundwater are decreasing indicating that the groundwater extraction and treatment system is successfully working toward meeting the goal of restoring the aquifers to beneficial use as potential drinking water sources. Groundwater sampling is performed on a tri-quarterly (i.e., every 9 months) basis at nine monitoring wells (five in the alluvial aquifer and four in the bedrock aquifer). An expanded network of monitoring wells is sampled prior to each Five-Year Review (six alluvial and five bedrock). Groundwater samples are analyzed for VOCs.

6.3.2.3. Operation and Maintenance

The Navy retains the responsibility for overseeing the administrative and substantive requirements of O&M for Site 10, OU-5. All official correspondence with the USEPA and WVDEP, including submissions of reports, are generated through the Navy.

Since groundwater extracted from Site 10 is treated at the Site 1 GWTP, some O&M activities are associated with both sites. Guidelines for O&M are provided in the *Final Environmental Facility User Manual for Groundwater Remediation – Site 1 Northern Riverside Waste Disposal Area, Volumes 1 through 4* (OHM, 1999). The primary O&M activities solely associated with Site 10, OU-5, consist of the following:

- Inspection and maintenance of groundwater extraction wells to ensure that they are capable of meeting pumping rates and other required set points
- Visual inspection of signage

[6] The 2011 LTM Plan supersedes the previous LTM plans.

Additional information regarding the O&M and monitoring performed for the Site 1 GWTP is provided in Section 4.3.2.

6.4 Progress Since Last Five-Year Review

6.4.1 Follow-up Actions Since Last Five-Year Review

The previous Five-Year Review Report included the following protectiveness statement for Site 10, OU-5:

> *The remedy at Site 10 (OU-5) consisting of the existing groundwater extraction and treatment system is protective of human health and the environment and is expected to continue to be protective in the future. Exposure pathways that could result in an unacceptable risk are being controlled through a combination of the groundwater extraction system, engineered land use controls (e.g., site security, fencing and signage) and institutional controls. An assessment of vapor intrusion at Site 10 (OU-5) will be performed, as part of an ABL facility-wide vapor intrusion assessment, to verify that there are no unacceptable risks associated with this pathway*.

Although the Five-Year Review concluded that the remedy is functioning as intended and protective of human health and the environment, issues and recommendations for follow-up actions were identified. **Table 6-2** presents the status of these recommendations and follow-up actions.

6.4.2 Results of Implemented Actions

This section is intended to provide a summary of O&M and LTM program activities at Site 10, OU-5, since the last Five-Year Review Report was completed in September 2008. To assess the performance of the remedial action, data and information were reviewed with respect to each of the performance standards identified in the ROD, as presented in **Table 6-1**.

Some of the data presented to assist in this Five-Year Review have previously been presented to the USEPA Region III and WVDEP through reports (LTM reports) or the ABL Tier 1 Partnering Team web site. As the primary risk driver at Site 10, based on previous investigations and risk assessments summarized in Section 6.2.4, TCE is used as the representative contaminant for monitoring historical trends and achievement of cleanup levels and performance standards. However, all VOC analytical data from the 2012 Five-Year Review sampling are provided in **Appendix E**.

6.4.2.1. Groundwater Extraction and Treatment

Hydraulic Containment

Hydraulic head measurements are collected from the North Branch Potomac River, extraction wells, and select alluvial/bedrock monitoring well pairs via pressure transducers to evaluate the effectiveness of the system in maintaining hydraulic containment. Each extraction well is designed to maintain a preset operating water level such that the natural hydraulic gradient is reversed. Gradient reversal between the stagnation point and the Site 10 extraction wells is verified by comparing the measured water levels in designated well pairs (alluvial monitoring well pair 10GW16 and 10GW25 and bedrock monitoring well pair 10GW28 and 10GW29). Based on the water level indicated by the pressure transducers, adjustments are made to the flow to keep the water level constant. Additionally, manual hydraulic head measurements are collected on a monthly basis from 69 wells (extraction and monitoring) within Plant 1. Results of hydraulic head monitoring are presented to USEPA and WVDEP monthly via e-mail, including potentiometric surface maps and treatment plant influent/effluent and air emissions data.

Non-pumping groundwater flow conditions in the alluvial and bedrock aquifers from July 2001 indicate the predominant groundwater flow direction at Site 10 is northeast in both aquifers toward the eastern edge of Site 1 and the North Branch Potomac River (**Figure 4-8** and **4-9**).

TABLE 6-2
Site 10 Progress Action Items from 2008 Five-Year Review
Allegany Ballistics Laboratory

Issue	Recommendations and Follow-up Actions	Party Responsible	Mile-stone Date	Affects Protectiveness		Status – May 2013	
				Current	Future	Action Taken and Outcome	Date of Action*
Full implementation of a combination of engineered LUCs and ICs for Site 10 (OU-5) has not been formally completed, as defined in the ROD.	A formal LUC Plan will be completed and implemented in accordance with the requirements of the ROD.	Navy USEPA WVDEP	Nov. 2008	No	No	LUC RD finalized.	Complete (May 2013)
A loss of hydraulic containment in the bedrock aquifer occurred in 2007. This loss of hydraulic containment was due to mechanical problems with the pumping system. Repair efforts reestablished hydraulic containment for the bedrock aquifer in January 2008.	To ensure adequate groundwater extraction from the bedrock aquifer, equipment upgrades were implemented in the spring of 2008. These upgrades will ensure that capture is consistently maintained.	Navy	Spring 2008	No	No	Well repair was conducted in 2011 to address bedrock aquifer loss of capture issues. Monthly monitoring of extraction well performance is conducted. Extraction well repairs and maintenance are performed on an “as-needed” basis.	Complete
The vapor intrusion pathway was not evaluated for Site 10 (OU-5) as part of the RI/FS for this site. Because there are occupied buildings overlying the TCE plume in groundwater at Site 10, further evaluation of the vapor intrusion pathway to assess whether this pathway generates potentially unacceptable risk should be performed.	A vapor intrusion assessment for Site 10 (OU-5) should be performed based on TCE and other VOCs within the groundwater. This assessment will be included as part of an ABL facility-wide vapor intrusion assessment planned for 2008.	Navy	Dec. 2008	No	No	The ABL facility-wide vapor intrusion assessment is ongoing. Preliminary buildings of interest have been identified and surveys were conducted in December 2012. Following an assessment of building survey results, a Uniform Federal Policy (UFP)-SAP will be prepared for vapor intrusion sampling if necessary.	Currently Underway
During a site inspection in March 2008, rubber seals on several extraction well vault lids were noted as falling off or appeared damaged, cracks were noted on several concrete well pads, and several wells were not properly locked.	All the rubber seals on the extraction well vault lids and concrete pads will be inspected and repaired as necessary. Extraction well locks will be inspected and damaged or rusted locks will be replaced. All extractions wells will remain locked at all times.	Navy	Jan. 2009	No	No	Extraction well rehabilitation was completed in 2011. Quarterly inspections of the monitoring and extraction well conditions are ongoing. Well repairs are conducted as needed.	Completed

Ongoing items have been carried through to Table 6-4 and new Milestone Dates established.

To demonstrate the results of hydraulic capture monitoring, alluvial and bedrock aquifer contour maps were selected from each year inside the Five-Year Review period to represent seasonal variations and correspond with groundwater LTM events conducted in January 2008, October 2008, July 2009, April 2010, January 2011, October 2011, and August 2012 (**Figures 4-8** through **4-23**). The hydraulic capture in the alluvial aquifer is seen on **Figures 4-8**, **4-10**, **4-12**, **4-14**, **4-16**, **4-18**, **4-20**, and **4-22**. The cone of depression generated from extraction wells at Site 10 results in a predominant flow component toward extraction well 10EW38 at the eastern edge of Site 10. Estimates of the capture zone presented on these figures indicate a large zone of capture extending from extraction well 10EW38 (a minimum of 350 feet in a northern direction). This analysis indicates that hydraulic capture of alluvial aquifer groundwater by the Site 10 extraction well system is occurring.

The hydraulic capture in the bedrock aquifer is seen on **Figures 4-9**, **4-11**, **4-13**, **4-15**, **4-17**, **4-19**, **4-21**, and **4-23**. The area of influence generated from extraction wells at Site 10 results in a flow component toward the area of extraction well 10EW42, and monitoring wells 10GW28 and 10GW29. Estimates of the capture zone indicate a zone of capture extending approximately 350 feet or greater from extraction well 10EW42. As displayed on **Figures 4-19** and **4-21** (January 10, 2011, and October 10, 2011), hydraulic capture in the bedrock aquifer was lost due to extraction well performance issues discussed in Section 4.4.2.1. Specifically, this loss of capture can be seen in the area of monitoring wells 10GW27, 10GW28, and 10GW29, where the predominant flow component is shown toward the northeast, indicating complete capture was not occurring, despite a minimal hydraulic gradient due to the groundwater extraction. The hydraulic capture was reestablished in August 2012 (**Figure 4-23**) with flow again toward an area of influence in the area of extraction wells 10EW40 and 10EW42 and monitoring wells 10GW28 and 10GW29. Although capture was not maintained for a portion of 2011, this analysis indicates that hydraulic capture of bedrock aquifer groundwater by the Site 10 extraction well system is occurring during normal operations.

6.4.2.2. Groundwater Sampling

Alluvial Aquifer

Figure 6-3 displays the historical alluvial groundwater TCE plume from the January 1999 sampling event. In 1999 concentrations of TCE were as high as 800 D[7] µg/L and the aerial extent of the alluvial plume was 17.12 acres in size. As indicated on **Figure 6-4**, both the contaminant concentrations within, and the aerial extent of, the alluvial plume have decreased since the remedy was implemented. The maximum concentration of TCE detected in alluvial groundwater at Site 10 in 2012 was 71.7 µg/L (10EW36). This concentration is located within the central portion of the plume and these concentrations are comparable to concentrations found in 10EW38 (69.2 µg/L), along the eastern portion of the plume. The current plume covers 7.75 acres (**Figure 6-4**). Offsite migration does not appear to be occurring based on sampling results. All of the wells with a history of concentrations greater than 100 µg/L indicate a decreasing trend. Additionally, it should be noted that some of the monitoring wells were not sampled during historical or recent rounds of sampling that could provide some additional insight into the plume extent; thus, there is some uncertainty with regards to the current plume configuration.

Bedrock Aquifer

Figure 6-5 displays the bedrock groundwater TCE contamination from the January 1999 sampling event. In 1999, the maximum concentration of TCE was 230 µg/L. The approximate aerial extent of contamination covered 2 acres. As indicated on **Figure 6-6**, the approximate aerial extent of contamination has increased to cover 3 acres. This slight “plume expansion” is likely due to a change in hydraulics from pumping at Site 1 and 10. However, it should be noted that the maximum concentration currently detected is 56.1 µg/L, lower than the maximum concentration detected in 1999. Wells with notable concentrations of TCE have shown a decreasing trend in concentrations or stable conditions over time. It should be noted that some of the monitoring wells were not sampled during historical or recent rounds of sampling that could provide some additional insight into the plume extent.

[7] D = Compound identified in an analysis at a secondary dilution factor.

6.4.3 Costs Associated with Site Operations and O&M Modifications

Table 6-3 and **Figure 6-7** presents annual O&M costs and LTM costs for Site 10, OU-5. For this Five-Year Review period (2008 through 2012), total O&M and LTM costs were within the original estimated range of $100,800 to $216,000. As shown on **Figure 6-7**, O&M and LTM costs have decreased steadily from 2008 to 2012, except for the 2011 spike where costs incurred represent the O&M efforts associated with alluvial well cleaning and addressing the loss of hydraulic containment in the bedrock aquifer including the extraction well rehabilitation and electrical system and extraction pump replacement.

TABLE 6-3
Estimated Annual O&M and LTM Costs for Site 10 Groundwater (OU-5)
Allegany Ballistics Laboratory

Year	O&M Cost (Rounded to the Nearest $500)	LTM Cost (Rounded to the Nearest $500)	Total O&M and LTM Cost (Rounded to the Nearest $500)
1999	$64,000 *	--	$64,000
2000	$69,500 *	--	$69,500
2001	$74,000 *	--	$74,000
2002	$117,000 *	--	$117,000
2003	$83,000	$51,000	$134,000
2004	$89,000	$97,000	$186,000
2005	$94,000	$56,000	$150,000
2006	$94,000	$57,000	$151,000
2007	$110,000	$68,000	$178,000
2008	$98,500	$40,500	$139,000
2009	$92,000	$29,500	$121,500
2010	$91,500	$25,500	$117,000
2011	$125,000	$62,500	$187,500
2012	$62,000	$28,500	$90,500

Note:
O&M Costs from 1999 through 2002, includes LTM Costs. Treatment costs were factored into the Site 1 cost (Table 4-3).

6.5 Technical Assessment

6.5.1 Question A – Is the remedy functioning as intended by the ROD?

6.5.1.1. Remedial Action Performance

The remedial action at Site 10 (OU-5) is operating and functioning as intended with hydraulic containment of contaminated groundwater in both the alluvial and bedrock aquifers, with the exception of periodic loss of hydraulic capture in the bedrock aquifer. However, since groundwater flows directly towards Site 1 (and the Site 1 extraction well network) prior to entering the North Branch Potomac River, it is not believed that this affects the protectiveness of human health or the environment. Also, TCE concentrations exceeding the MCLs remain within the area of restricted groundwater use.

Achievement of the TCE MCL of 5 µg/L has not been met for the alluvial and/or bedrock aquifers at Site 10 (OU-5). In the alluvial aquifer, the TCE plume has shown a reduction in size and concentration in comparison to the 1999 baseline sampling event. In the bedrock aquifer, the TCE plume increased slightly in size from the 1999 baseline sampling event to the 2012 sampling event; however, concentrations have decreased. The progress of the alluvial plume reduction in the first 8 years of operation indicates the remedy may be on track for reaching RAOs within the projected 30-year timeframe.

6.5.1.2. Systems Operations (O&M)

Current O&M procedures, as implemented, will maintain the effectiveness of the remedial action, specifically related to the extraction and treatment of contaminated groundwater in the alluvial and bedrock aquifers. Total O&M costs were within the original estimated range of $100,800 to $216,000.

6.5.1.3. Opportunities for Optimization

Changes to Site 10 LTM should be evaluated during the next LTM UFP-SAP update. Possible revisions to sample locations and the sample parameters list should be evaluated with the Partnering Team during UFP-SAP scoping.

6.5.1.4. Early Indicators of Potential Issues

Periodic loss of capture of contaminated groundwater, such as the 2011 loss of capture, could place the protectiveness of the Site 10 (OU-5) remedial action at risk. However, since groundwater LUCs are currently in place restricting groundwater use and since Site 10 groundwater flows toward the Site 1 extraction wells prior to discharge to the North Branch Potomac River, this potential issue does not appear to affect protectiveness. Also TCE concentrations exceeding the MCLs remain within the area of restricted groundwater use.

Additionally, some pumping rate issues have been identified in the extraction well system as discussed in Section 4.5.1.4; however, maintenance is being performed on the system. This issue is not anticipated to affect the protectiveness of the remedy.

6.5.1.5. Implementation of Land Use Controls and Other Measures

The LUC RD was finalized in May 2013 and prohibits the extraction and use of onsite groundwater at Site 10 (except for transport to the Site 1 GWTP). Additionally, the LUC RD outlines the implementation actions that will be conducted in order to maintain the LUC objectives (CH2M HILL, 2013b). A comprehensive list of LUCs with associated boundaries and expected durations is retained at the ABL facility and is implemented through the *Final Construction, Excavation and Groundwater Use Restriction Plan for Installation Restoration Program Sites* (CH2M HILL, 2002c). Site inspections conducted in 2012 indicated signage is in place at Site 10. Because the areal extent of TCE concentrations exceeding the MCLs is less than the area of restricted groundwater use (LUC boundary) defined in the ROD, the LUC boundary could be refined to include only that portion of the aquifer that exceeds MCLs.

6.5.2 Question B – Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?

The performance metrics identified in the Site 10 (OU-5) ROD are being met; progress toward achievement of MCL cleanup goals has been observed and land use controls are in place to prevent groundwater exposure. There have not been any changes in the ARARs or to be considered (TBC) standards that would impact the protectiveness of the remedy.

Changes to toxicity and RSL values have been made during this Five-Year Review period (**Table 4-5**) and will be considered during refinement of the COC list for Site 10; however, with the pump-and-treat system active and LUCs in place, exposure to site 10 groundwater is limited; therefore, changes in toxicity do not impact the protectiveness of the remedy as discussed in Section 6.3.1. The exposure assumptions used to develop the HHRA are reasonable given the consistency in land use at Site 10, with the possible exception of the vapor intrusion pathway into occupied buildings. Assessment of vapor intrusion is ongoing at ABL; however, a full assessment has not yet been completed at Site 10. Therefore, some uncertainty exists with regards to the protectiveness of the remedy with regards to potential vapor intrusion at the site. It is anticipated that the vapor intrusion assessment at Site 10 will be completed by December 2014; at which time a protectiveness determination for Site 10 (OU-5) will be made.

Currently LUCs, as indicated by the ROD, are in place to protect the future construction worker from exposure to VOCs. It should be noted that this pathway was not evaluated in the 1996 risk assessment completed as part of the Phase II RI. Therefore, it may be overly conservative to have a LUC for the future construction worker as the concentrations of VOCs in groundwater may not pose an unacceptable risk to this receptor. Continuing to manage

a LUC boundary originally established in the ROD while the aerial extent of the VOC plume shrinks also is conservative and revision of the LUC boundary may be justified.

Arsenic and manganese were identified as COPCs in the ROD; however, they have not been included as part of the LTM program for Site 10. As stated in the ROD, inorganics are ubiquitous to groundwater and the concentrations detected at Site 10 are similar to those found elsewhere at the facility. The maximum detected arsenic concentration used for COPC calculations in the ROD was 2 μg/L, which is below the arsenic MCL of 10 μg/L. Historical manganese concentrations at Site 10 have been below the maximum value used in the risk assessment and similar to those found elsewhere on ABL.

6.5.3 Question C – Has any other information come to light that could question the protectiveness of the remedy?

There is no other information that calls into question the effectiveness of the remedy.

6.5.4 Technical Assessment Summary

Based on the information presented herein, the remedy for Site 10 (OU-5) is functioning as intended by the ROD. There have been no changes in the physical conditions of the site that would affect the protectiveness of the remedy. Known exposure pathways that could result in a risk are being controlled through a combination of the groundwater extraction system and LUCs.

6.6 Issues, Recommendations, and Follow-up Actions

Based on this Five-Year Review, the following issues in **Table 6-4** have been identified.

TABLE 6-4
Issues, Recommendations, and Follow-up Actions for Site 10 (OU-5)
Allegany Ballistics Laboratory

Issue	Recommendations and Follow-up Actions	Party Responsible	Milestone Date**	Affects Protectiveness	
				Current	Future
Carry-over Issues from Third Five-Year Review Report, September 2008					
The vapor intrusion pathway was not evaluated as part of the RI/FS for this site.	Basewide vapor intrusion evaluation currently underway.	Navy USEPA WVDEP	December 2014	Y*	Y*
Issues Identified During Current Five-Year Review					
COCs were not specifically identified in the 2005 ROD.	Develop a COC list based on Remedial Investigation results and optimize the COC list and sampling approach based on LTM results. Document revised COCs in technical memorandum or ESD, as appropriate.	Navy USEPA WVDEP	June 2014	N	N
Uncertainty exists associated with alluvial and bedrock plume extent and contaminant concentrations.	Revise the Five-Year Review monitoring well network to include appropriate wells that could provide additional insight into the plume extent and contaminant concentrations.	Navy USEPA WVDEP	March 2014	N	Y
Groundwater remedy performance issues. Uncertainty exists associated with the timeframe to achieve RAOs. A loss of hydraulic containment in the bedrock aquifer occurs periodically.	Conduct optimization analysis, including groundwater sampling and time of remediation (TOR) analysis, to determine timeframe and practicability of reaching MCLs with the current remediation system.	Navy USEPA WVDEP	September 2018 implementation (establish framework by December 2014)	N	N

*Determination of complete exposure pathway for vapor intrusion is unknown; therefore, protectiveness is currently deferred.

** Milestone dates are contingent on Navy funding

6.7 Protectiveness Statement

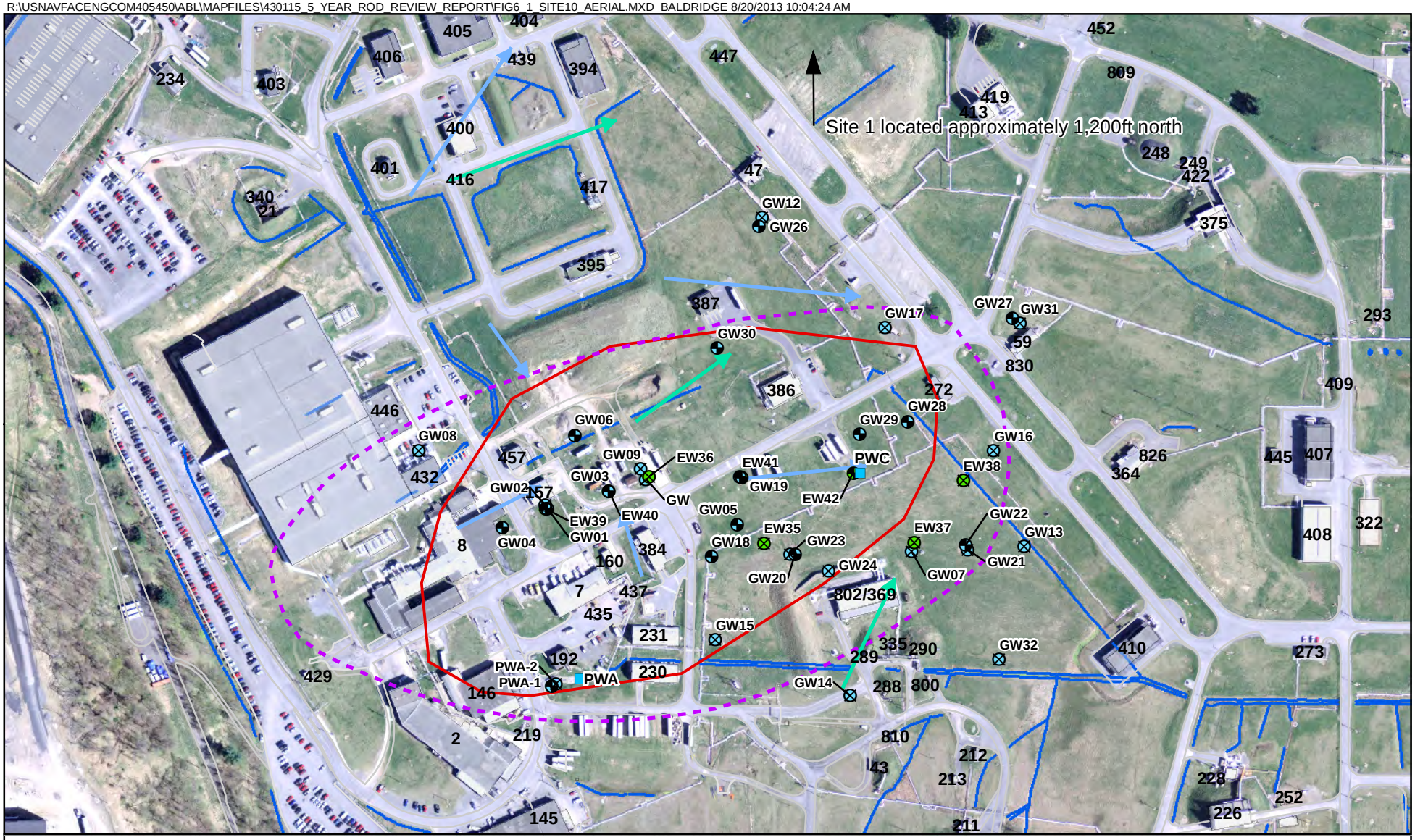
A protectiveness determination of the remedy at Site 10 (OU-5) consisting of the existing groundwater extraction and treatment system cannot be made at this time until further information regarding the vapor intrusion pathway is obtained. All other exposure pathways that could result in an unacceptable risk are being controlled through a combination of the groundwater extraction system, engineered LUCs (such as site security, fencing, and signage) and ICs. It is expected that the vapor intrusion assessment will be completed by December 2014, at which time a protectiveness determination will be made.

TABLE 6-1
Expected Outcomes for Site 10 (OU-10)
Five Year ROD Review
Allegany Ballistics Laboratory
Rocket Center, West Virginia

Risk									
Human Health	**Ecological**	**COC Requiring Action**	**Basis for Action**	**RAO**	**Remedy Component**	**Performance Standard Identified in ROD**	**Success Metric**	**Expected Outcomes**	**Exit Strategy**
				Groundwater					
Ingestion of, dermal contact with, and inhalation of chlorinated VOCs in groundwater under future potable use scenario.	No exposure pathway.	1,1-Dichloroethene 1,2-Dichloroethene Methylene Chloride Tetrachloroethene Trichloroethene	Cancer risk above 10-4 and/or non-cancer hazard above 1	Prevent or minimize exposure of potential future onsite residents and construction workers to contaminated groundwater originating from Site 10[1]	LUCs and LTM	Not identified.	Periodic inspections of the site to ensure compliance with LUCs until Federal MCLs are achieved. Monitor hydraulic head in alluvial and bedrock aquifers to ensure hydraulic containment of leading edge of plume	Restore alluvial and bedrock aquifers to beneficial use as a potable residential water supply. Restricted access will no longer be necessary.	Federal MCLs
				Achieve the chemical-specific MCLs, where practicable.	Groundwater Extraction	Groundwater extraction will be terminated after contaminant levels in dissolved phase TCE plume are below MCLs, providing residual groundwater contaminant concentrations do not present unacceptable risk to human health.	Monitor groundwater concentrations in VOC plume to confirm reduction in contaminant concentrations until Federal MCLs are achieved.		

[1] Risk to the construction worker not evaluated as part of the HHRA contained in the Phase II RI for Site 10. Risk is assumed, however to a lesser degree than calculated potential future residential risk.

R:\USNAVFACENGCOM405450\ABL\MAPFILES\430115_5_YEAR_ROD_REVIEW_REPORT\FIG6_1_SITE10_AERIAL.MXD BALDRIDGE 8/20/2013 10:04:24 AM



Legend

- Former Production Wells
- Monitoring Well - Alluvial
- Monitoring Well - Bedrock
- Extraction Well - Alluvial
- Extraction Well - Bedrock
- Surface Water
- Roads
- Alluvial Groundwater Flow
- Bedrock Groundwater Flow
- Site 10 Boundary
- Buildings
- Area of Restricted Groundwater Use

N

0 150 300 Feet

1 inch = 300 feet

Figure 6-1
Site 10 Features - Aerial
5 Year ROD Review Report
Allegany Ballistics Laboratory
Rocket Center, West Virginia

CH2MHILL

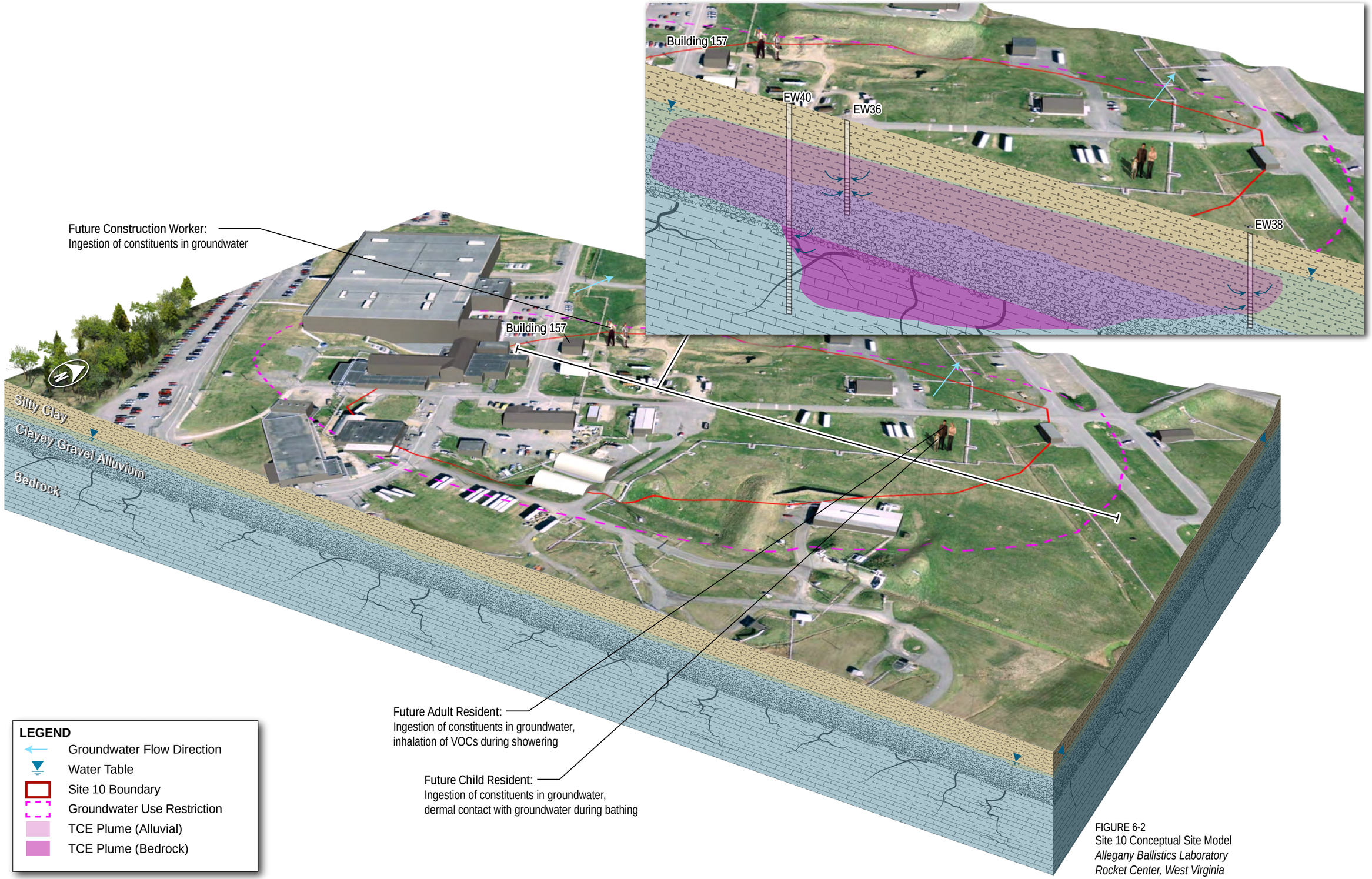
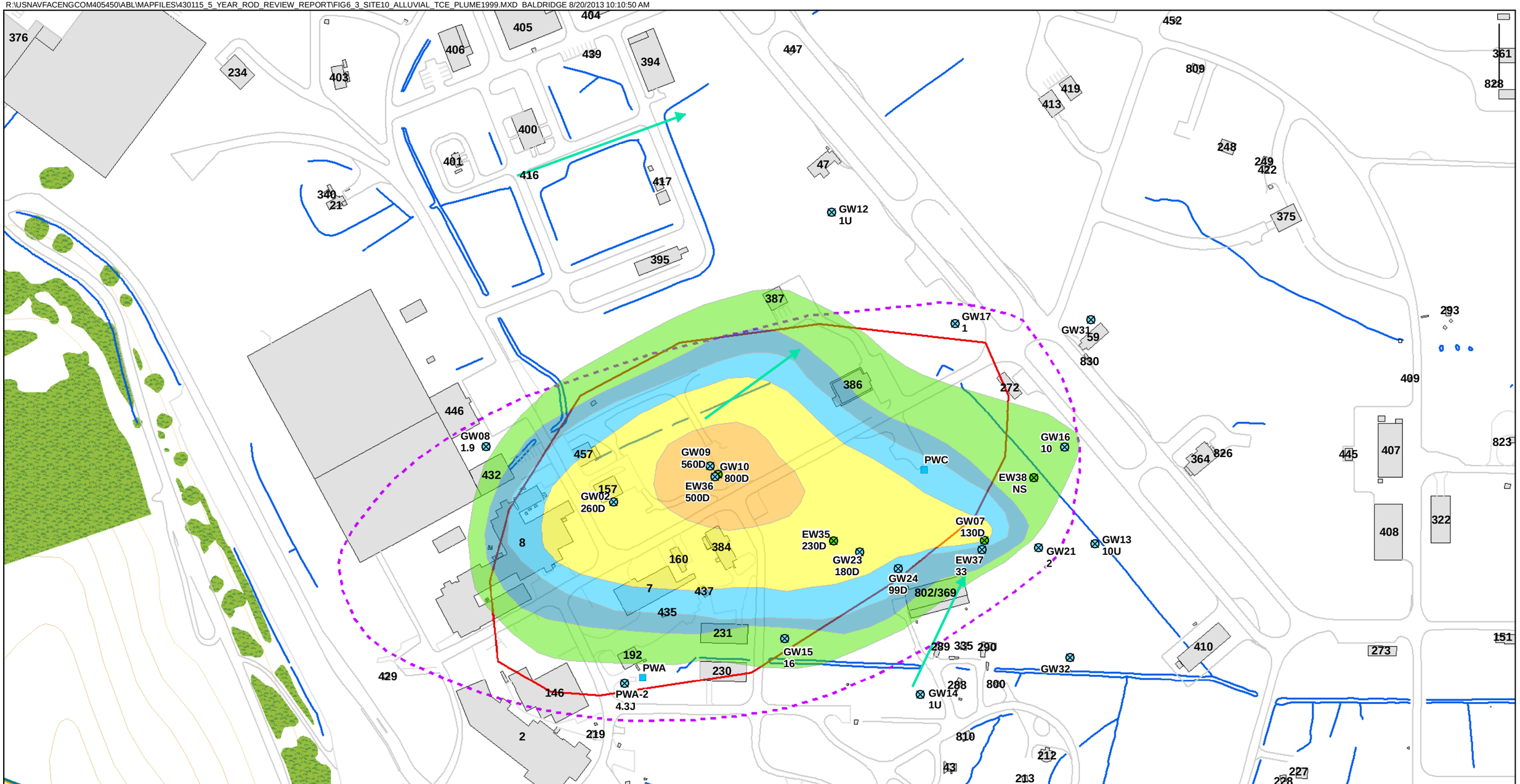


FIGURE 6-2
Site 10 Conceptual Site Model
Allegany Ballistics Laboratory
Rocket Center, West Virginia

CH2MHILL

R:\USNAVFACENGCOM405450\ABL\MAPFILES\430115_5_YEAR_ROD_REVIEW_REPORT\FIG6_3_SITE10_ALLUVIAL_TCE_PLUME1999.MXD BALDRIDGE 8/20/2013 10:10:50 AM



Legend

- Former Production Wells
- Monitoring Well - Alluvial
- Extraction Well - Alluvial
- Alluvial Groundwater Flow
- Roads
- Surface Water
- Area of Restricted Groundwater Use
- Site 10 Boundary
- Buildings
- Vegetation Area
- Plant 1
- Plant 1 - Undeveloped Area

Estimated TCE Plume

- 5 - 25 µg/L
- 25 - 50 µg/L
- 50 - 100 µg/L
- 100 - 500 µg/L
- 500 - 800 µg/L

NS - Not Sampled

N

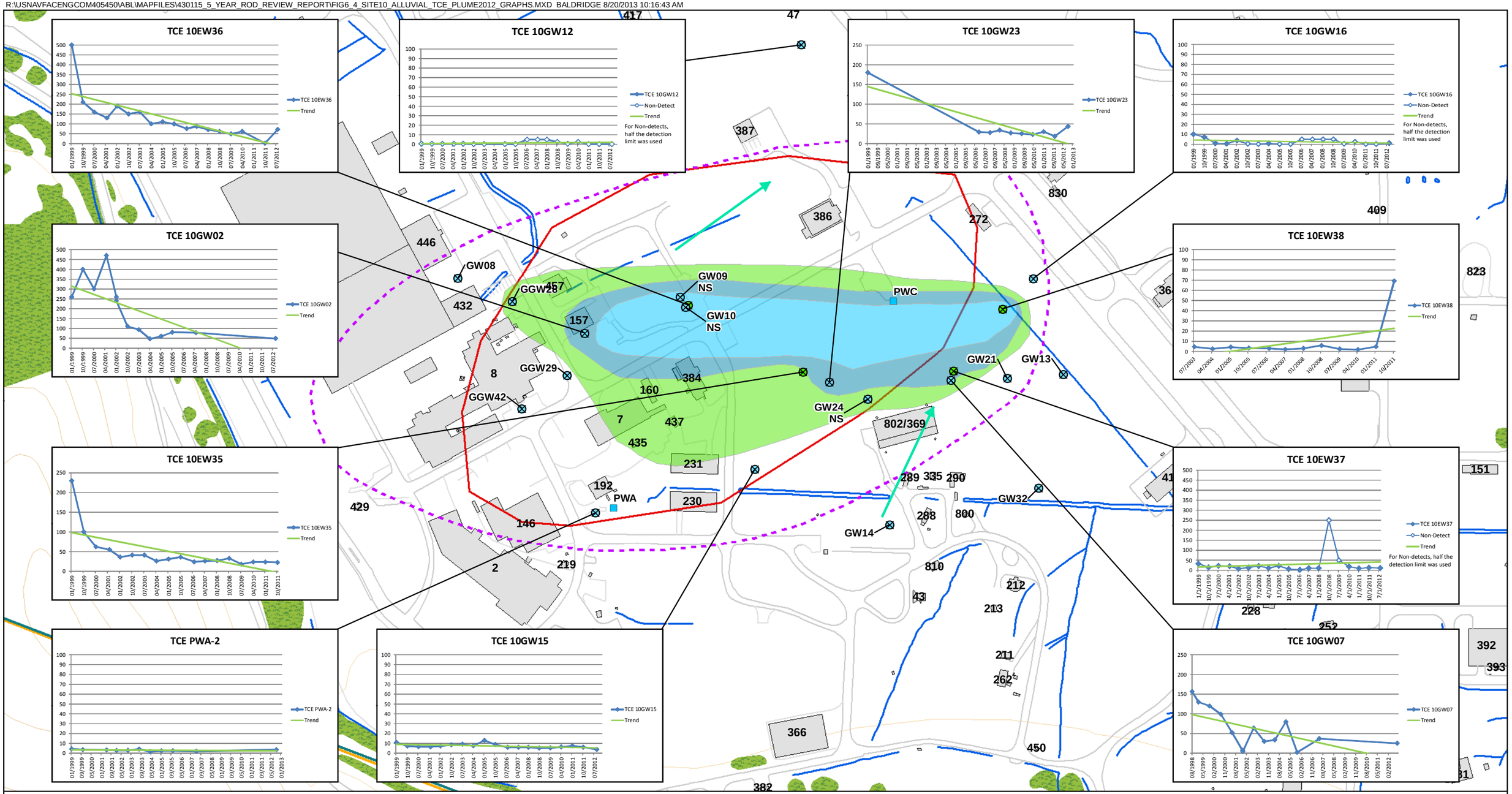
0 100 200 Feet

1 inch = 200 feet

Figure 6-3
Alluvial Aquifer Site 10 Plume - January 1999
5 Year ROD Review Report
Allegany Ballistics Laboratory
Rocket Center, West Virginia

CH2MHILL

R:\USNAVFACENGCOM405450\ABL\MAPFILES\430115_5_YEAR_ROD_REVIEW_REPORT\FIG6_4_SITE10_ALLUVIAL_TCE_PLUME2012_GRAPHS.MXD BALDRIDGE 8/20/2013 10:16:43 AM



Legend

- Former Production Wells
- Monitoring Well - Alluvial
- Extraction Well - Alluvial
- Alluvial Groundwater Flow
- Roads
- Surface Water
- Area of Restricted Groundwater Use
- Site 10 Boundary
- Buildings
- Vegetation Area
- Plant 1
- Plant 1 - Undeveloped Area

Estimated TCE Plume

- 5 - 25 µg/L
- 25 - 50 µg/L
- 50 - 100 µg/L

NS - Not Sampled
* Data used from October 2011 round, well not sampled in September 2012.

N

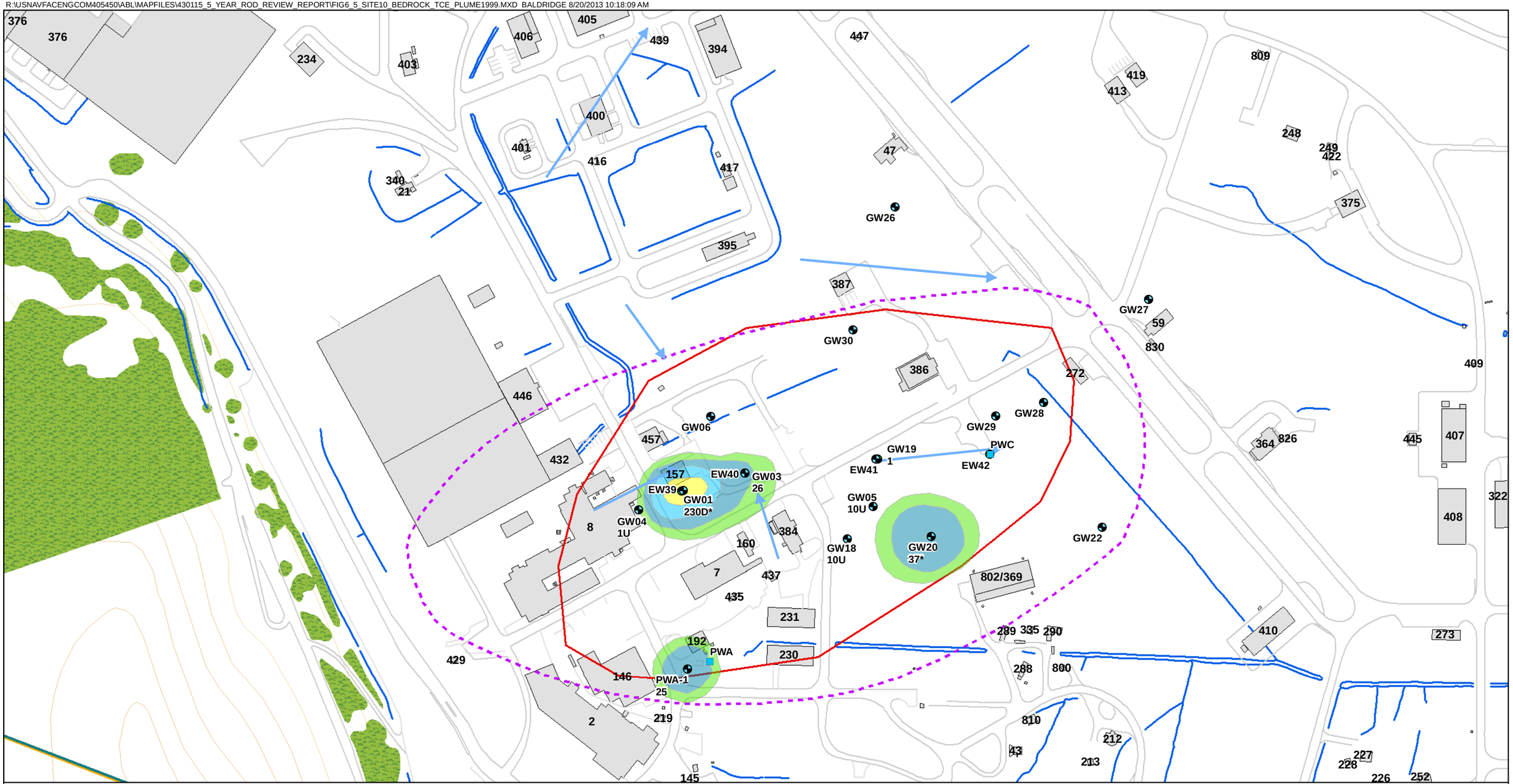
0 100 200 Feet

1 inch = 200 feet

Figure 6-4
Alluvial Aquifer Site 10 Plume - September 2012
5 Year ROD Review Report
Allegany Ballistics Laboratory
Rocket Center, West Virginia

CH2MHILL

R:\USNAVFACENGCOM405450\ABL\MAPFILES\430115_5_YEAR_ROD_REVIEW_REPORT\FIG6_5_SITE10_BEDROCK_TCE_PLUME1999.MXD BALDRIDGE 8/20/2013 10:18:09 AM



Legend

- Former Production Wells
- Monitoring Well - Bedrock
- Extraction Well - Bedrock
- Bedrock Groundwater Flow
- Roads
- Surface Water
- Area of Restricted Groundwater Use
- Site 10 Boundary
- Buildings
- Vegetation Area
- Plant 1
- Plant 1 - Undeveloped Area

Estimated TCE Plume

- 5 - 25 µg/L
- 25 - 50 µg/L
- 50 - 100 µg/L
- 100 - 500 µg/L

* Data used from October 1999 round, as opposed to January 1999

N

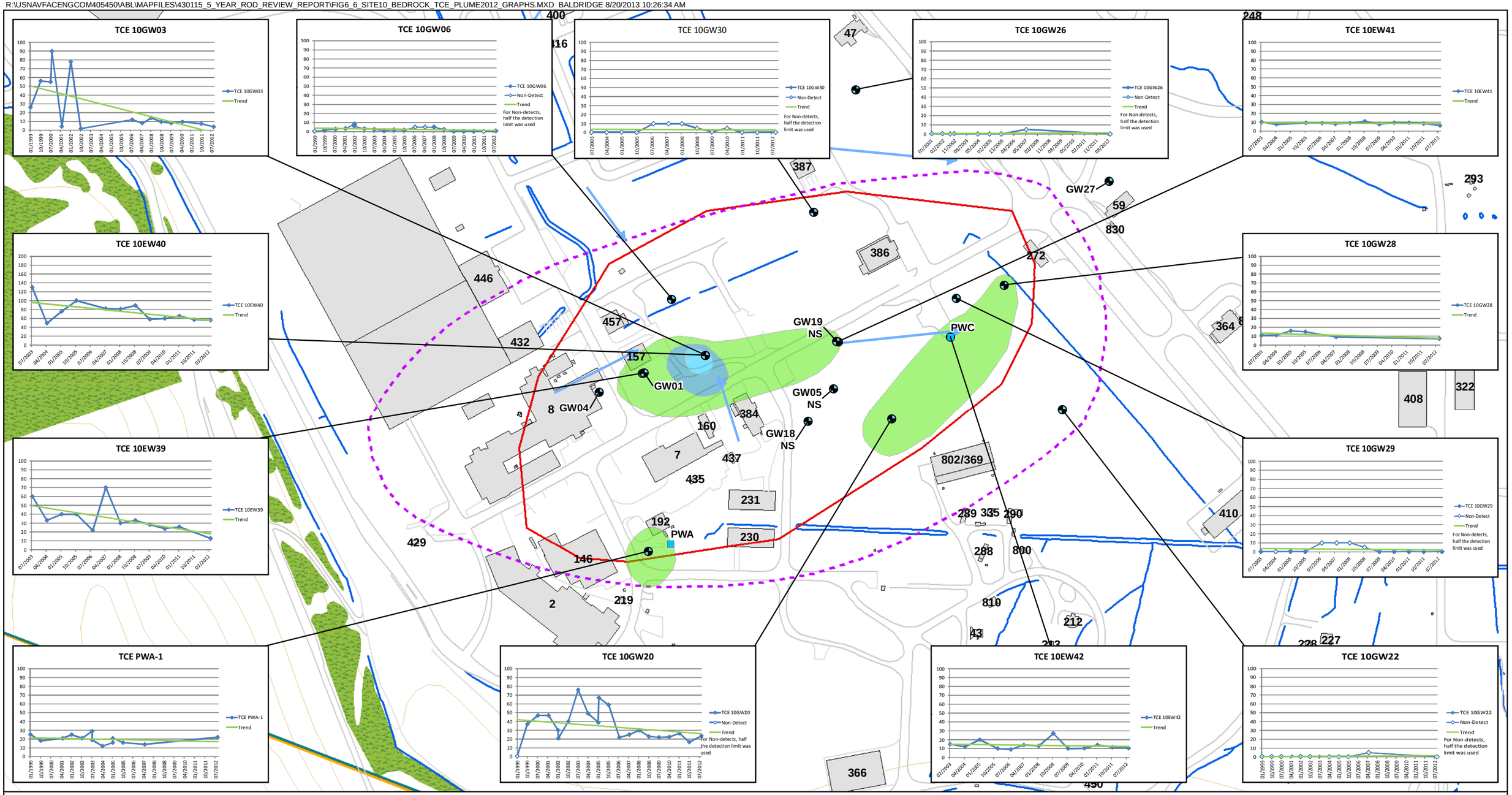
0 100 200 Feet

1 inch = 200 feet

Figure 6-5
Bedrock Aquifer Site 10 TCE Plume - January 1999
5 Year ROD Review Report
Allegany Ballistics Laboratory
Rocket Center, West Virginia

CH2MHILL

R:\USNAVFACENGCOM405450\ABL\MAPFILES\430115_5_YEAR_ROD_REVIEW_REPORT\FIG6_6_SITE10_BEDROCK_TCE_PLUME2012_GRAPHS.MXD BALDRIDGE 8/20/2013 10:26:34 AM



Legend

- Former Production Wells
- Monitoring Well - Bedrock
- Extraction Well - Bedrock
- Bedrock Groundwater Flow
- Roads
- Surface Water
- Area of Restricted Groundwater Use
- Site 10 Boundary
- Buildings
- Plant 1
- Plant 1 - Undeveloped Area
- Vegetation Area

Estimated TCE Plume

- 5 - 25 µg/L
- 25 - 50 µg/L
- 50 - 100 µg/L

Note

NS - not sampled.

* Data used from November 2011 round, as opposed to September 2012.

N

0 100 200 Feet

1 inch = 200 feet

Figure 6-6
Bedrock Aquifer Site 10 TCE Plume - September 2012
5 Year ROD Review Report
Allegany Ballistics Laboratory
Rocket Center, West Virginia

CH2MHILL

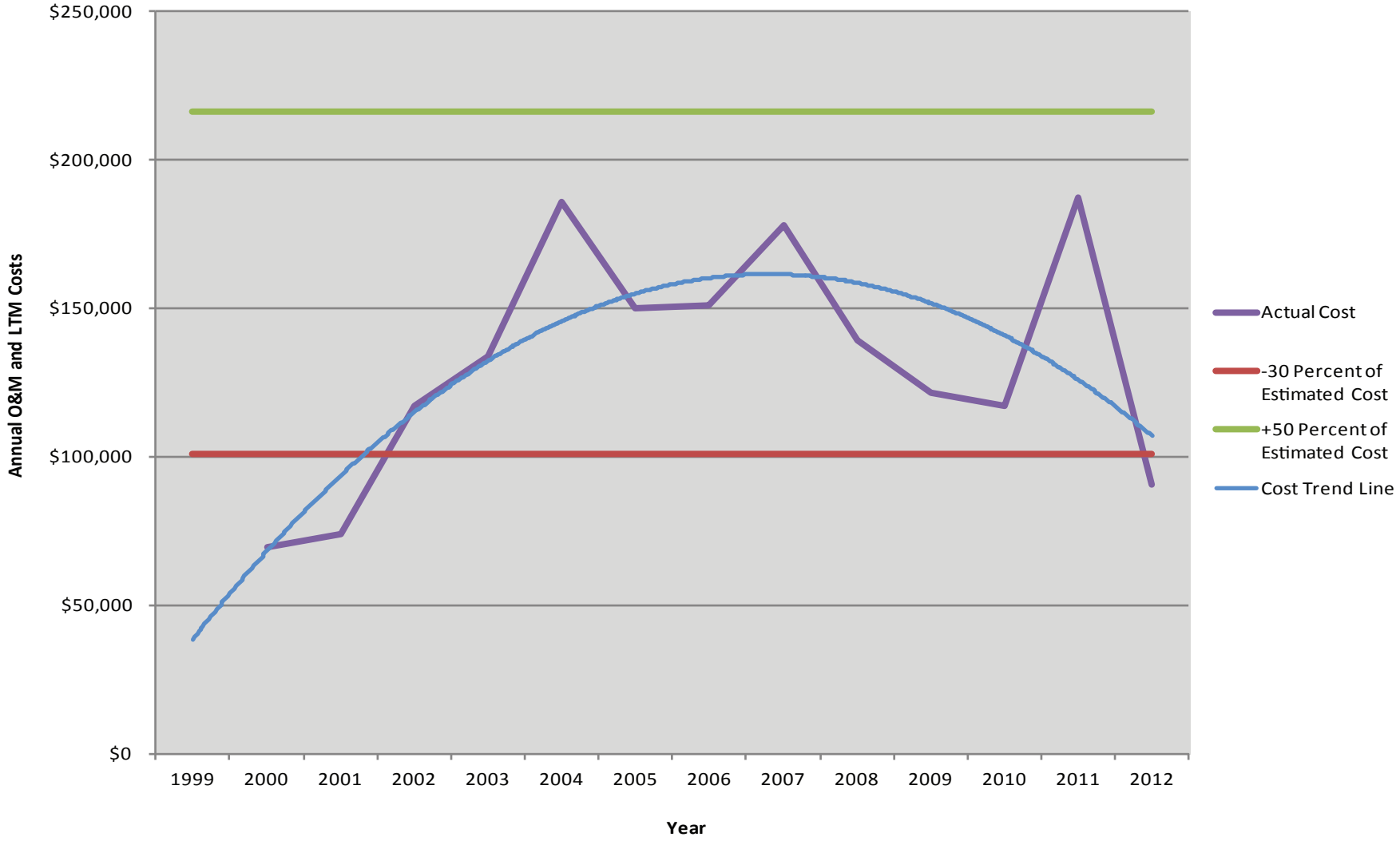


Figure 6-7
Annual O&M and LTM Costs
5 Year ROD Review Report
Allegany Ballistics Laboratory
Rocket Center, West Virginia

SECTION 7

Sites 11 (Operable Unit 11) and 12 (Operable Unit 8)

This section provides an overview of the history and RA effectiveness for Sites 11 (OU-11) and 12 (OU-8).

7.1 Site Chronology

Date	Event
1995	Advanced Site Inspection at Site 11 (CH2M HILL, 1996d)
1996	Phase I Investigation at Site 12 (CH2M HILL, 2001)
2000	Phase II Investigation at Site 12 (CH2M HILL, 2005c)
2002 – 2003	Phase III Investigation at Site 12 (CH2M HILL, 2003b)
2005	Soil Removal Action at Site 12 (CH2M HILL, 2004c)
January 2005	Site 11 RI (CH2M HILL 2005f)
June 2008	Site 12 RI (CH2M HILL, 2008b)
January 2010	FS for Sites 11 and 12 (CH2M HILL, 2010a)
January 2011	PRAP for Sites 11 and 12 (NAVFAC, 2011)
January 4, 2012	ROD for Sites 11 and 12 signed. (Navy, 2011)

7.2 Background

7.2.1 Sites 11 and 12 Description and History

Site 11

Site 11, Former Production Well "F" (OU 11), formerly consisted of a boiler house (Building 215), fuel oil storage area, and a deep bedrock production well known as F-Well (**Figure 7-1**). The original boiler house, built in the late 1950s, was approximately 1,000 square feet in area and housed a single boiler unit. In 1961, F-Well was installed adjacent to Building 215 to provide potable water to Plant 1 and boiler water to Building 215. Following its installation, attempts to develop F-Well were unsuccessful due to sand flowing into the well through fractures in the bedrock. Because the sand prevented pump operation in the well, F-Well was not put into operation; however, it was not properly abandoned. In 1962, the boiler house was renovated, which doubled the size and the number of boilers. During this expansion, F-Well was covered by the larger building footprint.

An oil pit was located within the perimeter of a 2.5-foot-high concrete containment barrier, which contained the aboveground storage tank (AST) area within an 18- by 42-foot area (dike area). The oil pit was constructed of a 55-gallon drum (former SWMU 24U) used for collecting waste fuel oil from the oil-water separator (SWMU 34) in the boiler room. The drum was a fully enclosed structure buried up to its neck with a concrete floor surface. Facility representatives stated that the unit may have served as a transfer hose drip catchment. It has been reported that although oil was discharged to the pit during operation of the boiler house, no oil was ever pumped from the pit (Navy, 2011).

The Advanced Site Inspection was conducted in 1995 to characterize groundwater contamination associated with F-Well and potential soil and groundwater contamination associated with the oil pit. Six temporary piezometers and nine deep soil borings were installed and sampled to characterize soil and groundwater. Several VOCs and SVOCs were detected in soil above the risk-based concentrations (RBCs) in the vicinity of Site 11, mostly near the estimated location of the former oil pit. Several VOCs, including PCE, TCE, 1,2-DCE, and VC, were detected in alluvial groundwater.

Two downhole video camera surveys and overdrilling techniques were used to investigate F-Well. During the second downhole survey, a 1-foot-thick layer of light non-aqueous phase liquid (LNAPL) was observed. Subsequently, three potential water bearing fractures at 32 feet bgs, 81 to 83 feet bgs, and 129 feet bgs were identified. The camera also encountered what is believed to have been a DNAPL at 172 feet bgs. The well was purged and sampled, indicating VOCs and SVOCs were present in both the LNAPL and DNAPL (CH2M HILL, 1996d).

An RI was conducted from 1998 to 2001 at Site 11 to characterize the site and evaluate the potential risk to human health and the environment from site media. Surface soil and groundwater samples were collected to further delineate the nature and extent of contamination. Seven monitoring wells were installed to assess the groundwater contamination associated with the source areas identified in the Advanced Site Inspection. In addition, the six temporary piezometers installed during the Advanced Site Inspection were modified to become permanent alluvial monitoring wells. With the use of downhole video inspection and overdrilling techniques the assumed original depth of F-Well was reached at 350 feet bgs. LNAPL and/or DNAPL in F-Well were removed by the overdrilling activities. Groundwater samples collected from significant water bearing zones indicated that VOCs were not present below a depth of 158 feet bgs.

Five rounds of groundwater sampling indicated that COCs were lower than anticipated and that the previous source was likely the LNAPL and DNAPL in F-Well, which had been removed while overdrilling the F-Well. Analytical results from the alluvial aquifer groundwater, the bedrock aquifer groundwater, and subsurface soil were used to evaluate the potential human health risks. Both aquifer groundwater (alluvial and bedrock) and soil had carcinogenic risks or non-carcinogenic hazards greater than the USEPA acceptable levels. The human health COCs for the alluvial groundwater are TCE, VC, iron, manganese, and thallium; the human health COC for the bedrock aquifer groundwater is arsenic. Iron was identified as a human health COC in soil; however, the detected concentrations of iron are attributable to site-specific background. A BERA was conducted to evaluate whether potential risks to ecological receptors exist as a result of exposure to Site 11 soil. The ERA concluded that negligible risks to ecological receptors are expected at the site based on the site configuration and the lack of complete and significant exposure pathways in terrestrial areas. Therefore, no remedial action for iron in soil was recommended (CH2M HILL, 2005d).

From 2009 to 2010, an FS was completed to address groundwater contamination at Site 11 and to evaluate remedial alternatives for mitigating potential hazards associated with the groundwater (CH2M HILL, 2010a).

Site 12

Site 12, Building 167 SWMUs (OU-8), serves as the preparation chamber building used mainly for the preparation of rocket casings (**Figure 7-2**). Casing preparation activities in the building include hydro-testing, grit blasting, degreasing, painting, and coating for propellant bonding. In the 1960s and 1970s, both TCE and MC were used as degreasing solvents in the building operations. The building housed a solvent recovery unit and two ASTs, with capacities between 500 and 1,000 gallons. Both ASTs were used for storage and handling of solvent that contained MC. Historical features of the building also included an unlined waste water sump (SWMU 37N) and an alodine treatment tank (SWMU 52).

Nine SWMUs were originally identified in the vicinity of what is now known as Site 12. At seven of these SWMUs (SWMUs 12, 14, 24S, 24T, 25B, 29F, and 30), it was determined that No Further Action was required. Additionally, it was determined that possible releases from SWMUs 12, 14, 24S, 24T, and 25B would be evaluated as part of the investigation of SWMU 52. Therefore, only two SWMUs (SWMUs 37N and 52), were recommended for further investigation (CH2M HILL, 1995a). SWMU 37N was an unlined wastewater sump that was connected to a grated trench from Building 167. SWMU 37N was located approximately 60 feet southeast of the southeast corner of Building 167. Historical information indicated that the sump received water from a grated trench located between the original alodine treatment tank (SWMU 12) and Building 167 Satellite Accumulation Area II (SWMU 24S). Therefore, SWMU 37N was considered to have potentially received alodine waste or products from alodine treatment operations. The original alodine treatment tank (SWMU 12) operated between 1978 and 1982; however, SWMU 52 began operation in 1991 as a replacement for SWMU 12. SWMU 52 was located approximately 10 feet south of Building 167. The replacement aboveground alodine treatment tank (SWMU 52)

was located outside on a concrete pad surrounded by exposed ground. It was also open on top and had a plastic containment structure (6 feet in diameter and 2 feet deep) below it. The Phase II Resource Conservation and Recovery Act Facility Assessment (RFA) reported evidence of a possible release from SWMU 12 at Building 167 during a 1982 inspection. The inspectors noted an area of dead vegetation that had presumably been caused by a release of waste or product (A.T. Kearney, 1993). When the alodine treatment tank (SWMU 52) was removed, no evidence of a release to soil or groundwater was observed. SWMU 52 ceased operations sometime prior to 1995 (CH2M HILL, 2008b).

In 1996, the Phase I SWMU/AOC Investigation was initiated to assess whether the site required further investigation. It was concluded that further investigation of SWMUs 37N and 52 was warranted because organic and inorganic constituents were detected above USEPA RBCs (CH2M HILL, 2001).

In 2000, the Phase II SWMU/AOC Investigation was conducted to adequately define the nature and extent of inorganic and organic constituents in surface soil and alluvial groundwater in the vicinity of SWMUs 37N and 52. During the investigation, SWMUs 37N and 52 were combined into one AOC (AOC N). Constituents were detected in the soil and groundwater at concentrations that posed an unacceptable risk to human health and the environment. Consequently, AOC N was recommended for further investigation (CH2M HILL, 2005e).

Also in 2000, during the investigation of SWMU 37N, the concrete and metal sump and some surrounding soil were excavated and removed. Soil samples collected from the excavation indicated that a potential non-cancer hazard associated with soil exposure was still present. Therefore, it was determined that additional investigations of soil were required at AOC N (CH2M HILL, 2005e).

From 2002 to 2003, the Phase III SWMU and AOC Investigation was conducted to (1) define the nature and extent of VOCs and inorganics in alluvial groundwater, (2) define the nature and extent of inorganics in soil in the southeastern portion of Site 12, and (3) define the limits of soil and groundwater contamination associated with the former SWMUs 37N and 52. Based on the soil analytical results, an NTCRA was recommended. The groundwater analytical results identified two areas of TCE contamination and one area of MC contamination in the alluvial aquifer. One area of TCE contamination was centered around Building 167; the second TCE area of contamination was centered beneath the former SWMU 37N sump location. The results also identified the limits of an area of MC contamination in groundwater that coincided with the TCE area of contamination beneath SWMU 37N. AOC N was designated as IRP Site 12 (CH2M HILL, 2003b).

Soil analytical results from Site 12 indicated that the unacceptable human health and ecological risks were associated with impacted shallow soils (less than 2 feet deep) near the locations of SWMUs 37N and 52. To address these risks, a soil removal action was performed in 2005 following an engineering evaluation and cost analysis. This action included removal of approximately 240 tons of soil from the site. Confirmatory sampling indicated that the cleanup goals were obtained and that the soil no longer posed an unacceptable risk to human or ecological receptors. Therefore, No Further Action was recommended for Site 12 soil (CH2M HILL, 2004c).

From 2003 to 2008, an RI was conducted at Site 12 to characterize groundwater and evaluate the potential risk to human health and the environment from this medium. Investigation activities included installation and sampling of 20 shallow and deep groundwater monitoring wells, downhole geophysical surveys, well packer testing, aquifer yield tests, and a dye trace study. Five rounds of groundwater sampling were also completed. In general, concentrations of TCE and MC were lower than initially anticipated and supported the conclusion that the former SWMU 37N sump was a primary source of groundwater contamination at Site 12.

Analytical results from the alluvial aquifer and bedrock groundwater were used to evaluate the potential human health risks. Both the alluvial and bedrock aquifer groundwater had carcinogenic risks or non-carcinogenic hazards greater than the USEPA acceptable levels. A BERA was conducted to evaluate whether potential risks to ecological receptors exist. The ERA concluded that negligible risks to ecological receptors are expected at the site and that no unacceptable risks or complete exposure pathways are present in terrestrial areas (CH2M HILL, 2008a).

From 2009 to 2010, an FS was completed to address groundwater contamination at Site 12 and to evaluate remedial alternatives for mitigating potential hazards associated with the groundwater (CH2M HILL, 2010a).

7.2.2 Sites 11 and 12 Physical Characteristics

Sites 11 and 12 have similar geologic and hydrogeologic characteristics because they are located adjacent to each other. Therefore, the site characteristics are discussed together. The CSM for Site 11 (**Figures 7-3**) illustrates key site features, as well as potential migration pathways for constituents that may have been released from possible source areas. The CSM also shows fill material where excavation activities have occurred. The CSM for Site 12 (**Figures 7-4**) illustrates key site features, as well as potential migration pathways for constituents that may have been released from possible source areas.

Site Geology

The geology of both sites is dominated by steeply dipping, to vertically dipping, bedrock (mainly limestone) overlain by various unconsolidated alluvial deposits from the North Branch Potomac River. The characteristics and stratigraphy of the unconsolidated deposits are similar to the alluvial deposits that are encountered across the facility.

Alluvial thickness beneath Sites 11 and 12 varies from approximately 18 to 32 feet. The alluvium consists of the following three distinct types of deposits: (1) silty clay layer of approximately 4 to 11 feet thick (surficial layer), (2) sandy clay to coarse sand approximately 0.5 to 2 feet thick (intermittent layer), and (3) poorly sorted, heterogeneous sand, gravel, pebbles, and cobbles with variable but typically significant amounts of clay and silt (basal layer). The water table is generally 13 to 15 feet bgs.

The lithology of the bedrock beneath Sites 11 and 12 was largely evaluated from observations of the structural geology of the large bedrock outcrop adjacent to the railroad tracks on the north side of the North Branch Potomac River at Pinto, Maryland. In addition, observations from downhole video camera surveys in bedrock boreholes and the application of geophysical logs were used to describe the bedrock at the sites. The Tonoloway Limestone and Wills Creek Formation can be projected directly under Sites 11 and 12. Locally, the Tonoloway Limestone appears in the outcrop as 30- to 45-foot-thick massive limestone interbedded with thin calcareous shale. The Wills Creek Formation appears in the outcrop as a massive 30-foot-thick unit composed primarily of limestone with minor amounts of thin interbedded calcareous shale.

Site Hydrogeology

Similar to the facility-wide hydrogeologic regime at ABL, the alluvium and bedrock that underlie Sites 11 and 12 form two hydrogeologic units. To better understand the distribution of contamination, the bedrock groundwater at Sites 11 and 12 has been further divided into two units—shallow bedrock aquifer and deep bedrock aquifer. The bedrock aquifer has been divided into two segments because of where the fracture zones were observed at the sites.

The alluvial aquifer at Site 11 is typically 5 feet thick, with a considerable degree of spatial variability present in the alluvial aquifer material and properties. The general direction of groundwater flow at Site 11 is westward or northwestward, toward the river. However, at times, there may be a local component of flow to the southwest. The cobble-rich strata at the base of the alluvium are the significant water bearing zones in the alluvial aquifer. However, due to bedrock mounding along the western portion of Site 11, this cobble zone, and essentially the entire alluvial aquifer, is not present in the western area.

The alluvial aquifer at Site 12 is typically approximately 16 feet thick. The general direction of groundwater flow at Site 12 is north and northwest through the alluvial aquifer, toward the river. The Site 12 potentiometric surface maps indicate localized artesian conditions, where the upward movement of groundwater in the southeast portion of the site creates a localized “mound” in the alluvial water table. The alluvial groundwater subsequently appears to flow radially outward from the “mound” generally in a north to northwest direction. The “mound” dissipates toward the margins of the site and groundwater flow likely becomes consistent with the regional flow gradient.

The groundwater flow in the bedrock aquifers at both sites is affected by the orientation and density of fractures in the bedrock. Therefore, the potentiometric surface contours may not represent the primary direction or magnitude of groundwater flow in this aquifer. For example, at Site 12, the potentiometric surface contours

suggest bedrock groundwater flows to the northwest (parallel to subordinate fractures that trend N39°W. It is more likely, however, that the migration pathway for bedrock groundwater is northeast to the North Branch Potomac River, through the prominent fracture zones that trend approximately N29ºE, located beneath the northwest portion of the site.

As with the remainder of the ABL facility, the data suggest a hydrogeologic connectivity between the alluvial and bedrock aquifers at Site 11. The data from one of the alluvial and bedrock well pairs at Site 11 suggest that the vertical gradient between the alluvium and bedrock are predominantly upward in the southeast portion of the site. Groundwater typically flows upward from deep to shallow bedrock; however, a downward component of flow is periodically observed.

Site 12 potentiometric surface maps show the largest difference in hydraulic head between the alluvial and bedrock aquifers (upward) occurs near the southeast corner of the site, with declining magnitude of difference toward the northwest. This pattern suggests an upward discharge of bedrock groundwater to the alluvial aquifer in the southeast portion of the site. Flow patterns in both the alluvial and bedrock aquifers appear to change relative to conditions observed in the southeast portion of the site. Overall, an upward flow from bedrock to the alluvial aquifer is noticeable in wells located farther to the east-southeast and a downward flow from the alluvial aquifer to bedrock in wells located farther to the west.

7.2.3 Land and Resource Uses

Currently, land use at Sites 11 and 12 and the surrounding area is primarily industrial. There are occupied and unoccupied buildings surrounding Sites 11 and 12. The Navy anticipates that this area will remain under Navy ownership and will continue to be used as part of the industrial facility for the foreseeable future. The alluvial and bedrock groundwater are currently not an active groundwater resource and are not anticipated to be used as a source of drinking water at ABL. LUCs are currently maintained within the area of restricted groundwater use at Sites 11 and 12. The LUCs restrict land use and exposure to groundwater until concentrations of VOCs are reduced to levels that allow for unlimited use and unrestricted exposure. The ROD for Sites 11 and 12 included No Further Action for soil, and, therefore, no LUCs were required for soil (Navy, 2011).

The land surrounding ABL consists of undeveloped mountainous woodland to the south and east and several residences and farmland across the North Branch Potomac River to the north and west. No perennial surface water bodies exist at Sites 11 and 12. The closest surface water body is the North Branch Potomac River with the closest point approximately 500 feet west northwest of Sites 11 and 12. The closest potable groundwater production wells to Sites 11 and 12 are more than a mile to the southwest.

7.2.4 History of Contamination

Site 11

Two former source areas contributed contamination to soil and groundwater at Site 11. One former source area was the oil pit, where the release of petroleum hydrocarbons was associated with oil disposed in the pit. This source was removed as part of a soil removal action in 1994. The second former source area was the F-Well, where non-aqueous phase liquid that contained chlorinated VOCs and total petroleum hydrocarbon compounds existed. It is believed that this source was removed when F-Well was overdrilled and redeveloped in 1999. No significant continuing source was identified during the RI (CH2M HILL, 2005d).

Results of the HHRA, completed under the Site 11 RI, indicate potential future risks for child residents, adult residents, and construction workers in alluvial groundwater, bedrock groundwater, and soil. The only risk driver for soil was iron; however, the detected concentrations of iron are attributable to site-specific background concentrations. Therefore, soil at Site 11 requires No Further Action. TCE, VC, iron, manganese, and thallium were identified as risk drivers for alluvial groundwater. A risk was associated with future child resident exposure to arsenic in bedrock groundwater. Because there are no wetlands or complete terrestrial exposure pathways present at the site, ecological risks at Site 11 are negligible.

Site 12

In the 1960s and 1970s, both TCE and MC were used as degreasing solvents in the building operations at Site 12. The building housed a solvent recovery unit and two ASTs, with capacities between 500 and 1,000 gallons. Both ASTs were used for storage and handling of solvent that contained MC. The Phase II RFA reported evidence of a possible release from SWMU 12 at Building 167 during a 1982 inspection. The inspectors noted an area of dead vegetation that had presumably been caused by a release of waste or product.

Results of the HHRA, completed under the Site 12 RI, indicate potential future risks for child residents and adult residents in alluvial groundwater and bedrock groundwater. 1,2-Dibromo-3-chloropropane (DBCP), VC, arsenic, manganese, and thallium were identified as risk drivers for alluvial groundwater. Arsenic, chromium, manganese, and thallium were identified as risk drivers in bedrock groundwater. Because there are no complete exposure pathways in terrestrial areas and no unacceptable risks associated with drainage ditch sediments, ecological risks at Site 12 are negligible.

7.2.5 Initial Response

At Site 11, the boiler house was decommissioned in the late-1980s, including removal of the boilers and two ASTs. In 1994, the AST pad, oil pit, dike wall, and all soil within the confines of the diked area were removed, and the well casing for F-Well was revealed. After soil sampling revealed that soil was impacted by petroleum hydrocarbons, a total of 3,000 to 4,500 cubic feet of soil in the fuel storage area was removed to meet cleanup requirements. Following soil removal, Building 421 was constructed adjacent to F-Well, and an asphalt parking lot was constructed around F-Well and over the former diked fuel storage area and former oil pit. To further investigate F-Well, two downhole video camera surveys were used, both LNAPL and DNAPL were encountered within F-Well. Following additional investigation and delineation activities, LNAPL and/or DNAPL in F-Well were removed by the overdrilling. Groundwater samples collected from significant water bearing zones indicated that VOCs were not present below a depth of 158 feet bgs (CH2M HILL, 2005d).

Nine SWMUs were originally identified in the vicinity of what is now known as Site 12. At seven of these SWMUs it was determined that No Further Action was required. Additionally, it was determined that possible releases from SWMUs 12, 14, 24S, 24T, and 25B would be evaluated as part of the investigation of SWMU 52. Therefore, only two SWMUs (SWMUs 37N and 52) were recommended for further investigation (CH2M HILL, 1995a).

In 1996, the Phase I SWMU and AOC Investigation was initiated to assess whether the site required further investigation. It was concluded that further investigation of SWMUs 37N and 52 was warranted. In 2000, the Phase II SWMU and AOC Investigation was conducted to adequately define the nature and extent of inorganic and organic constituents in surface soil and alluvial groundwater in the vicinity of SWMUs 37N and 52. During the investigation, SWMUs 37N and 52 were combined into one AOC (AOC N). Constituents were detected in the soil and groundwater at concentrations that posed an unacceptable risk to human health and the environment. Consequently, AOC N was recommended for further investigation (CH2M HILL, 2005e).

Also in 2000, during the investigation of SWMU 37N, the concrete and metal sump and some surrounding soil were excavated and removed. Soil samples collected from the excavation indicated that a potential non-cancer hazard associated with soil exposure was still present. Therefore, it was determined that additional investigations of soil were required at AOC N (CH2M HILL, 2005e).

From 2002 to 2003, the Phase III SWMU and AOC Investigation was conducted, based on the soil analytical results, and an NTCRA was recommended. Also during this investigation, AOC N was designated as IRP Site 12 (CH2M HILL, 2003b).

7.2.6 Basis for Remedial Action

The Site 11 alluvial groundwater COCs consist of PCE, TCE, VC, total antimony, total barium, total chromium, dissolved iron, dissolved and total manganese, and dissolved and total thallium. The Site 11 bedrock groundwater COCs consist of TCE and dissolved and total arsenic. The Site 12 alluvial groundwater COCs consist of DBCP, MC, TCE, VC, dissolved arsenic, dissolved manganese, and dissolved thallium. The Site 12 bedrock groundwater COCs consist of MC, TCE, bis(2-ethylhexyl)phthalate, total arsenic, total chromium, total lead, total manganese, and

dissolved and total thallium. VOCs present in groundwater are a result of historical activities conducted at Sites 11 and 12. COCs in groundwater were selected based on HHRA screening and comparison with USEPA Safe Drinking Water Act MCLs (Navy, 2011).

7.3 Remedial Actions

7.3.1 Remedy Selection

The ROD for Sites 11 (OU-11) and 12 (OU-8) was signed on January 4, 2012 (Navy, 2011). This report summarized the risks to human health, established RAOs, and defined the selected remedy. The site-specific RAOs were originally developed in the FS (CH2M HILL, 2010a); however, these RAOs were updated based on regulatory comments. The RAOs for groundwater at Sites 11 and 12, as stated in the PRAP (NAVFAC, 2011) and ROD (Navy, 2011) include the following:

- Prevent human exposure to groundwater containing COCs above site remediation goals (SRGs)
- Reduce concentrations of COCs to meet SRGs in groundwater in order to remediate the targeted aquifer to drinking water quality within 36 years

To achieve these RAOs, the selected remedy consists of the following major components:

- Focused enhanced anaerobic biodegradation for actively treating alluvial and bedrock aquifers where the highest concentrations of TCE and MC are detected.
- Monitored Natural Attenuation for all COCs not targeted for direct remediation
- Institutional Controls in the form of excavation restrictions and prohibition of potable groundwater use.
- Long-Term Monitoring to assess changes in water quality

The site risk analysis resulted in the following COCs being targeted for direct remediation:

- Site 11 alluvial aquifer: TCE and VC
- Site 11 bedrock aquifer: TCE
- Site 12 alluvial aquifer: TCE
- Site 12 bedrock aquifer: MC

The SRGs for these COCs are presented in **Table 7-1**. The SRGs for TCE, VC, and MC are based on their respective federal MCLs for drinking water.

While groundwater concentrations are above SRGs, the ROD requires Sites 11 and 12 be designated as “restricted use” areas.

In addition to cleanup levels for groundwater, performance standards and expected outcomes for evaluating the overall performance of the remedy were established in the ROD and are summarized later in this document in **Tables 7-2** and **7-3**.

TABLE 7-1
Sites 11 and 12 Site Remediation Goals
Allegany Ballistics Laboratory

Contaminants Targeted for Direct Remediation	SRG (µg/L)
Site 11	
TCE	5
VC	2
Site 12	
TCE	5
MC	5

7.3.2 Remedy Implementation

In June 2012, groundwater sampling was completed to assess the current site conditions and achieve an understanding of the current site plume configurations, contaminant concentrations, and existing geochemical properties prior to remedy implementation. **Figures 7-5**, **7-6**, and **7-7** show the historical TCE plume, historical VC plume and current TCE plume for the alluvial aquifer for Sites 11 and 12. VC was not detected during the most-recent round of sampling. **Figure 7-8** shows the historical TCE plume and **Figure 7-9** shows the historical MC plume in the bedrock aquifer. During the most-recent round of sampling, MC was not detected. TCE was detected; however, concentrations were below SRGs. Six existing monitoring wells (three bedrock and three alluvial) were initially targeted as injection points based on the highest concentrations of TCE and MC in groundwater from data collected in 2007. However, the results of the groundwater sampling completed in June 2012 demonstrate a reduction in concentrations of TCE and MC. TCE and MC concentrations in the bedrock aquifer at both Sites 11 and 12 are below the SRGs. Therefore, the Navy, with concurrence from USEPA and WVDEP, determined injection of enhanced reductive dechlorination (ERD) substrate into bedrock groundwater was not necessary during the initial implementation of the remediation action. In November 2012, injection of ERD occurred in alluvial aquifer monitoring wells 11GW06, 11GW15, and 12MW18. Alluvial and bedrock groundwater monitoring will be conducted during the first year of post injection performance monitoring. Following review of bedrock groundwater monitoring data, the Navy, USEPA, and WVDEP will evaluate if injection of ERD substrate is necessary in the bedrock aquifer.

Groundwater use controls will prevent potable use of untreated groundwater and excavation restrictions will ensure that adequate worker protection is used if excavation activities encounter groundwater in the affected area. The restricted use designation will remain in place until groundwater monitoring indicates that SRGs have been met and contaminants at the site are at levels that do not present a risk for unlimited use and unrestricted exposure at the site.

7.4 Progress Since Last Five-Year Review

The ROD was signed in January 2012 and this is the First Five-Year Review for Sites 11 and 12.

7.4.1 Summary of the Estimated Remedy Costs

The capital cost of the selected remedy and 1 year of performance monitoring is estimated to be $200,000 (CH2M HILL, 2010a). This cost includes the implementation of groundwater use restrictions as part of the ICs and drilling of new groundwater monitoring wells, submitting the LTM UFP-SAP, and introducing ERD substrate via a one-time process. O&M activities under the selected remedy were mostly associated with post-injection monitoring and MNA. Periodic costs associated under the selected remedy are primarily associated with the Five-Year Reviews. The total present-worth cost of this alternative is approximately $975,500.

For this Five-Year Review period (2008 to 2012), total O&M and LTM costs have not been recognized as of yet.

7.5 Technical Assessment

7.5.1 Question A – Is the remedy functioning as intended by the ROD?

Injection of Enhanced Anaerobic Bioremediation (EAB) was completed in November 2012. However, post-injection performance monitoring data have not been collected and evaluated at the time of this Five-Year Review.

7.5.2 Question B – Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?

Physical conditions of Sites 11 and 12 have not changed since the signature of the ROD. The RAOs developed in 2012 remain protective, with the exception of potential vapor intrusion into buildings at the sites. It is anticipated that the vapor intrusion assessment at Sites 11 and 12 will be completed by December 2014; at which time a protectiveness determination will be made.

7.5.3 Question C – Has any other information come to light that could question the protectiveness of the remedy?

No new information has come to light that would question the protectiveness of the remedy.

7.6 Issues and Recommendations

Issues and recommendations for Sites 11 and 12 are identified in **Table 7-4**, as follows. None of the issues or recommendations have been determined to affect the protectiveness of the remedy under current or future conditions.

TABLE 7-4
Issues, Recommendations, and Follow-up Actions for Sites 11 and 12
Allegany Ballistics Laboratory

Issue	Recommendations and Follow-up Actions	Party Responsible	Milestone Date	Effects Protectiveness? Y/N	
				Current	Future
The vapor intrusion pathway was not evaluated as part of the RI/FS for this site.	Basewide vapor intrusion evaluation currently underway	Navy USEPA WVDEP	December 2014	Y*	Y*

*Determination of complete exposure pathway for vapor intrusion is unknown; therefore, protectiveness cannot be determined and is currently deferred.

7.7 Protectiveness Statement

A protectiveness determination of the remedy at Sites 11 and 12 cannot be made at this time until further information regarding the vapor intrusion pathway is obtained. All other exposure pathways that could result in an unacceptable risk will be addressed through the ICs (such as excavation restrictions, groundwater use restrictions, and LTM of groundwater). It is expected that the vapor intrusion assessment will be completed by December 2014, at which time a protectiveness determination will be made.

TABLE 7-2

Expected Outcomes for Site 11 (OU-11)

Five Year ROD Review

Allegany Ballistics Laboratory

Rocket Center, West Virginia

Risk		COC Requiring Action	Basis for Action	RAO	Remedy Component	Exit Strategy	Performance Metric/Clean-up Level	Expected Outcomes
Human Health	**Ecological**							
Alluvial Groundwater								
A future adult, child, and age-adjusted resident[1] and construction worker exposed to Site 11 alluvial aquifer groundwater	No exposure pathway.	TCE, VC, dissolved iron, total manganese, dissolved manganese, dissolved thallium, and PCE	The ingestion pathway for the adult, child, and age-adjusted resident exposed to Site 11 alluvial aquifer groundwater exceeds USEPA acceptable risk levels, primarily associated with TCE, iron, manganese, thallium, VC, and PCE. The dermal pathway for the construction worker exposed to Site 11 alluvial aquifer groundwater exceeds USEPA acceptable risk levels, mainly due to the manganese in the groundwater.	Prevent human exposure to groundwater containing COCs above site remediation goals (SRGs).	ICs in the form of excavation restrictions to require adequate worker protection if excavation activities encounter groundwater at Site 11, and a prohibition of potable groundwater use at Sites 11 and 12, and a long-term groundwater monitoring program to assess changes in water quality.	Enforce ICs until each groundwater COC is at or below its cleanup level.	Compliance with LUCs	Removal of groundwater LUCs
				Reduce concentrations of COCs to meet SRGs in groundwater in order to remediate the targeted aquifer to drinking water quality within 36 years.	Conduct Focused Enhanced Anaerobic Biodegradation for actively treating groundwater within the alluvial aquifer where the highest concentrations of TCE and MC are detected. MNA for all COCs not targeted for direct remediation.	Conduct groundwater LTM until each COC is at or below its cleanup level.	Site Remediational Goals	
No risk identified		Total antimony, total barium, total chromium, and total thallium	Exceeded Federal MCLs.	Prevent human exposure to groundwater containing COCs above site remediation goals (SRGs).	ICs in the form of excavation restrictions to require adequate worker protection if excavation activities encounter groundwater at Site 11, and a prohibition of potable groundwater use at Sites 11 and 12, and a long-term groundwater monitoring program to assess changes in water quality.	Enforce ICs until each groundwater COC is at or below its cleanup level.	Compliance with LUCs	
				Reduce concentrations of COCs to meet SRGs in groundwater in order to remediate the targeted aquifer to drinking water quality within 36 years.	Conduct Focused Enhanced Anaerobic Biodegradation for actively treating groundwater within the alluvial aquifer where the highest concentrations of TCE and MC are detected. MNA for all COCs not targeted for direct remediation.	Conduct groundwater LTM until each COC is at or below its cleanup level.	Site Remediational Goals	
Bedrock Groundwater								
A future child and age-adjusted resident exposed to Site 11 bedrock aquifer groundwater	No exposure pathway.	Dissolved arsenic	The ingestion pathway for the child and age-adjusted resident exposed to Site 11 bedrock aquifer groundwater also exceeds the USEPA acceptable risk levels, primarily associated with arsenic.	Prevent human exposure to groundwater containing COCs above site remediation goals (SRGs).	ICs in the form of excavation restrictions to require adequate worker protection if excavation activities encounter groundwater at Site 11, and a prohibition of potable groundwater use at Sites 11 and 12, and a long-term groundwater monitoring program to assess changes in water quality.	Enforce ICs until each groundwater COC is at or below its cleanup level.	Compliance with LUCs	Removal of groundwater LUCs
				Reduce concentrations of COCs to meet SRGs in groundwater in order to remediate the targeted aquifer to drinking water quality within 36 years.	Conduct Focused Enhanced Anaerobic Biodegradation for actively treating groundwater within the alluvial aquifer where the highest concentrations of TCE and MC are detected. MNA for all COCs not targeted for direct remediation.	Conduct groundwater LTM until each COC is at or below its cleanup level.	Site Remediational Goals	
No risk identified		TCE and total arsenic	Exceeded Federal MCLs.	Prevent human exposure to groundwater containing COCs above site remediation goals (SRGs).	ICs in the form of excavation restrictions to require adequate worker protection if excavation activities encounter groundwater at Site 11, and a prohibition of potable groundwater use at Sites 11 and 12, and a long-term groundwater monitoring program to assess changes in water quality.	Enforce ICs until each groundwater COC is at or below its cleanup level.	Compliance with LUCs	
				Reduce concentrations of COCs to meet SRGs in groundwater in order to remediate the targeted aquifer to drinking water quality within 36 years.	Conduct Focused Enhanced Anaerobic Biodegradation for actively treating groundwater within the alluvial aquifer where the highest concentrations of TCE and MC are detected. MNA for all COCs not targeted for direct remediation.	Conduct groundwater LTM until each COC is at or below its cleanup level.	Site Remediational Goals	

[1]Carcinogenic risks were calculated for an age-adjusted resident to incorporate the different contact rates (ingestion, dermal contact, etc.) of exposure during the first 30 years of life. The age-adjusted exposures were calculated using age-adjusted factors that combine exposure factors for small children (0-6 years) and adults (for a total of 24 years).

TABLE 7-3

Expected Outcomes for Site 12 (OU-8)

Five Year ROD Review

Allegany Ballistics Laboratory

Rocket Center, West Virginia

Risk		COC Requiring Action	Basis for Action	RAO	Remedy Component	Exit Strategy	Performance Metric/Clean-up Level	Expected Outcomes
Human Health	**Ecological**							
				Alluvial Groundwater				
A future adult, child, and age-adjusted resident[1] exposed to Site 12 alluvial aquifer groundwater	No exposure pathway.	VC, 1,2-dibromo-3-chloropropane, dissolved arsenic, dissolved manganese, and dissolved thallium	The ingestion and inhalation pathway for the adult resident exposed to Site 12 alluvial aquifer groundwater exceeds USEPA's acceptable risk levels, primarily associated with manganese, thallium, and 1,2-dibromo-3-chloropropane. The ingestion and dermal pathway for the child resident exposed to Site 12 alluvial aquifer groundwater exceeds the USEPA acceptable risk levels, mainly due to 1,2-dibromo-3-chloropropane, arsenic, manganese, and thallium. The ingestion pathway for the age-adjusted resident exposed to Site 12 alluvial aquifer groundwater also exceeds the USEPA acceptable risk levels associated with arsenic, 1,2-dibromo-3-chloropropane, and VC.	Prevent human exposure to groundwater containing COCs above site remediation goals (SRGs).	ICs in the form of excavation restrictions to require adequate worker protection if excavation activities encounter groundwater at Site 11, and a prohibition of potable groundwater use at Sites 11 and 12, and a long-term groundwater monitoring program to assess changes in water quality.	Enforce ICs until each groundwater COC is at or below its cleanup level.	Compliance with LUCs	Removal of groundwater LUCs
				Reduce concentrations of COCs to meet SRGs in groundwater in order to remediate the targeted aquifer to drinking water quality within 36 years.	Conduct Focused Enhanced Anaerobic Biodegradation for actively treating groundwater within the alluvial aquifer where the highest concentrations of TCE and MC are detected. MNA for all COCs not targeted for direct remediation.	Conduct groundwater LTM until each COC is at or below its cleanup level.	Site Remediational Goals	
No risk identified		MC and TCE	Exceeded Federal MCLs.	Prevent human exposure to groundwater containing COCs above site remediation goals (SRGs).	ICs in the form of excavation restrictions to require adequate worker protection if excavation activities encounter groundwater at Site 11, and a prohibition of potable groundwater use at Sites 11 and 12, and a long-term groundwater monitoring program to assess changes in water quality.	Enforce ICs until each groundwater COC is at or below its cleanup level.	Compliance with LUCs	
				Reduce concentrations of COCs to meet SRGs in groundwater in order to remediate the targeted aquifer to drinking water quality within 36 years.	Conduct Focused Enhanced Anaerobic Biodegradation for actively treating groundwater within the alluvial aquifer where the highest concentrations of TCE and MC are detected. MNA for all COCs not targeted for direct remediation.	Conduct groundwater LTM until each COC is at or below its cleanup level.	Site Remediational Goals	
				Bedrock Groundwater				
A future adult, child, and age-adjusted resident exposed to Site 12 bedrock aquifer groundwater.	No exposure pathway.	Total arsenic, total chromium, total manganese, and total thallium	The ingestion and dermal (for child only) pathways for the adult, child, and age adjusted resident exposed to Site 12 bedrock aquifer groundwater exceed the USEPA acceptable risk levels, associated with arsenic, chromium, manganese, and thallium.	Prevent human exposure to groundwater containing COCs above site remediation goals (SRGs).	ICs in the form of excavation restrictions to require adequate worker protection if excavation activities encounter groundwater at Site 11, and a prohibition of potable groundwater use at Sites 11 and 12, and a long-term groundwater monitoring program to assess changes in water quality.	Enforce ICs until each groundwater COC is at or below its cleanup level.	Compliance with LUCs	Removal of groundwater LUCs
				Reduce concentrations of COCs to meet SRGs in groundwater in order to remediate the targeted aquifer to drinking water quality within 36 years.	Conduct Focused Enhanced Anaerobic Biodegradation for actively treating groundwater within the alluvial aquifer where the highest concentrations of TCE and MC are detected. MNA for all COCs not targeted for direct remediation.	Conduct groundwater LTM until each COC is at or below its cleanup level.	Site Remediational Goals	
No risk identified		MC, TCE, bis(2-ethylhexyl)phthalate, total lead, and dissolved thallium	Exceeded Federal MCLs.	Prevent human exposure to groundwater containing COCs above site remediation goals (SRGs).	ICs in the form of excavation restrictions to require adequate worker protection if excavation activities encounter groundwater at Site 11, and a prohibition of potable groundwater use at Sites 11 and 12, and a long-term groundwater monitoring program to assess changes in water quality.	Enforce ICs until each groundwater COC is at or below its cleanup level.	Compliance with LUCs	
				Reduce concentrations of COCs to meet SRGs in groundwater in order to remediate the targeted aquifer to drinking water quality within 36 years.	Conduct Focused Enhanced Anaerobic Biodegradation for actively treating groundwater within the alluvial aquifer where the highest concentrations of TCE and MC are detected. MNA for all COCs not targeted for direct remediation.	Conduct groundwater LTM until each COC is at or below its cleanup level.	Site Remediational Goals	

[1]Carcinogenic risks were calculated for an age-adjusted resident to incorporate the different contact rates (ingestion, dermal contact, etc.) of exposure during the first 30 years of life. The age-adjusted exposures were calculated using age-adjusted factors that combine exposure factors for small children (0-6 years) and adults (for a total of 24 years).

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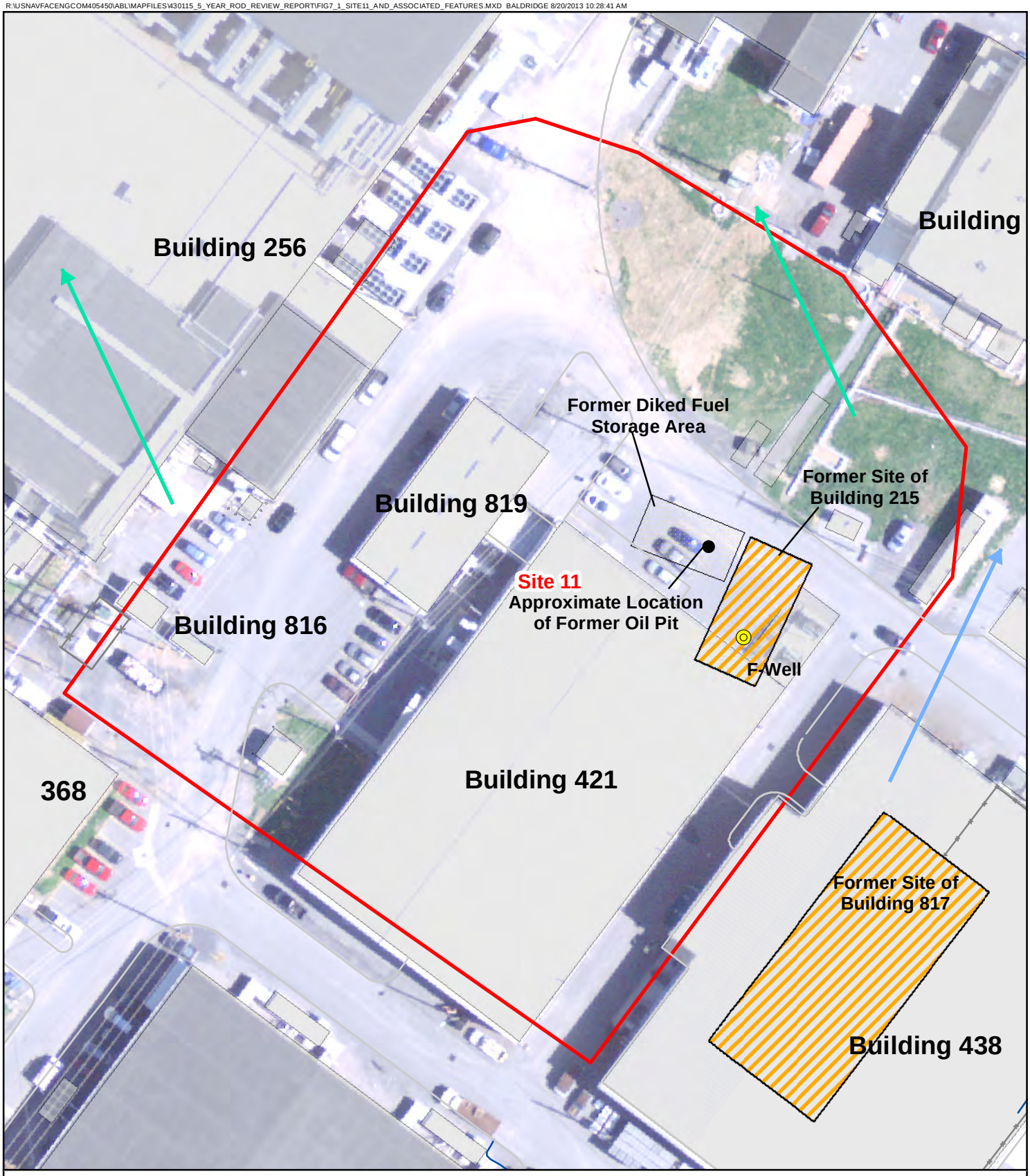

Legend

- Road
- Former Oil Pit
- Former Production Well
- IR Site
- Former Buildings
- Approximate Location of Former Diked Fuel Storage Area
- Buildings
- Alluvial Groundwater Flow
- Bedrock Groundwater Flow

N

0 30 60 Feet

1 inch = 60 feet

Figure 7-1
Site 11 and Associated Features
5 Year ROD Review Report
Allegany Ballistics Laboratory
Rocket Center, West Virginia

CH2MHILL

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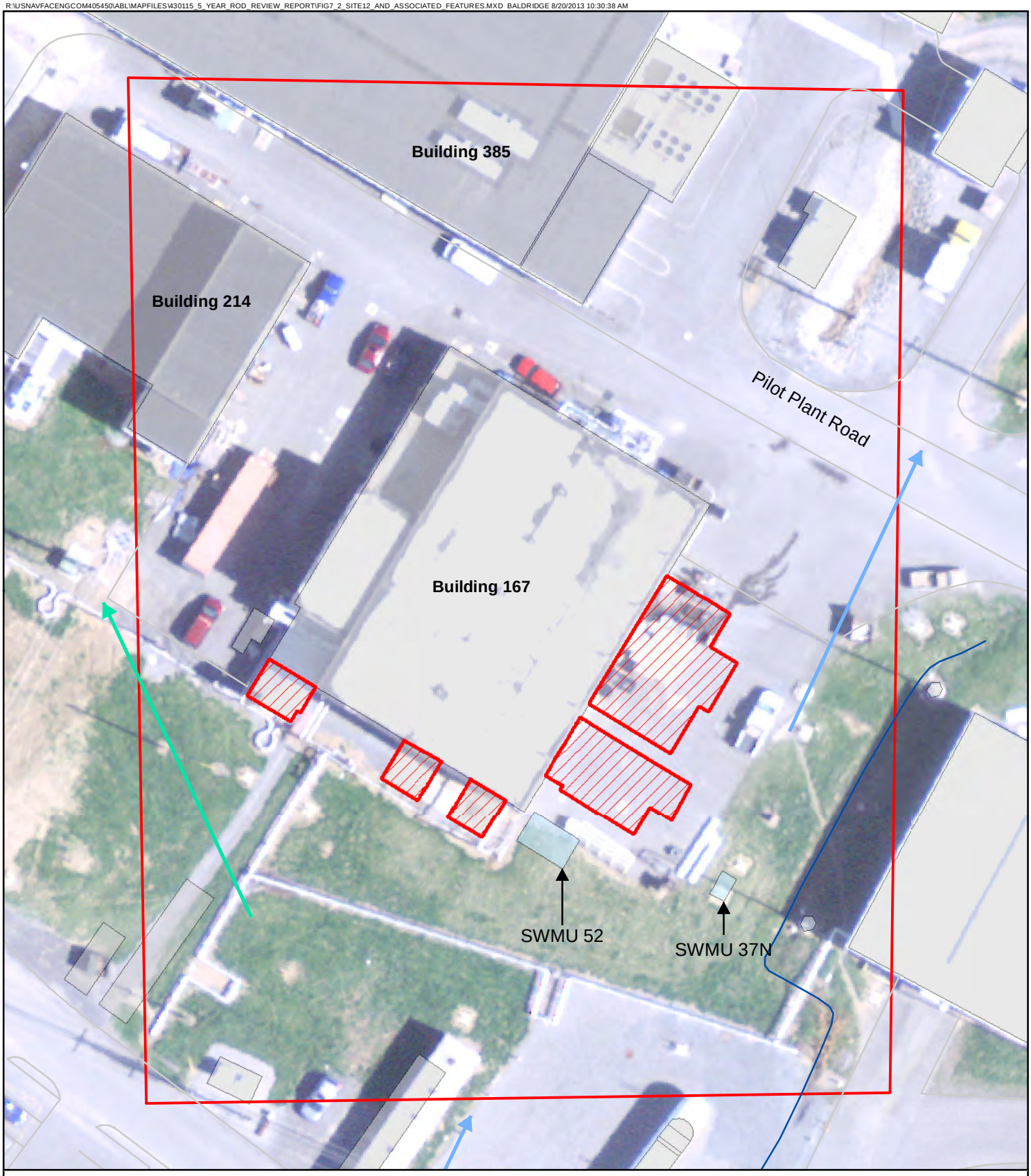


Legend

- Alluvial Groundwater Flow
- Bedrock Groundwater Flow
- Streams and Drainage Ditches
- Road
- Site Boundary
- Former Building 167 Configuration
- SWMU Boundary
- Buildings

N

0 20 40 Feet

1 inch = 40 feet

Figure 7-2
Site 12 and Associated Features
5 Year ROD Review Report
Allegany Ballistics Laboratory
Rocket Center, West Virginia

CH2MHILL

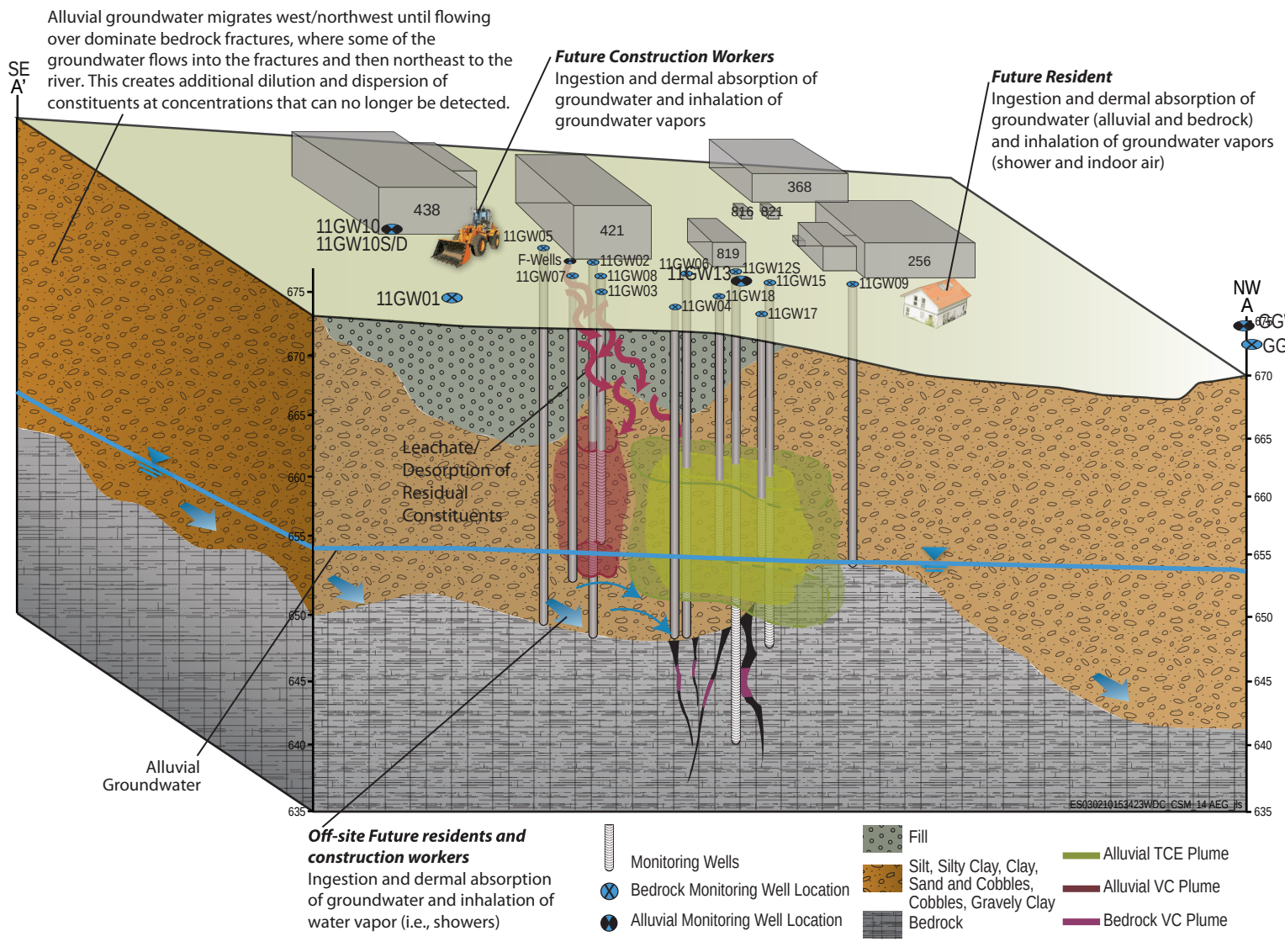
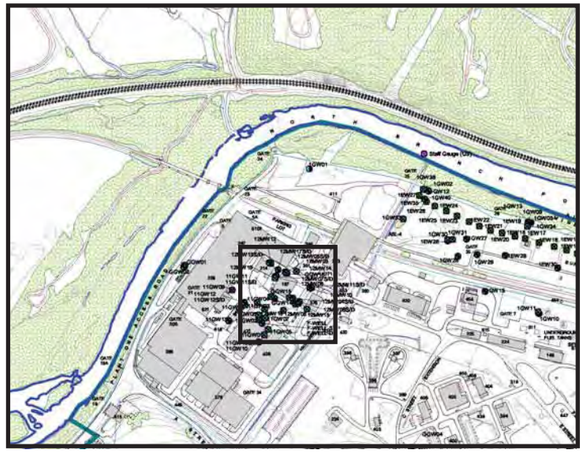


Figure 7-3
Site 11 Conceptual Site Model
5 Year ROD Review Report
Allegany Ballistics Laboratory
Rocket Center, West Virginia



Key Plan

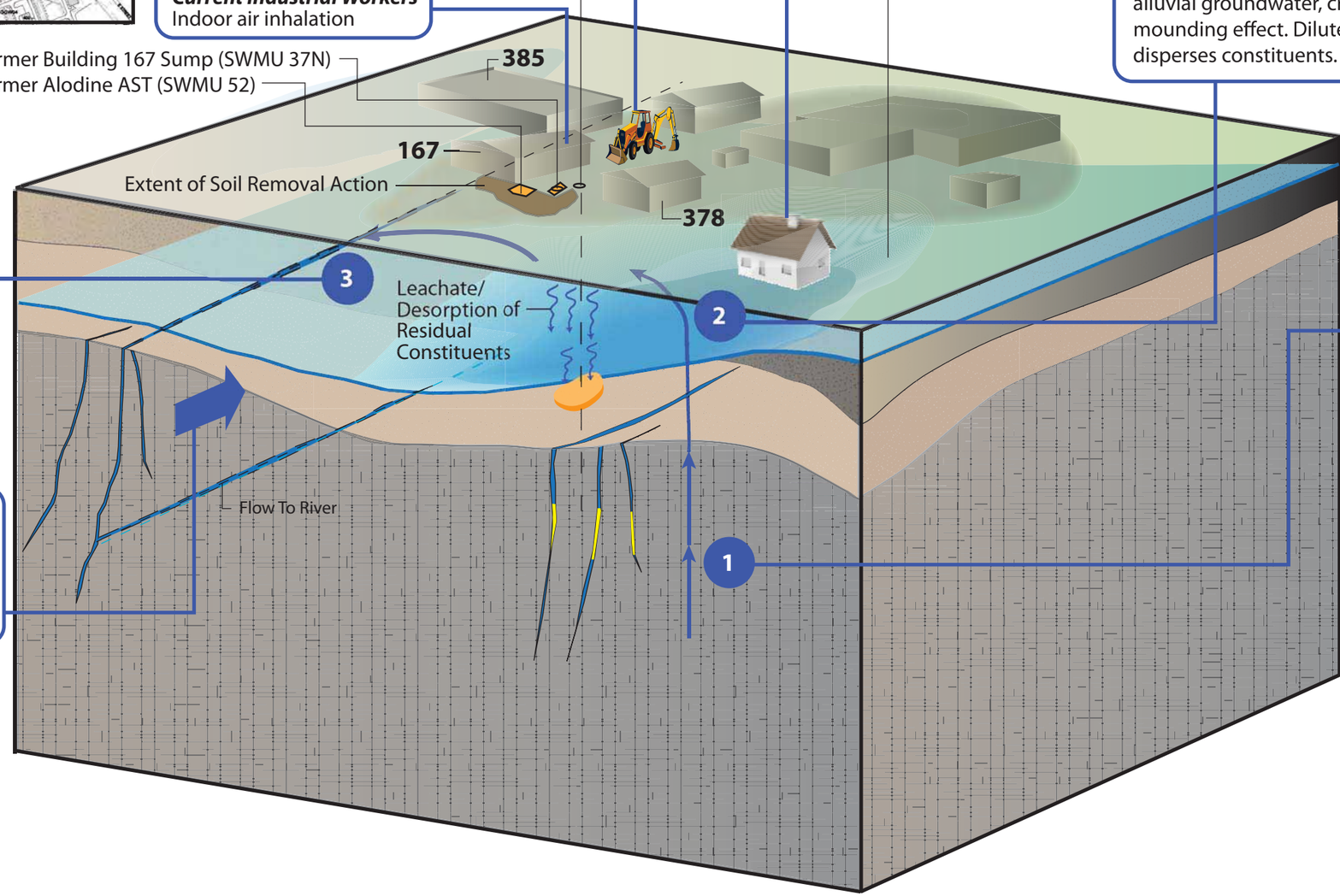


Figure 7-4
Site 12 Conceptual Site Model
5 Year ROD Review Report
Allegany Ballistics Laboratory
Rocket Center, West Virginia

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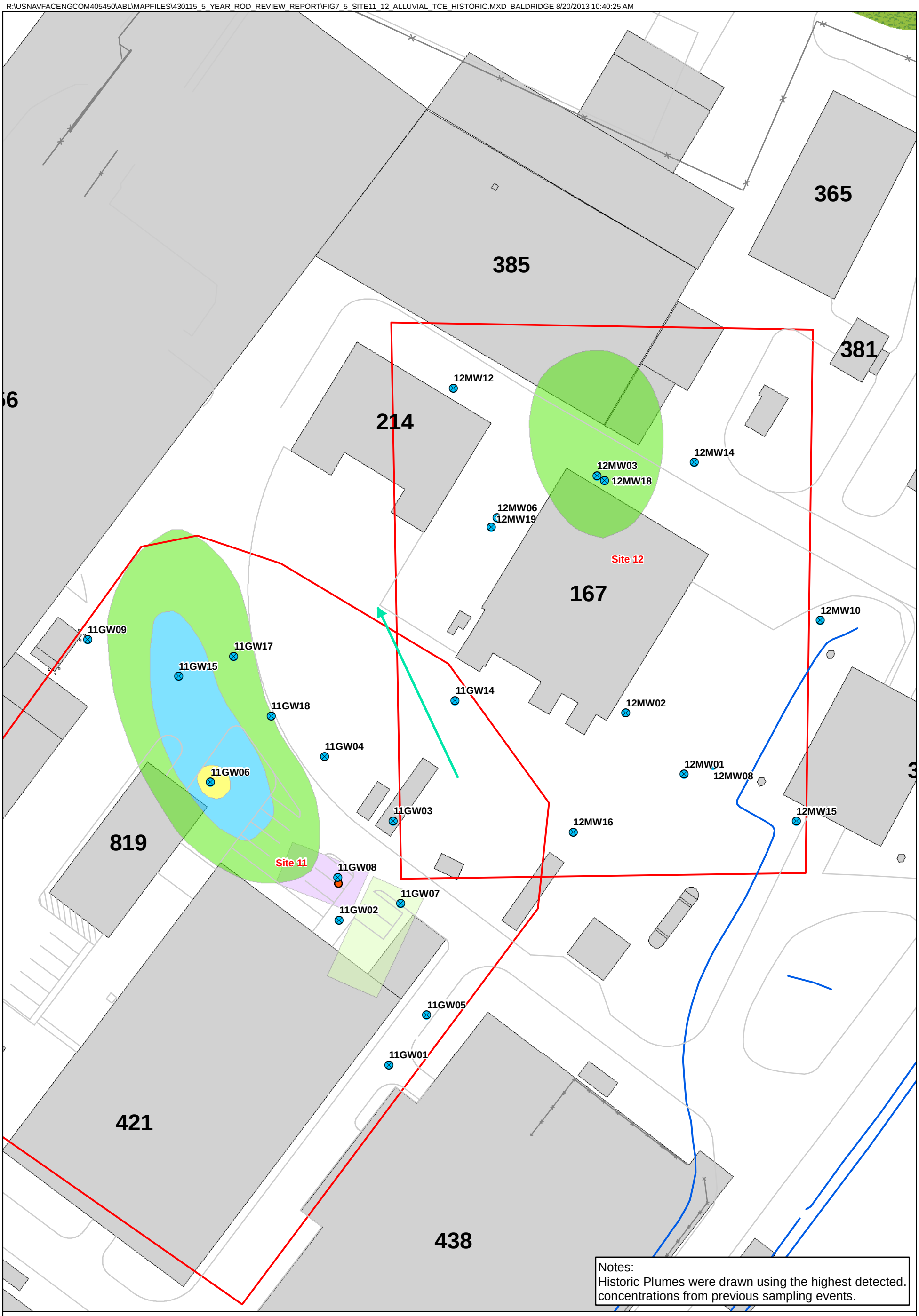

Legend

- Alluvial Monitoring Well
- Former Oil Pit
- Alluvial Groundwater Flow
- Former Building 215
- Former Diked Fuel Storage Area
- Buildings
- Site Boundary

Estimated TCE Plume

- 5 - 50 µg/L
- 50 -100 µg/L
- > 100 µg/L

N

0 25 50 Feet

1 inch = 50 feet

Figure 7-5
Alluvial Aquifer Sites 11 and 12 TCE Plume – Historic
5 Year ROD Review Report
Allegany Ballistics Laboratory
Rocket Center, West Virginia

CH2MHILL

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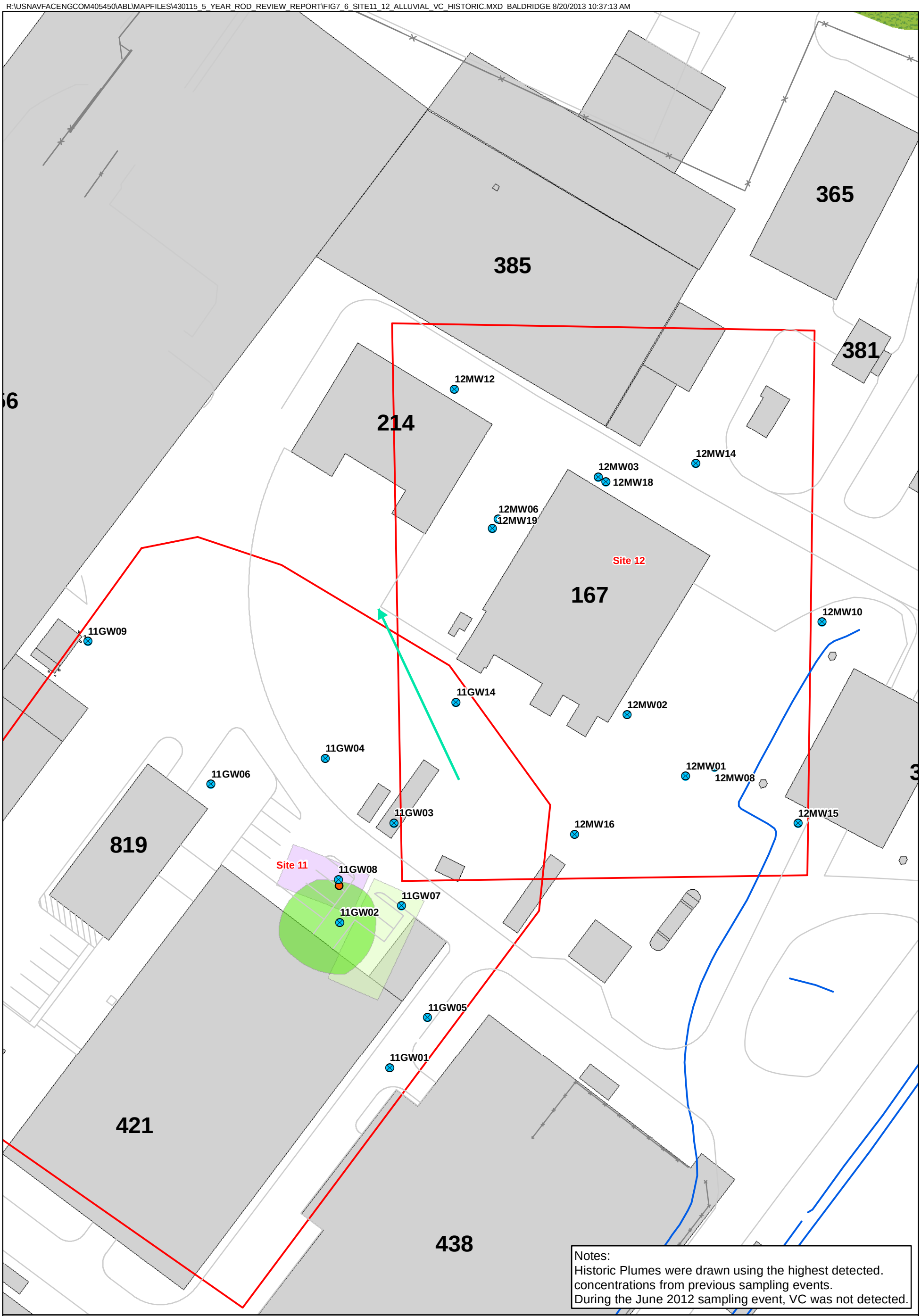

Legend

- Alluvial Monitoring Well
- Former Oil Pit
- Alluvial Groundwater Flow
- Former Building 215
- Former Diked Fuel Storage Area
- Buildings
- Site Boundary

Estimated VC Plume

- 2 µg/L

N

0 25 50 Feet

1 inch = 50 feet

Figure 7-6
Alluvial Aquifer Sites 11 and 12 VC Plume – Historic
5 Year ROD Review Report
Allegany Ballistics Laboratory
Rocket Center, West Virginia

CH2MHILL

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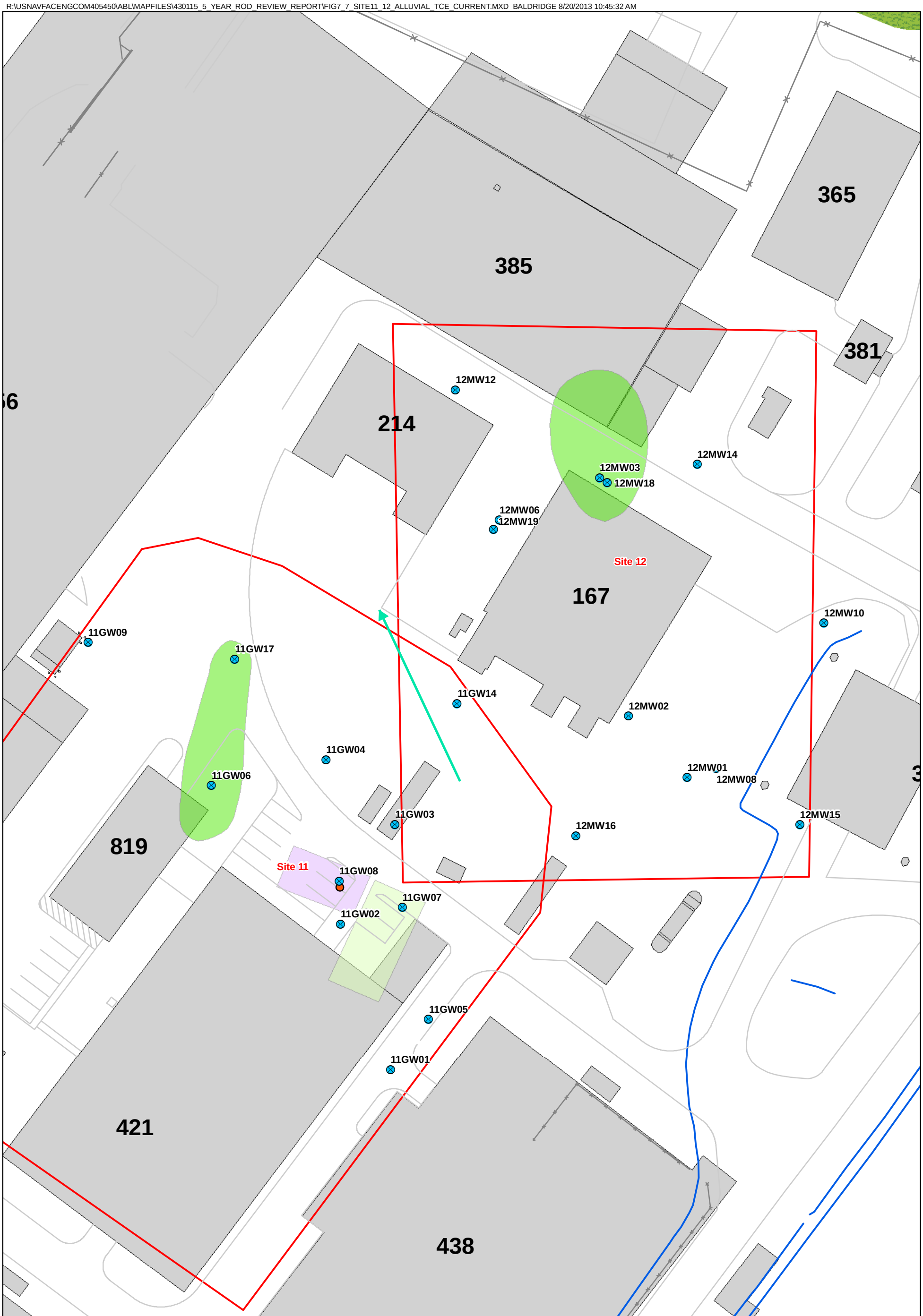

Legend

- Alluvial Monitoring Well
- Former Oil Pit
- Alluvial Groundwater Flow
- Former Building 215
- Former Diked Fuel Storage Area
- Buildings
- Site Boundary

Estimated TCE Plume

- 5 - 50 µg/L

N

0 25 50 Feet

1 inch = 50 feet

Figure 7-7
Alluvial Aquifer Sites 11 and 12 TCE Plume – June 2012
5 Year ROD Review Report
Allegany Ballistics Laboratory
Rocket Center, West Virginia

CH2MHILL

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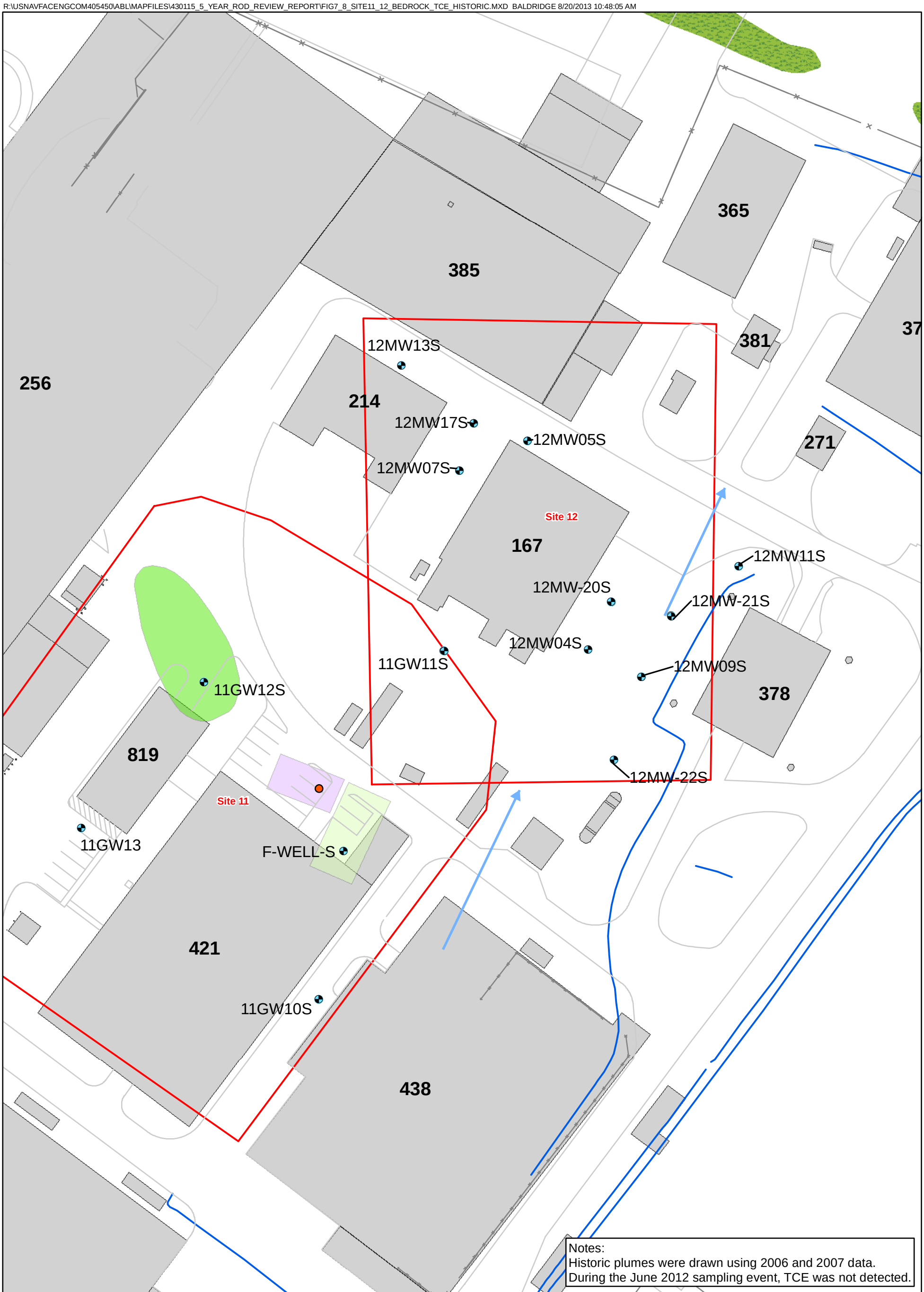

Legend

- Former Oil Pit
- Bedrock Well
- Bedrock Groundwater Flow
- Former Building 215
- Former Diked Fuel Storage Area
- Buildings
- Site Boundary

Estimated TCE Plume

- 5 µg/L

N

0 30 60 Feet

1 inch = 60 feet

Figure 7-8
Bedrock Aquifer Sites 11 and 12 TCE Plume – Historic
5 Year ROD Reveiw Report
Allegany Ballistics Laboratory
Rocket Center, West Virginia

CH2MHILL

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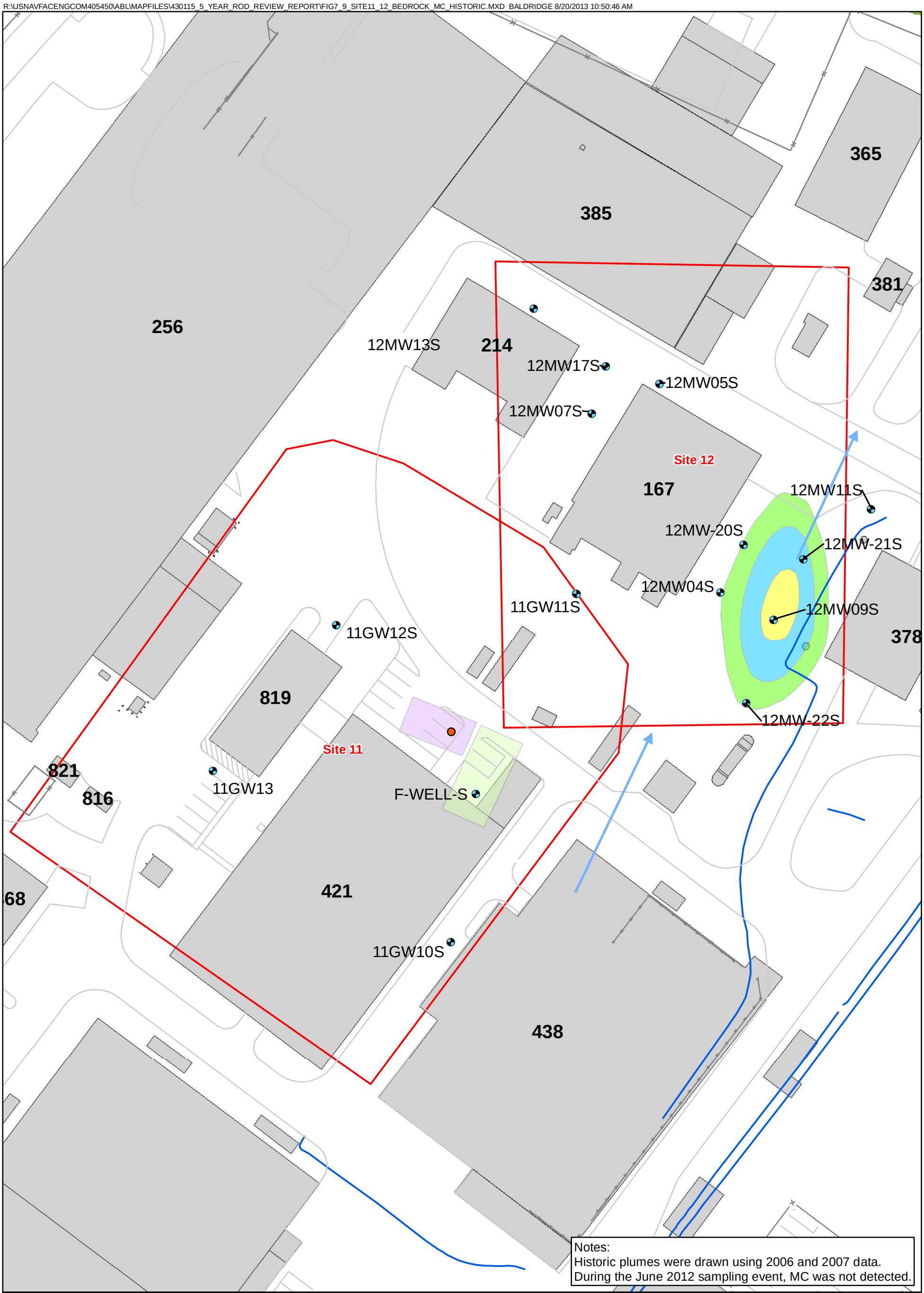

Legend

- Former Oil Pit
- Bedrock Well
- Bedrock Groundwater Flow
- Former Building 215
- Former Diked Fuel Storage Area
- Buildings
- Site Boundary

Estimated MC Plume

- 5 - 50 µg/L
- 50 - 250 µg/L
- > 250 µg/L

N

0 30 60 Feet

1 inch = 60 feet

Figure 7-9
Bedrock Aquifer Sites 11 and 12 MC Plume – Historic
5 Year ROD Reveiw Report
Allegany Ballistics Laboratory
Rocket Center, West Virginia

CH2MHILL

SECTION 8

Next Review

The next Five-Year Review is anticipated to be completed in 2018 and signed by the Navy signature authority 5 years from the Navy signature of this Five-Year Review.

SECTION 9

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Appendix A
Public Notice

Miss Frostburg Maria Filer; Frostburg Area Ambulance Service; 1962 Queen of the Sesquicentennial Barbara (Layman) Stem and 2012 Queen of the Bicentennial; Frostburg Volunteer Fire Department.

Division II, Military and Veterans Division, Oldtown VFW Color Guard; Garrett Highlands Pipes and Drums; Maryland Lt. Gov. Anthony Brown in a 1942 Willy's Jeep driven by Kline Conway; retired Two Star Gen. Melissa Rank, driven by Bruce Durst; World War II Prisoner of War David Willetts, driven by Mike Kamauff; World War II Veteran Al Via, driven by Joe Conway; 372nd Army Reserve Unit; Ace Auto flat bed with veterans; National Guard; Disabled Veterans Chapter 127 from Berlin, Pa.; Mountainside Marines League; World War II Army Duce and One-Half; Western Maryland Lawn and Landscaping truck with veterans; American Legion van with veterans; Navy Sea Cadets; and Army Recruiting Humvee.

House Hunting?
Historic Highlands
Association of REALTORS, Inc.

NAVFAC
Naval Facilities Engineering Command

PUBLIC NOTICE
Record of Decision Five-Year Review
Allegany Ballistics Laboratory, West Virginia

The Department of the Navy and the US Environmental Protection Agency (EPA) Region 3, with concurrence from the West Virginia Department of Environmental Protection (WVDEP), are beginning a Five-Year Review of five existing Record of Decision (ROD) documents and ongoing remedial (environmental cleanup) actions at the Allegany Ballistics Laboratory (ABL), in Mineral County, West Virginia. This is the fourth 5-year review for ABL. A Five-Year Review is required by Section 121 of Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) for remedial actions which result in any hazardous substances, pollutants, or contaminants remaining at a site at levels that do not allow for unlimited use and unrestricted exposure.

The purpose of the 5-year review is to ensure that these remedial actions are providing adequate protection of human health and the environment. The Navy will submit draft findings of the 5-year review to EPA and WVDEP in January 2013. The final report will be made available to the public by October 2013.

Community members who have questions or information about the effectiveness of the remedies that would help the review team are encouraged to contact the Public Affairs Officer:

Mr. Thomas Kreidel
NAVFAC Mid-Atlantic
9742 Maryland Avenue
Norfolk, VA 23511
(757) 341-1410
Thomas.Kreidel@navy.mil

Where to find the RODs and related information:

These RODs and other information about the environmental cleanup program are available on the public website, by clicking on the"Administrative Records" tab. The Allegany Ballistics Laboratory Administrative Record file contains all documents that the Navy and regulators used as the basis for these RODs.

Website: http://go.usa.gov/TsM

CHEERLEADERS... TEACHERS... ADMINISTRATORS... ALUMNI

FORT HILL vs ALLEGANY
Sentinels
Homecoming Page
Will Be Published
SATURDAY
November 3rd.
Deadline: Oct. 29th
Campers

BISHOP WALSH
Homecoming Page
Will Be Published on
SATURDAY, October 13th
Deadline: Oct. 8th
Spartans

FRANKFORT
Falcons
Homecoming Page
Will Be Published on
FRIDAY, October 12th
Deadline: Oct. 8th

KEYSER
Homecoming Page
Will Be Published on
FRIDAY, Sept. 28th
Deadline: Sept. 24th
Tornado

MOUNTAIN RIDGE
Miners
Homecoming Page
Will Be Published on
FRIDAY, Sept. 28th
Deadline: Sept. 24th

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Where to find the RODs and related information:

These RODs and other information about the environmental cleanup program are available on the public website, by clicking on the"Administrative Records" tab. The Allegany Ballistics Laboratory Administrative Record file contains all documents that the Navy and regulators used as the basis for these RODs.

Website: http://go.usa.gov/TsM

RODs and Remedial Actions to be reviewed:

Operable Unit (OU1) - Site 5 Landfill cap and Surface Soil: A landfill cap (consisting of a geosynthetic clay layer and flexible membrane cap) was placed in the subsurface at Site 5 in October 1997 to reduce potential exposure risks and to reduce contaminant leaching from the landfill waste and degradation of groundwater beneath.

OU2 - Site 5 Groundwater, Surface Water, and Sediment: A permeable reactive barrier (PRB) was installed in the subsurface at Site 5 in May 2006 to address trichloroethene in alluvial groundwater. Groundwater is monitored to determine the progress of the PRB wall and for natural attenuation (evaluation of reductions in contaminants through naturally occurring processes, i.e. biodegradation, dispersion, and dilution). Land use controls are in place to prohibit groundwater use.

OU3 - Site 1 Groundwater, Surface Water, and Sediment: A groundwater extraction and treatment system has been in operation since September 1998 to address volatile organic compounds (VOCs) (chemicals with properties that readily allow them to vaporize) in groundwater. Groundwater, surface water, and sediment are monitored to evaluate the effectiveness of the extraction system. Land use controls are in place to prohibit the on-site use of untreated groundwater.

OU5 - Site 10 Groundwater: Site-wide groundwater is extracted and discharged into the Site 1 treatment system to address VOCs in alluvial groundwater. Groundwater monitoring is conducted to evaluate the effectiveness of the extraction system. Land use controls are in place to prohibit groundwater use.

Site 11 - Production Well "F" and Site 12 - Building 167 Solid Waste Management Units: A ROD was signed in January 2012 to address VOCs and metals in groundwater at Sites 11 and 12. The selected remedy was focused enhanced anaerobic biodegradation, monitored natural attenuation, and institutional controls. The remedial action for Site 11 and 12 is expected to take place in September 2012.

FRIDAY, Sept. 28th
Deadline: Sept. 24th

Miners
MOUNTAIN RIDGE
Homecoming Page
Will Be Published on
FRIDAY, Sept. 28th
Deadline: Sept. 24th

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Appendix B
Documents Reviewed

APPENDIX B

Documents Reviewed

In addition to the documents listed below, review of documents maintained on the ABL Tier 1 Partnering Team (Navy, EPA Region III, and the West Virginia Department of the Environment) website was also performed including groundwater monitoring data, groundwater contour maps, discharge monitoring reports, and landfill inspection reports.

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AGVIQ-CH2M HILL Joint Venture I. *Draft Construction Closeout Report, Site Treatment Plant Maintenance, Allegany Ballistics Laboratory, Rocket Center, West Virginia*. December 2007b.

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Navy. *Record of Decision Sites 11 (Operable Unit 11) and Site 12 (Operable Unit 8).* Allegany Ballistics Laboratory, Rocket Center, West Virginia. November 2011.

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Appendix C
Five-Year Review Site Inspection Checklists, Photo Log, and Quarterly Inspections Summary

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: Site 10 and Site 1	**Date of inspection:** 10/23/2012
Location and Region: ABL, Rocket Center WV	**EPA ID:**
Agency, office, or company leading the five-year review: CH2MHILL, NAVFAC	**Weather/temperature:** Clear, sunny, ~50° F

Remedy Includes: (Check all that apply)

- Landfill cover/containment
- Access controls
- Institutional controls
- ✓ Groundwater pump and treatment
- Surface water collection and treatment
- Other GWTP for Sites 1 and 10
- Monitored natural attenuation
- Groundwater containment
- Vertical barrier walls

Attachments: Inspection team roster attached Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Steve Blandsdal GWTP O&M Manager
   Name Title Date
   Interviewed at site at office by phone Phone no. _____
   Problems, suggestions; Report attached _____
   Interviews with O&M Site managers to be conducted at another time.

2. **O&M staff** _____ _____ _____
   Name Title Date
   Interviewed at site at office by phone Phone no. _____
   Problems, suggestions; Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency EPA
Contact Sarah Kloss (Name) RPM (Title) 10/23/12 (Date) _____ (Phone no.)
Problems; suggestions; Report attached none

Agency WVDEP
Contact Tom Bass (Name) RPM (Title) 10/23/12 (Date) _____ (Phone no.)
Problems; suggestions; Report attached none

Agency NAVFAC
Contact Walter Bell (Name) RPM (Title) 10/23/12 (Date) _____ (Phone no.)
Problems; suggestions; Report attached none

Agency _____
Contact _____ (Name) _____ (Title) _____ (Date) _____ (Phone no.)
Problems; suggestions; Report attached _____

4. **Other interviews** (optional) Report attached.

EPA, WVDEP, NAVFAC, and CH2MHILL conducted a site walk at site 10 and the GWTP. The team drove through the Site 1 burning ground for a windshield tour. Also the team walked along the riverbank on the southern portion of Site 1 only.

Site 10
and Site 1

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1.	**O&M Documents**			
	O&M manual	Readily available	Up to date	N/A
	As-built drawings	Readily available	Up to date	N/A
	Maintenance logs	Readily available	Up to date	N/A
	Remarks			
2.	**Site-Specific Health and Safety Plan**	Readily available	Up to date	N/A
	Contingency plan/emergency response plan	Readily available	Up to date	N/A
	Remarks			
3.	**O&M and OSHA Training Records**	Readily available	Up to date	N/A
	Remarks			
4.	**Permits and Service Agreements**			
	Air discharge permit	Readily available	Up to date	N/A
	Effluent discharge	Readily available	Up to date	N/A
	Waste disposal, POTW	Readily available	Up to date	N/A
	Other permits	Readily available	Up to date	N/A
	Remarks			
5.	**Gas Generation Records**	Readily available	Up to date	N/A
	Remarks			
6.	**Settlement Monument Records**	Readily available	Up to date	N/A
	Remarks			
7.	**Groundwater Monitoring Records**	Readily available	Up to date	N/A
	Remarks			
8.	**Leachate Extraction Records**	Readily available	Up to date	N/A
	Remarks			
9.	**Discharge Compliance Records**			
	Air	Readily available	Up to date	N/A
	Water (effluent)	Readily available	Up to date	N/A
	Remarks			
10.	**Daily Access/Security Logs**	Readily available	Up to date	N/A
	Remarks			

IV. O&M COSTS

1. **O&M Organization**

State in-house — Contractor for State
PRP in-house — Contractor for PRP
Federal Facility in-house — Contractor for Federal Facility
Other_____

2. **O&M Cost Records**

Readily available — Up to date
Funding mechanism/agreement in place
Original O&M cost estimate_____ Breakdown attached

Total annual cost by year for review period if available

From_____ To_____ _____ Breakdown attached
Date Date Total cost
From_____ To_____ _____ Breakdown attached
Date Date Total cost
From_____ To_____ _____ Breakdown attached
Date Date Total cost
From_____ To_____ _____ Breakdown attached
Date Date Total cost
From_____ To_____ _____ Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS (Applicable) N/A

A. Fencing

1. **Fencing damaged** Location shown on site map (Gates secured) N/A

Remarks Fencing around ATK facility is in good condition

B. Other Access Restrictions

1. **Signs and other security measures** Location shown on site map N/A

Remarks ATK Security

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented	Yes	No	N/A
Site conditions imply ICs not being fully enforced	Yes	No	N/A

Type of monitoring (*e.g.*, self-reporting, drive by) _____
Frequency _____
Responsible party/agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.

Reporting is up-to-date	Yes	No	N/A
Reports are verified by the lead agency	Yes	No	N/A
Specific requirements in deed or decision documents have been met	Yes	No	N/A
Violations have been reported	Yes	No	N/A

Other problems or suggestions: Report attached

_____
_____
_____
_____

2. **Adequacy** ICs are adequate ICs are inadequate N/A
Remarks _____
_____
_____

D. General

1. **Vandalism/trespassing** Location shown on site map (No vandalism evident)
Remarks _____
_____

2. **Land use changes on site** (N/A)
Remarks _____
_____

3. **Land use changes off site** (N/A)
Remarks _____
_____

VI. GENERAL SITE CONDITIONS

A. Roads (Applicable) N/A

1. **Roads damaged** Location shown on site map (Roads adequate) N/A
Remarks _____
_____

B. Other Site Conditions

Remarks_____

VII. LANDFILL COVERS Applicable N/A

A. Landfill Surface

1. **Settlement** (Low spots) Location shown on site map Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Cracks** Location shown on site map Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks_____

3. **Erosion** Location shown on site map Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Holes** Location shown on site map Holes not evident
   Areal extent_____ Depth_____
   Remarks_____

5. **Vegetative Cover** Grass Cover properly established No signs of stress
   Trees/Shrubs (indicate size and locations on a diagram)
   Remarks_____

6. **Alternative Cover (armored rock, concrete, etc.)** N/A
   Remarks_____

7. **Bulges** Location shown on site map Bulges not evident
   Areal extent_____ Height_____
   Remarks_____

8. **Wet Areas/Water Damage** Wet areas/water damage not evident
   - Wet areas Location shown on site map Areal extent_____
   - Ponding Location shown on site map Areal extent_____
   - Seeps Location shown on site map Areal extent_____
   - Soft subgrade Location shown on site map Areal extent_____

   Remarks_____

9. **Slope Instability** Slides Location shown on site map No evidence of slope instability
   Areal extent_____
   Remarks_____

B. Benches Applicable N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** Location shown on site map N/A or okay
   Remarks_____

2. **Bench Breached** Location shown on site map N/A or okay
   Remarks_____

3. **Bench Overtopped** Location shown on site map N/A or okay
   Remarks_____

C. Letdown Channels Applicable N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** Location shown on site map No evidence of settlement
   Areal extent_____ Depth_____
   Remarks_____

2. **Material Degradation** Location shown on site map No evidence of degradation
   Material type_____ Areal extent_____
   Remarks_____

3. **Erosion** Location shown on site map No evidence of erosion
   Areal extent_____ Depth_____
   Remarks_____

4. **Undercutting** Location shown on site map No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ No obstructions
Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
No evidence of excessive growth
Vegetation in channels does not obstruct flow
Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations Applicable N/A

1. **Gas Vents** Active Passive
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance
N/A
Remarks_____

2. **Gas Monitoring Probes**
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance N/A
Remarks_____

4. **Leachate Extraction Wells**
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance N/A
Remarks_____

5. **Settlement Monuments** Located Routinely surveyed N/A
Remarks_____

E. Gas Collection and Treatment	Applicable	N/A
1. **Gas Treatment Facilities** Flaring Thermal destruction Collection for reuse Good condition Needs Maintenance Remarks_____		
2. **Gas Collection Wells, Manifolds and Piping** Good condition Needs Maintenance Remarks_____		
3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings) Good condition Needs Maintenance N/A Remarks_____		
F. Cover Drainage Layer	Applicable	N/A
1. **Outlet Pipes Inspected** Remarks_____	Functioning	N/A
2. **Outlet Rock Inspected** Remarks_____	Functioning	N/A
G. Detention/Sedimentation Ponds	Applicable	N/A
1. **Siltation** Areal extent_____ Depth_____ N/A Siltation not evident Remarks_____		
2. **Erosion** Areal extent_____ Depth_____ Erosion not evident Remarks_____		
3. **Outlet Works** Remarks_____	Functioning	N/A
4. **Dam** Remarks_____	Functioning	N/A

H. Retaining Walls Applicable (N/A)

1. **Deformations** Location shown on site map Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____

2. **Degradation** Location shown on site map Degradation not evident
   Remarks_____

I. Perimeter Ditches/Off-Site Discharge Applicable (N/A)

1. **Siltation** Location shown on site map Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Vegetative Growth** Location shown on site map N/A
   Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks_____

3. **Erosion** Location shown on site map Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Discharge Structure** Functioning N/A
   Remarks_____

VIII. VERTICAL BARRIER WALLS Applicable (N/A)

1. **Settlement** Location shown on site map Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Performance Monitoring** Type of monitoring_____
   Performance not monitored
   Frequency_____ Evidence of breaching
   Head differential_____
   Remarks_____

IX. GROUNDWATER/SURFACE WATER REMEDIES	Applicable	N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines Applicable N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   Good condition All required wells properly operating Needs Maintenance N/A
   Remarks Maintenance is ongoing. Pumping wells have been cleaning chemically. Troubleshooting transducers and valve equipment issues

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   Good condition Needs Maintenance
   Remarks Pipes have calcification/scaling that needs to be addressed.

3. **Spare Parts and Equipment**
   Readily available Good condition Requires upgrade Needs to be provided
   Remarks Parts are continuously on order. Lead times of 4-5 weeks to get parts poses a challenge at times.

B. Surface Water Collection Structures, Pumps, and Pipelines Applicable N/A

1. **Collection Structures, Pumps, and Electrical**
   Good condition Needs Maintenance
   Remarks

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   Good condition Needs Maintenance
   Remarks

3. **Spare Parts and Equipment**
   Readily available Good condition Requires upgrade Needs to be provided
   Remarks

C. Treatment System (Applicable) N/A

1. **Treatment Train** (Check components that apply)
   - Metals removal — Oil/water separation — Bioremediation
   - ✓ Air stripping — Carbon adsorbers
   - Filters Polyphosphate
   - Additive (e.g., chelation agent, flocculent) pH to control scaling
   - Others
   - Good condition — Needs Maintenance
   - ✓ Sampling ports properly marked and functional
   - ✓ Sampling/maintenance log displayed and up to date
   - ✓ Equipment properly identified
   - ✓ Quantity of groundwater treated annually
   - Quantity of surface water treated annually
   - Remarks

2. **Electrical Enclosures and Panels** (properly rated and functional)
   - N/A — (Good condition) — Needs Maintenance
   - Remarks

3. **Tanks, Vaults, Storage Vessels**
   - N/A — (Good condition) — Proper secondary containment — Needs Maintenance
   - Remarks Water tower will go through cosmetic rehabilitation

4. **Discharge Structure and Appurtenances**
   - N/A — (Good condition) — Needs Maintenance
   - Remarks

5. **Treatment Building(s)**
   - N/A — (Good condition (esp. roof and doorways)) — Needs repair
   - Chemicals and equipment properly stored
   - Remarks

6. **Monitoring Wells** (pump and treatment remedy)
   - ✓ Properly secured/locked — ✓ Functioning — ✓ Routinely sampled — ✓ Good condition
   - ✓ All required wells located — Needs Maintenance — N/A
   - Remarks Check vault seals

D. Monitoring Data

1. Monitoring Data
   - Is routinely submitted on time — Is of acceptable quality

2. Monitoring data suggests:
   - Groundwater plume is effectively contained — Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
   Properly secured/locked Functioning Routinely sampled Good condition
   All required wells located Needs Maintenance N/A
   Remarks

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

Concrete pad on approximately 7 wells are cracked. Needs replacement w/o repair at Site 10.
Wells included: 10GW13, 10GW15, 10GW17, 10GW18, 10GW20, and PWH-1.
PWH-1 well casing is missing and should be replaced with a new lock and well cap.

Site 1 well inspections will be completed at another time.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: Site 5	**Date of inspection:** 10/23/2012
Location and Region:	**EPA ID:**
Agency, office, or company leading the five-year review: NAVFAC Mid-Atlantic	**Weather/temperature:** 70°F, Cloudy

Remedy Includes: (Check all that apply)

- ✓ Landfill cover/containment
- Access controls
- ✓ Institutional controls
- Groundwater pump and treatment
- Surface water collection and treatment
- Other _____
- Monitored natural attenuation
- Groundwater containment
- ✓ Vertical barrier walls

Attachments: Inspection team roster attached Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Steve Bladisdale (Name) O&M Site Manager (Title) 10/23/12 (Date)
   Interviewed at site at office by phone Phone no. _____
   Problems, suggestions; Report attached _____

2. **O&M staff** _____ (Name) _____ (Title) _____ (Date)
   Interviewed at site at office by phone Phone no. _____
   Problems, suggestions; Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency WVDEP
Contact Tom Bass — RPM — 10/23/12 — ____
Name — Title — Date — Phone no.
Problems; suggestions; Report attached none

Agency EPA
Contact Sarah Kloss — RPM — 10/23/12 — ____
Name — Title — Date — Phone no.
Problems; suggestions; Report attached none

Agency NAVFAC
Contact Walt Bell — RPM — 10/23/12 — ____
Name — Title — Date — Phone no.
Problems; suggestions; Report attached none

Agency ____
Contact ____ — ____ — ____ — ____
Name — Title — Date — Phone no.
Problems; suggestions; Report attached ____

4. **Other interviews** (optional) Report attached.

To be conducted at another time

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1.	**O&M Documents**			
	O&M manual	Readily available	Up to date	N/A
	As-built drawings	Readily available	Up to date	N/A
	Maintenance logs	Readily available	Up to date	N/A
	Remarks			
2.	**Site-Specific Health and Safety Plan**	Readily available	Up to date	N/A
	Contingency plan/emergency response plan	Readily available	Up to date	N/A
	Remarks			
3.	**O&M and OSHA Training Records**	Readily available	Up to date	N/A
	Remarks			
4.	**Permits and Service Agreements**			
	Air discharge permit	Readily available	Up to date	N/A
	Effluent discharge	Readily available	Up to date	N/A
	Waste disposal, POTW	Readily available	Up to date	N/A
	Other permits	Readily available	Up to date	N/A
	Remarks			
5.	**Gas Generation Records**	Readily available	Up to date	N/A
	Remarks			
6.	**Settlement Monument Records**	Readily available	Up to date	N/A
	Remarks			
7.	**Groundwater Monitoring Records**	Readily available	Up to date	N/A
	Remarks			
8.	**Leachate Extraction Records**	Readily available	Up to date	N/A
	Remarks			
9.	**Discharge Compliance Records**			
	Air	Readily available	Up to date	N/A
	Water (effluent)	Readily available	Up to date	N/A
	Remarks			
10.	**Daily Access/Security Logs**	Readily available	Up to date	N/A
	Remarks			

IV. O&M COSTS

1. **O&M Organization**

State in-house — Contractor for State
PRP in-house — Contractor for PRP
Federal Facility in-house — Contractor for Federal Facility
Other _____

2. **O&M Cost Records**

Readily available — Up to date
Funding mechanism/agreement in place
Original O&M cost estimate _____ Breakdown attached

Total annual cost by year for review period if available

From _____ To _____ _____ Breakdown attached
Date — Date — Total cost

From _____ To _____ _____ Breakdown attached
Date — Date — Total cost

From _____ To _____ _____ Breakdown attached
Date — Date — Total cost

From _____ To _____ _____ Breakdown attached
Date — Date — Total cost

From _____ To _____ _____ Breakdown attached
Date — Date — Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS (Applicable) N/A

A. Fencing

1. **Fencing damaged** — Location shown on site map — Gates secured — N/A

Remarks _____

B. Other Access Restrictions

1. **Signs and other security measures** — Location shown on site map — N/A

Remarks Good Condition for groundwater restriction Signs
ATF Security for access restrictions

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented	Yes	(No)	N/A
Site conditions imply ICs not being fully enforced	Yes	(No)	N/A

Type of monitoring (*e.g.*, self-reporting, drive by) drive by
Frequency Quarterly
Responsible party/agency CH2M HILL
Contact Steve Blaidsdell GWTP Operator

Name	Title	Date	Phone no.
Steve Blaidsdell	GWTP Operator		

Reporting is up-to-date	Yes	No	N/A
Reports are verified by the lead agency	Yes	No	N/A
Specific requirements in deed or decision documents have been met	Yes	No	N/A
Violations have been reported	Yes	No	N/A

Other problems or suggestions: Report attached

2. **Adequacy** ICs are adequate ICs are inadequate N/A
Remarks

D. General

1. **Vandalism/trespassing** Location shown on site map (No vandalism evident)
Remarks

2. **Land use changes on site** (N/A)
Remarks

3. **Land use changes off site** (N/A)
Remarks

VI. GENERAL SITE CONDITIONS

A. Roads Applicable N/A

1. **Roads damaged** Location shown on site map (Roads adequate) N/A
Remarks

B. Other Site Conditions

Remarks BLGV03 - Carbon filter Case is damaged and Carbon filter is missing. A beehive is located in the well, which will need to be removed prior to replacing Carbon filter.

VII. LANDFILL COVERS Applicable N/A

A. Landfill Surface

1. **Settlement** (Low spots) Location shown on site map Settlement not evident
Areal extent _____ Depth _____
Remarks Signs of settlement throughout landfill. Ripple effect evident at top of landfill. Approximately 15' length and 10 feet height

2. **Cracks** Location shown on site map Cracking not evident
Lengths _____ Widths _____ Depths _____
Remarks None

3. **Erosion** Location shown on site map Erosion not evident
Areal extent _____ Depth _____
Remarks None

4. **Holes** Location shown on site map Holes not evident
Areal extent _____ Depth _____
Remarks None

5. **Vegetative Cover** Grass Cover properly established No signs of stress
Trees/Shrubs (indicate size and locations on a diagram)
Remarks No trees on cover. Grass is mowed.

6. **Alternative Cover (armored rock, concrete, etc.)** N/A
Remarks

7. **Bulges** Location shown on site map Bulges not evident
Areal extent _____ Height _____
Remarks

8.	**Wet Areas/Water Damage**	Wet areas/water damage not evident	
	Wet areas	Location shown on site map	Areal extent _____
	Ponding	Location shown on site map	Areal extent _____
	Seeps	Location shown on site map	Areal extent _____
	Soft subgrade	Location shown on site map	Areal extent _____
	Remarks _____		
9.	**Slope Instability** Slides	Location shown on site map	No evidence of slope instability
	Areal extent _____		
	Remarks _____		

B. Benches Applicable N/A

(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1.	**Flows Bypass Bench**	Location shown on site map	N/A or okay
	Remarks _____		
2.	**Bench Breached**	Location shown on site map	N/A or okay
	Remarks _____		
3.	**Bench Overtopped**	Location shown on site map	N/A or okay
	Remarks _____		

C. Letdown Channels Applicable N/A

(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1.	**Settlement**	Location shown on site map	No evidence of settlement
	Areal extent _____	Depth _____	
	Remarks _____		
2.	**Material Degradation**	Location shown on site map	No evidence of degradation
	Material type _____	Areal extent _____	
	Remarks _____		
3.	**Erosion**	Location shown on site map	No evidence of erosion
	Areal extent _____	Depth _____	
	Remarks _____		

4. **Undercutting** Location shown on site map No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ No obstructions
Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
No evidence of excessive growth
Vegetation in channels does not obstruct flow
Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations Applicable N/A

1. **Gas Vents** Active Passive
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance
N/A
Remarks Carbon filter missing and a new screen is needed for 5LGV03

2. **Gas Monitoring Probes**
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance N/A
Remarks_____

4. **Leachate Extraction Wells**
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance N/A
Remarks_____

5. **Settlement Monuments** Located Routinely surveyed N/A
Remarks_____

E. Gas Collection and Treatment	Applicable	N/A	
1. **Gas Treatment Facilities** Flaring Good condition Remarks	Thermal destruction Needs Maintenance	Collection for reuse	
2. **Gas Collection Wells, Manifolds and Piping** Good condition Remarks	Needs Maintenance		
3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings) Good condition Remarks	Needs Maintenance	N/A	
F. Cover Drainage Layer	Applicable	N/A	
1. **Outlet Pipes Inspected** Remarks	Functioning	N/A	
2. **Outlet Rock Inspected** Remarks	Functioning	N/A	
G. Detention/Sedimentation Ponds	Applicable	N/A	
1. **Siltation** Areal extent_____ Siltation not evident Remarks	Depth_____	N/A	
2. **Erosion** Areal extent_____ Erosion not evident Remarks	Depth_____		
3. **Outlet Works** Remarks	Functioning	N/A	
4. **Dam** Remarks	Functioning	N/A	

H. Retaining Walls Applicable N/A

1. **Deformations** Location shown on site map Deformation not evident
   Horizontal displacement _____ Vertical displacement _____
   Rotational displacement _____
   Remarks _____

2. **Degradation** Location shown on site map Degradation not evident
   Remarks _____

I. Perimeter Ditches/Off-Site Discharge Applicable N/A

1. **Siltation** Location shown on site map Siltation not evident
   Areal extent _____ Depth _____
   Remarks Good Condition No blockage, good flow.

2. **Vegetative Growth** Location shown on site map N/A
   Vegetation does not impede flow
   Areal extent _____ Type _____
   Remarks _____

3. **Erosion** Location shown on site map Erosion not evident
   Areal extent _____ Depth _____
   Remarks _____

4. **Discharge Structure** Functioning N/A
   Remarks _____

PRBwall **VIII. VERTICAL BARRIER WALLS** Applicable N/A

1. **Settlement** Location shown on site map Settlement not evident
   Areal extent _____ Depth _____
   Remarks
   No Settlement

2. **Performance Monitoring** Type of monitoring LTM
   Performance not monitored
   Frequency 9 months Evidence of breaching No
   Head differential _____
   Remarks _____

IX. GROUNDWATER/SURFACE WATER REMEDIES	Applicable	N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines	Applicable	N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   Good condition All required wells properly operating Needs Maintenance N/A
   Remarks_____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   Good condition Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   Readily available Good condition Requires upgrade Needs to be provided
   Remarks_____

B. Surface Water Collection Structures, Pumps, and Pipelines	Applicable	N/A

1. **Collection Structures, Pumps, and Electrical**
   Good condition Needs Maintenance
   Remarks_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   Good condition Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   Readily available Good condition Requires upgrade Needs to be provided
   Remarks_____

C. Treatment System Applicable N/A

1. **Treatment Train** (Check components that apply)
   Metals removal Oil/water separation Bioremediation
   Air stripping Carbon adsorbers
   Filters_____
   Additive (*e.g.*, chelation agent, flocculent)_____
   Others_____
   Good condition Needs Maintenance
   Sampling ports properly marked and functional
   Sampling/maintenance log displayed and up to date
   Equipment properly identified
   Quantity of groundwater treated annually_____
   Quantity of surface water treated annually_____
   Remarks_____

2. **Electrical Enclosures and Panels** (properly rated and functional)
   N/A Good condition Needs Maintenance
   Remarks_____

3. **Tanks, Vaults, Storage Vessels**
   N/A Good condition Proper secondary containment Needs Maintenance
   Remarks_____

4. **Discharge Structure and Appurtenances**
   N/A Good condition Needs Maintenance
   Remarks_____

5. **Treatment Building(s)**
   N/A Good condition (esp. roof and doorways) Needs repair
   Chemicals and equipment properly stored
   Remarks_____

6. **Monitoring Wells** (pump and treatment remedy)
   Properly secured/locked Functioning Routinely sampled Good condition
   All required wells located Needs Maintenance N/A
   Remarks_____

D. Monitoring Data

1. Monitoring Data
   Is routinely submitted on time Is of acceptable quality

2. Monitoring data suggests:
   Groundwater plume is effectively contained Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy) LTM wells are routinely sampled
✓Properly secured/locked ✓Functioning ✓Routinely sampled ✓Good condition
All required wells located Needs Maintenance N/A
Remarks Good condition Locks are rusty but locked. ~~and functi~~
Some well IDs need to be repainted on wells.

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

old Siltfencing at the bottom of landfill needs to be removed.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: Site 11 / 112	**Date of inspection:** 10/23/2012
Location and Region: ABL, WV	**EPA ID:**
Agency, office, or company leading the five-year review:	**Weather/temperature:** 70°F Cloudy

Remedy Includes: (Check all that apply)

- Landfill cover/containment
- ✓ Access controls
- ✓ Institutional controls
- ✓ Groundwater pump and treatment
- Surface water collection and treatment
- Other Remedy has not been implemented at this time and is expected to take place in Nov.
- Monitored natural attenuation
- Groundwater containment
- Vertical barrier walls

Attachments: Inspection team roster attached Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** _____ _____ _____
   Name Title Date
   Interviewed at site at office by phone Phone no. _____
   Problems, suggestions; Report attached _____

2. **O&M staff** _____ _____ _____
   Name Title Date
   Interviewed at site at office by phone Phone no. _____
   Problems, suggestions; Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency WVDEP
Contact Tom Bass (Name) RPM (Title) 10/23/12 (Date) _____ (Phone no.)
Problems; suggestions; Report attached none

Agency EPA
Contact Sarah Kloss (Name) RPM (Title) 10/23/12 (Date) _____ (Phone no.)
Problems; suggestions; Report attached none

Agency NAVFAC
Contact Walter Bell (Name) RPM (Title) 10/23/12 (Date) _____ (Phone no.)
Problems; suggestions; Report attached

Agency
Contact (Name) (Title) (Date) (Phone no.)
Problems; suggestions; Report attached

4. **Other interviews** (optional) Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1.	**O&M Documents**			
	O&M manual	Readily available	Up to date	N/A
	As-built drawings	Readily available	Up to date	N/A
	Maintenance logs	Readily available	Up to date	N/A
	Remarks			
2.	**Site-Specific Health and Safety Plan**	Readily available	Up to date	N/A
	Contingency plan/emergency response plan	Readily available	Up to date	N/A
	Remarks			
3.	**O&M and OSHA Training Records**	Readily available	Up to date	N/A
	Remarks			
4.	**Permits and Service Agreements**			
	Air discharge permit	Readily available	Up to date	N/A
	Effluent discharge	Readily available	Up to date	N/A
	Waste disposal, POTW	Readily available	Up to date	N/A
	Other permits	Readily available	Up to date	N/A
	Remarks			
5.	**Gas Generation Records**	Readily available	Up to date	N/A
	Remarks			
6.	**Settlement Monument Records**	Readily available	Up to date	N/A
	Remarks			
7.	**Groundwater Monitoring Records**	Readily available	Up to date	N/A
	Remarks			
8.	**Leachate Extraction Records**	Readily available	Up to date	N/A
	Remarks			
9.	**Discharge Compliance Records**			
	Air	Readily available	Up to date	N/A
	Water (effluent)	Readily available	Up to date	N/A
	Remarks			
10.	**Daily Access/Security Logs**	Readily available	Up to date	N/A
	Remarks			

IV. O&M COSTS

1. **O&M Organization**

State in-house — Contractor for State
PRP in-house — Contractor for PRP
Federal Facility in-house — Contractor for Federal Facility
Other _____

2. **O&M Cost Records**

Readily available — Up to date
Funding mechanism/agreement in place
Original O&M cost estimate _____ Breakdown attached

Total annual cost by year for review period if available

From _____ To _____ _____ Breakdown attached
Date Date Total cost
From _____ To _____ _____ Breakdown attached
Date Date Total cost
From _____ To _____ _____ Breakdown attached
Date Date Total cost
From _____ To _____ _____ Breakdown attached
Date Date Total cost
From _____ To _____ _____ Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS — Applicable — N/A

A. Fencing

1. **Fencing damaged** — Location shown on site map — Gates secured — N/A
Remarks Good Condition. Maintained by ATK

B. Other Access Restrictions

1. **Signs and other security measures** — Location shown on site map — N/A
Remarks Security by ATK. Good Condition

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented	Yes	No	N/A
Site conditions imply ICs not being fully enforced	Yes	No	N/A

Type of monitoring (e.g., self-reporting, drive by) drive by
Frequency Quarterly
Responsible party/agency US Navy NAVFAC Mid Atlantic
Contact _____ _____ _____ _____
Name Title Date Phone no.

Reporting is up-to-date	Yes	No	N/A
Reports are verified by the lead agency	Yes	No	N/A
Specific requirements in deed or decision documents have been met	Yes	No	N/A
Violations have been reported	Yes	No	N/A

Other problems or suggestions: Report attached

2. **Adequacy** ICs are adequate ICs are inadequate N/A
Remarks

D. General

1. **Vandalism/trespassing** Location shown on site map No vandalism evident
Remarks

2. **Land use changes on site** N/A
Remarks

3. **Land use changes off site** N/A
Remarks

VI. GENERAL SITE CONDITIONS

A. Roads Applicable N/A

1. **Roads damaged** Location shown on site map Roads adequate N/A
Remarks

B. Other Site Conditions

Remarks site was in good condition

VII. LANDFILL COVERS Applicable N/A

A. Landfill Surface

1. **Settlement** (Low spots) Location shown on site map Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Cracks** Location shown on site map Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks_____

3. **Erosion** Location shown on site map Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Holes** Location shown on site map Holes not evident
   Areal extent_____ Depth_____
   Remarks_____

5. **Vegetative Cover** Grass Cover properly established No signs of stress
   Trees/Shrubs (indicate size and locations on a diagram)
   Remarks_____

6. **Alternative Cover (armored rock, concrete, etc.)** N/A
   Remarks_____

7. **Bulges** Location shown on site map Bulges not evident
   Areal extent_____ Height_____
   Remarks_____

8.	**Wet Areas/Water Damage**	Wet areas/water damage not evident	
	Wet areas	Location shown on site map	Areal extent_____
	Ponding	Location shown on site map	Areal extent_____
	Seeps	Location shown on site map	Areal extent_____
	Soft subgrade	Location shown on site map	Areal extent_____
	Remarks_____		
9.	**Slope Instability** Slides	Location shown on site map	No evidence of slope instability
	Areal extent_____		
	Remarks_____		
B. Benches	Applicable N/A		
	(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)		
1.	**Flows Bypass Bench**	Location shown on site map	N/A or okay
	Remarks_____		
2.	**Bench Breached**	Location shown on site map	N/A or okay
	Remarks_____		
3.	**Bench Overtopped**	Location shown on site map	N/A or okay
	Remarks_____		
C. Letdown Channels	Applicable (N/A)		
	(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)		
1.	**Settlement**	Location shown on site map	No evidence of settlement
	Areal extent_____	Depth_____	
	Remarks_____		
2.	**Material Degradation**	Location shown on site map	No evidence of degradation
	Material type_____	Areal extent_____	
	Remarks_____		
3.	**Erosion**	Location shown on site map	No evidence of erosion
	Areal extent_____	Depth_____	
	Remarks_____		

4. **Undercutting** Location shown on site map No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ No obstructions
Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
No evidence of excessive growth
Vegetation in channels does not obstruct flow
Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations Applicable N/A

1. **Gas Vents** Active Passive
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance
N/A
Remarks_____

2. **Gas Monitoring Probes**
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance N/A
Remarks_____

4. **Leachate Extraction Wells**
Properly secured/locked Functioning Routinely sampled Good condition
Evidence of leakage at penetration Needs Maintenance N/A
Remarks_____

5. **Settlement Monuments** Located Routinely surveyed N/A
Remarks_____

E. Gas Collection and Treatment	Applicable	N/A	
1. **Gas Treatment Facilities** Flaring Good condition Remarks	Thermal destruction Needs Maintenance	Collection for reuse	
2. **Gas Collection Wells, Manifolds and Piping** Good condition Remarks	Needs Maintenance		
3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings) Good condition Remarks	Needs Maintenance	N/A	
F. Cover Drainage Layer	Applicable	N/A	
1. **Outlet Pipes Inspected** Remarks	Functioning	N/A	
2. **Outlet Rock Inspected** Remarks	Functioning	N/A	
G. Detention/Sedimentation Ponds	Applicable	N/A	
1. **Siltation** Areal extent_____ Siltation not evident Remarks	Depth_____	N/A	
2. **Erosion** Areal extent_____ Erosion not evident Remarks	Depth_____		
3. **Outlet Works** Remarks	Functioning	N/A	
4. **Dam** Remarks	Functioning	N/A	

H. Retaining Walls Applicable N/A

1. **Deformations** Location shown on site map Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____

2. **Degradation** Location shown on site map Degradation not evident
   Remarks_____

I. Perimeter Ditches/Off-Site Discharge Applicable N/A

1. **Siltation** Location shown on site map Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Vegetative Growth** Location shown on site map N/A
   Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks_____

3. **Erosion** Location shown on site map Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Discharge Structure** Functioning N/A
   Remarks_____

VIII. VERTICAL BARRIER WALLS Applicable N/A

1. **Settlement** Location shown on site map Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Performance Monitoring** Type of monitoring_____
   Performance not monitored
   Frequency_____ Evidence of breaching
   Head differential_____
   Remarks_____

IX. GROUNDWATER/SURFACE WATER REMEDIES Applicable N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines Applicable N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   Good condition All required wells properly operating Needs Maintenance N/A
   Remarks _____

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   Good condition Needs Maintenance
   Remarks _____

3. **Spare Parts and Equipment**
   Readily available Good condition Requires upgrade Needs to be provided
   Remarks _____

B. Surface Water Collection Structures, Pumps, and Pipelines Applicable N/A

1. **Collection Structures, Pumps, and Electrical**
   Good condition Needs Maintenance
   Remarks _____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   Good condition Needs Maintenance
   Remarks _____

3. **Spare Parts and Equipment**
   Readily available Good condition Requires upgrade Needs to be provided
   Remarks _____

C. Treatment System	Applicable	N/A

1. **Treatment Train** (Check components that apply)
   Metals removal Oil/water separation Bioremediation
   Air stripping Carbon adsorbers
   Filters _____
   Additive (*e.g.*, chelation agent, flocculent) _____
   Others _____
   Good condition Needs Maintenance
   Sampling ports properly marked and functional
   Sampling/maintenance log displayed and up to date
   Equipment properly identified
   Quantity of groundwater treated annually _____
   Quantity of surface water treated annually _____
   Remarks _____

2. **Electrical Enclosures and Panels** (properly rated and functional)
   N/A Good condition Needs Maintenance
   Remarks _____

3. **Tanks, Vaults, Storage Vessels**
   N/A Good condition Proper secondary containment Needs Maintenance
   Remarks _____

4. **Discharge Structure and Appurtenances**
   N/A Good condition Needs Maintenance
   Remarks _____

5. **Treatment Building(s)**
   N/A Good condition (esp. roof and doorways) Needs repair
   Chemicals and equipment properly stored
   Remarks _____

6. **Monitoring Wells** (pump and treatment remedy)
   Properly secured/locked Functioning Routinely sampled Good condition
   All required wells located Needs Maintenance N/A
   Remarks _____

D. Monitoring Data

1. Monitoring Data
   Is routinely submitted on time Is of acceptable quality

2. Monitoring data suggests:
   Groundwater plume is effectively contained Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
   Properly secured/locked Functioning Routinely sampled Good condition
   All required wells located Needs Maintenance N/A
   Remarks

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

Sites 11 and 12 remedy to inject ERD has not been conducted at this time. The following observations on well conditions were made:

11GW17 - Steel cap is broken. Well ID needs to be placed on or near well for easy identification.
11GW04 / 11GW07 - Concrete pads dry cracked
11GW17 / 12GW08 - bolts in steel casing cap are missing

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

Concrete Pad Status of Wells at Site 1	
Note: All wells locked, capped with J-Plug, and integrity of inner/outer casing is good - August 2012	
Well	**Concrete Pad Status**
1GW39	Cracked into separate piece at bollard
1GW02	Good
1GW12	Good
1GW33	Good
1GW30	Good
1GW31	Good
1GW27	Good
1GW28	Good
1GW29	Good
1GW13	Good
1GW09	Deep crack through middle of pad
1GW34	Cracked at multiple places into separate pieces
1GW35	Surface and deep cracks throughout pad
1GW36	Surface and deep cracks throughout pad
1GW37	Surface and deep cracks throughout pad
1GW04	Covered in grass/leaves
1GW22	Good
1GW32	Good
1GW20	Good
1GW21	Good
1GW24	Good
1GW25	Good
1GW13	Good
1GW05	Good
1GW38	Surface and deep cracks throughout pad

Well Status at Site 10	
Note: All wells locked, capped with J-Plug, and integrity of inner/outer casing is good - August 2012 (except if otherwise noted)	
Well	**Concrete Pad Status**
10GW15	Cracked concrete pad
10GW18	Cracked concrete pad
10GW20	Cracked concrete pad
10GW13	Cracked concrete pad
10GW17	Cracked concrete pad
10GW17	Cracked concrete pad
PWA-1	Casing needs replacement and needs a new lock

Photograph No.: 1
Date: December 16, 2012
Description: Site 1 groundwater use restriction sign

Photograph No.: 1
Date: October 23, 2012
Description: Site 5 permeable reactive barrier location

Photograph No.: 2
Date: October 23, 2012
Description: Site 5 landfill and access restriction sign

Photograph No.: 2
Date: December 16, 2012
Description: Site 5 landfill and access restriction sign

Photograph No.: 2
Date: December 16, 2012
Description: Site groundwater use restriction sign

Photograph No.: 3
Date: October 23, 2012
Description: Site 5 landfill drainage ditch

Photograph No.: 11
Date: October 23, 2012
Description: Site 10 Land Use Control Sign

Photograph No.: 12
Date: October 23, 2012
Description: Site 10 monitoring well and extraction well

Site 1 Five-Year Review, ABL West Virginia

	Inspection Quarter	Physical Access Restrictions	Activities	Groundwater Use
2008	January-March	N/a	Shaw contractors removing debris between Site 1 and Potomac River, CH2M HILL digging test pits along North fence line	N/a
	April-June	N/a	Shaw contractors removing debris betweent Site 1 and Potomac River, CH2M HILL digging test pits along North fence line	N/a
	July-September	N/a	N/a	N/a
	October-December	N/a	N/a	N/a
2009	January-March	N/a	N/a	N/a
	April-June	N/a	N/a	N/a
	July-September	Sign damaged, knocked down on Northern end of main burn ground	N/a	N/a
	October-December	Sign damaged, knocked down on Northern end of main burn ground	N/a	N/a
2010	January-March	Downed tree on fencing at Site 1 Outfall area, sign repaired	N/a	N/a
	April-June	N/a	N/a	N/a
	July-September	N/a	N/a	N/a
	October-December	N/a	N/a	N/a
2011	January-March	Trees on fence line have been cut, general well maintenance	N/a	N/a
	April-June	Tree removed from GW4, area has been maintained	N/a	Outfall cleaned of debris
	July-September	Tree lying on fence	N/a	Outfall requires cleaning
	October-December	N/a	N/a	N/a
2012	January-March	Fence at GW4 needs repair, general well maintenance	N/a	N/a
	April-June	Erosion hole under fence, missing sign, electrical conduit on ground, general well maintenance	N/a	N/a
	July-September			
	October-December			

Site 5 Five-Year Review, ABL West Virginia

	Inspection Quarter	Physical Access Restrictions	Activities	Groundwater Use
2008	January-March	N/a	N/a	N/a
	April-June	N/a	N/a	N/a
	July-September	N/a	N/a	N/a
	October-December	N/a	N/a	N/a
2009	January-March	N/a	N/a	N/a
	April-June	N/a	N/a	N/a
	July-September	Sign to main entrance of site knocked down, damaged	N/a	N/a
	October-December	Sign to main entrance of site knocked down, damaged, locks need replacing on wells	N/a	N/a
2010	January-March	Fallen tree on fence line, sign repaired, wells need maintenance	N/a	N/a
	April-June	Fencing and trespassing signs along river bank down in areas due to downed trees and flooding, outfall sign damaged and then repaired	N/a	N/a
	July-September	N/a	N/a	N/a
	October-December	General well maintenance	N/a	N/a
2011	January-March	Fencing damaged by trees falling, general well maintenance	N/a	N/a
	April-June	ATK addressing fencing, general well maintenance	N/a	N/a
	July-September	ATK addressing fencing, general well maintenance	N/a	N/a
	October-December	ATK addressing fencing, general well maintenance	N/a	N/a
2012	January-March	Fencing damaged, general well maintenance	N/a	N/a
	April-June	River fence down in two places, sign faded out, general well maintenance	Two semi trailers stored on site	N/a
	July-September	Missing sign, bee nest blocking access to vent riser, holes need to be drilled in vent risers, general well maintenance	N/a	N/a
	October-December			

Site 10 Five-Year Review, ABL West Virginia

	Inspection Quarter	Physical Access Restrictions	Activities	Groundwater Use
2008	January-March	N/a	N/a	N/a
	April-June	N/a	N/a	N/a
	July-September	N/a	N/a	N/a
	October-December	N/a	N/a	N/a
2009	January-March	N/a	N/a	N/a
	April-June	Two wells (10GW17 and 10GW18) had busted pads	N/a	N/a
	July-September	Three wells (10GW16, 10GW17, 10GW18) had busted pads	N/a	N/a
	October-December	Three wells (10GW16, 10GW17, 10GW18) had busted pads	N/a	N/a
2010	January-March	EV8 entrance hatch repaired	N/a	N/a
	April-June	Concrete pads for four wells are damaged (struck by bush hog)	N/a	N/a
	July-September	Tree removed from fencing of Site 1 Outfall area	N/a	N/a
	October-December	Concrete pads for four wells are damaged (struck by bush hog)	N/a	N/a
2011	January-March	General well maintenance	Dirt dumped at EW42 and GW9 from construction, remaining soil to be dumped in open area	N/a
	April-June	General well maintenance	Excavation ongoing, dirt removed to site 2	N/a
	July-September	General well maintenance	N/a	N/a
	October-December	General well maintenance	N/a	N/a
2012	January-March	General well maintenance	N/a	N/a
	April-June	General well maintenance	New transformers, backhoe, and wire spools stored on cement pad	N/a
	July-September			
	October-December			

Site 11 Five-Year Review, ABL West Virginia

	Inspection Quarter	Physical Access Restrictions	Activities	Groundwater Use
2008	January-March	N/a	N/a	N/a
	April-June	N/a	N/a	N/a
	July-September	N/a	N/a	N/a
	October-December	N/a	N/a	N/a
2009	January-March	N/a	N/a	N/a
	April-June	N/a	N/a	N/a
	July-September	N/a	N/a	N/a
	October-December	N/a	N/a	N/a
2010	January-March	N/a	N/a	N/a
	April-June	N/a	N/a	N/a
	July-September	N/a	N/a	N/a
	October-December	N/a	N/a	N/a
2011	January-March	N/a	N/a	N/a
	April-June	N/a	N/a	N/a
	July-September	N/a	N/a	N/a
	October-December	N/a	N/a	N/a
2012	January-March	N/a	N/a	N/a
	April-June	Well 11GW04 had a broken concrete pad.	N/a	N/a
	July-September	Well 11GW04 had a broken concrete pad and a bent bollard.	N/a	N/a
	October-December	N/a	N/a	N/a

Site 12 Five-Year Review, ABL West Virginia

	Inspection Quarter	Physical Access Restrictions	Activities	Groundwater Use
2008	January-March	N/a	Phase III Investigation for Remedial Investigation	N/a
	April-June	N/a	Phase III Investigation for Remedial Investigation	N/a
	July-September	N/a	N/a	N/a
	October-December	N/a	N/a	N/a
2009	January-March	N/a	N/a	N/a
	April-June	N/a	N/a	N/a
	July-September	N/a	N/a	N/a
	October-December	N/a	N/a	N/a
2010	January-March	N/a	N/a	N/a
	April-June	N/a	N/a	N/a
	July-September	N/a	N/a	N/a
	October-December	N/a	N/a	N/a
2011	January-March	N/a	N/a	N/a
	April-June	General well maintenance	N/a	N/a
	July-September	General well maintenance	N/a	N/a
	October-December	General well maintenance	N/a	N/a
2012	January-March	N/a	N/a	N/a
	April-June	General well maintenance	N/a	N/a
	July-September	General well maintenance	N/a	N/a
	October-December	General well maintenance	N/a	N/a

Appendix D
Interview Questionnaire

Interview with Janice Derby, Groundwater Treatment Plant Operator

Janice's responses provided in Blue

5 Year Review Interview Questions

Sites 1 and 10 Questions:

1. Are you aware of the remedy at the site? Yes
2. What are your overall impressions of remedy that was put in place and the ongoing operations at the site? The remedy is suitable and effective.
3. Are you aware of the groundwater extraction and the Treatment Plant at the site? Yes
4. Are you aware of the long-term management (LTM) component of the remedy (e.g., land use controls)? Yes
5. Are you aware of any community concerns regarding the site or its operation and administration? If so, please give details. No
6. Are you aware of any complaints, violations, or other incidents related to the site? If so, please give details of the events and results of the responses. Water level readings incorrect for first half of 2012. When problem discovered, monthly water level maps were corrected.
7. Have you ever performed or supervised work at the site? If so, please describe the work and indicate if you believe that work adversely impacts the remedy and/or LTM requirements? No.
8. Do you have any comments, suggestions or recommendations regarding the site's management? No
9. Do you feel well informed about the site's activities and progress? If not, would you like to be? Yes, as project manager, hold 2-3 weekly meetings about the site's activities and progress.

Additional questions for base-workers/O&M Manager/Project Manager:

1. Is the remedy functioning as expected? How well is the remedy performing? The remedy is currently partially achieving capture, and the team is working to restore full capture of groundwater.
2. Is there a continuous on-site O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities. Yes, full time operator, part time assistant operator, occasionally bring in staff with specific expertise (i.e., electrical) to guide problem solving.
3. Have there been any significant changes in the O&M requirements, maintenance schedules or sampling routines since start-up in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts. No changes in O&M requirements.

Site 5 Questions:

1. Are you aware of the remedy at the site? Yes
2. What are your overall impressions of remedies that were put in place at Site 5? The remedy is effective and low-maintenance.
3. Are you aware of the long-term management (LTM) component of the remedy (e.g., land use controls)? Yes
4. Are you aware of any community concerns regarding the site? If so, please give details. No
5. Are you aware of any complaints, violations, or other incidents related to the site? If so, please give details of the events and results of the responses. No
6. Have you ever performed or supervised work at the site? If so, please describe the work and indicate if you believe that work adversely impacts the remedy and/or LTM requirements? No.
7. Do you have any comments, suggestions or recommendations regarding the site's management? No
8. Do you feel well informed about the site's activities and progress? If not, would you like to be? Yes

Additional questions for base-workers/O&M Manager/Project Manager:

1. Is the remedy functioning as expected? How well is the remedy performing? Yes
2. Are site inspections done on a regular basis to ensure the protectiveness of the landfill cap? Yes, quarterly
3. Has any information come to light in the last five years that might indicate a lack in protectiveness concerning the landfill cap or the permeable reactive barrier? No

Sites 11 and 12 Questions:

1. Are you aware of the remedy at the site? Not involved in Sites 11 and 12.
2. What are your overall impressions of remedy that was put in place and the ongoing operations at the site? N/A
3. Are you aware of the long-term management (LTM) component of the remedy (e.g., institutional controls)? No
4. Are you aware of any community concerns regarding the site or its operation and administration? If so, please give details. No
5. Are you aware of any complaints, violations, or other incidents related to the site? If so, please give details of the events and results of the responses. No
6. Have you ever performed or supervised work at the site? If so, please describe the work and indicate if you believe that work adversely impacts the remedy and/or LTM requirements? No.
7. Do you have any comments, suggestions or recommendations regarding the site's management? No
8. Do you feel well informed about the site's activities and progress? If not, would you like to be? No

Additional questions for base-workers/O&M Manager/Project Manager:

1. Is the remedy functioning as expected? How well is the remedy performing? N/A
2. Is there a continuous on-site O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities. Quarterly inspections at Sites 11/12 performed by operator.

Interview with Les Mull, ATK representative and Environmental Compliance Manager

(ATK is the ABL facility operator)

Les's responses provided in Blue

5 Year Review Interview Questions

Sites 1, 5, 10, 11/12 Questions:

1. Are you aware of the remedy at the site? Yes. I am aware of the major remedial actions or activities at IRP Sites 1, 5, 10 and 11/12.

2. What are your overall impressions of remedy that was put in place and the ongoing operations at the site? I believe the remedial actions currently being employed at each of the aforementioned IRP sites are the most appropriate and cost effective measures available to the Navy for addressing each site's specific contaminants and characteristics.

3. Are you aware of the groundwater extraction and the Treatment Plant at the site? Yes. I am fully aware of all aspects related to the groundwater extraction ("pump and treat") system at IRP Sites 1 and 10.

4. Are you aware of the long-term management (LTM) component of the remedy (e.g., land use controls)? Yes. I am familiar with the primary LTM components for the subject sites including land use controls/restrictions. I also have a copy of the Facility-Wide Land Use Control Document for reference.

5. Are you aware of any community concerns regarding the site or its operation and administration? If so, please give details. No. I am not aware of any concerns within the local community regarding any of the IRP sites at ABL.

6. Are you aware of any complaints, violations, or other incidents related to the site? If so, please give details of the events and results of the responses. No. I am not aware of any complaints, violations, or other incidents related to any of the IRP sites at ABL.

7. Have you ever performed or supervised work at the site? If so, please describe the work and indicate if you believe that work adversely impacts the remedy and/or LTM requirements? No. I have not personally performed or supervised any work at any of the facility's IRP sites.

8. Do you have any comments, suggestions or recommendations regarding the site's management? From my perspective, as a representative of the ABL facility operator (i.e., ATK), it appears that the subject IRP sites are all being properly operated and maintained as intended.

9. Do you feel well informed about the site's activities and progress? If not, would you like to be? Yes. I believe I am more than adequately informed as to all ongoing and pending/planned activities at the various IRP sites on the facility.

Interview with Steve Blaisdell, Groundwater Treatment Plant Operator

Steve's responses provided in Blue

5 Year Review Interview Questions

Sites 1 and 10 Questions:

1. Are you aware of the remedy at the site? Yes
2. What are your overall impressions of remedy that was put in place and the ongoing operations at the site? State of the art when installed, ongoing maintenance needed
3. Are you aware of the groundwater extraction and the Treatment Plant at the site? Yes
4. Are you aware of the long-term management (LTM) component of the remedy (e.g., land use controls)? Yes
5. Are you aware of any community concerns regarding the site or its operation and administration? If so, please give details. There are concerns with ATK operations at ABL, but not with environmental sites.
6. Are you aware of any complaints, violations, or other incidents related to the site? If so, please give details of the events and results of the responses. No
7. Have you ever performed or supervised work at the site? If so, please describe the work and indicate if you believe that work adversely impacts the remedy and/or LTM requirements? Acting manager, GWTP operator. 2nd question: No
8. Do you have any comments, suggestions or recommendations regarding the site's management? No
9. Do you feel well informed about the site's activities and progress? If not, would you like to be? Yes, we have 2-3 weekly meetings about the site's activities and progress.

Additional questions for base-workers/O&M Manager/Project Manager:

1. Is the remedy functioning as expected? How well is the remedy performing? The remedy is currently partially achieving capture, and the team is working to restore full capture of groundwater.
2. Is there a continuous on-site O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities. Yes, including on-call for automatic shut down of treatment plant. Autodialer calls Steve's cell phone any time plant shuts down.
3. Have there been any significant changes in the O&M requirements, maintenance schedules or sampling routines since start-up in the last five years? If so, do they affect the protectiveness or effectiveness of the remedy? Please describe changes and impacts. No changes in O&M requirements.

Site 5 Questions:

1. Are you aware of the remedy at the site? Yes
2. What are your overall impressions of remedies that were put in place at Site 5? Monitoring, mowing, inspections, upkeep keep the remedy in good standing.
3. Are you aware of the long-term management (LTM) component of the remedy (e.g., land use controls)? Yes
4. Are you aware of any community concerns regarding the site? If so, please give details. No
5. Are you aware of any complaints, violations, or other incidents related to the site? If so, please give details of the events and results of the responses. No
6. Have you ever performed or supervised work at the site? If so, please describe the work and indicate if you believe that work adversely impacts the remedy and/or LTM requirements? Yes, acting manager of environmental sites at ABL.
7. Do you have any comments, suggestions or recommendations regarding the site's management? No
8. Do you feel well informed about the site's activities and progress? If not, would you like to be? Yes

Additional questions for base-workers/O&M Manager/Project Manager:

1. Is the remedy functioning as expected? How well is the remedy performing? Yes
2. Are site inspections done on a regular basis to ensure the protectiveness of the landfill cap? Yes, quarterly
3. Has any information come to light in the last five years that might indicate a lack in protectiveness concerning the landfill cap or the permeable reactive barrier? No

Sites 11 and 12 Questions:

1. Are you aware of the remedy at the site? No
2. What are your overall impressions of remedy that was put in place and the ongoing operations at the site? N/A
3. Are you aware of the long-term management (LTM) component of the remedy (e.g., institutional controls)? No
4. Are you aware of any community concerns regarding the site or its operation and administration? If so, please give details. No
5. Are you aware of any complaints, violations, or other incidents related to the site? If so, please give details of the events and results of the responses. No
6. Have you ever performed or supervised work at the site? If so, please describe the work and indicate if you believe that work adversely impacts the remedy and/or LTM requirements? Steve performs quarterly inspections of Sites 11/12.
7. Do you have any comments, suggestions or recommendations regarding the site's management? No
8. Do you feel well informed about the site's activities and progress? If not, would you like to be? No

Additional questions for base-workers/O&M Manager/Project Manager:

1. Is the remedy functioning as expected? How well is the remedy performing? N/A
2. Is there a continuous on-site O&M presence? If so, please describe staff and activities. If there is not a continuous on-site presence, describe staff and frequency of site inspections and activities. Quarterly inspections at Sites 11/12

Appendix E
2012 Five-Year Review Data

CTO-WE13
ABL, Site 1
Validated Fish Tissue Exceedance Analytical Results
2008-2012 LTM

Station ID	Region III Fish Tissue Screening Level	1SD-1/1SW-1					1SD-2/1SW-2			1SD-3/1SW-3				
Sample ID		AS01-B213(10)P-R07	AS01-B213(10)-R07	AS01-S212(10)-R07	AS01-B213(10)-R08	AS01-S212(10)-R08	AS01-S311(10)P-R07	AS01-S311(10)-R07	AS01-S311(10)-R08	AS01-B411(10)-R07	AS01-S410(10)-R07	AS01-B411(10)-R08	AS01-S410(10)P-R08	AS01-S410(10)-R08
Sample Date		06/24/10	06/24/10	06/24/10	06/27/12	06/27/12	06/23/10	06/23/10	06/26/12	06/23/10	06/23/10	06/26/12	06/26/12	06/26/12
Chemical Name														
Volatile Organic Compounds (UG/KG)														
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	4,100,000	120 U	92 U	NA	80 UL	NA	NA	NA	NA	93 U	NA	79 UL	NA	NA
Acetone	120,000	480 U	370 U	NA	180 L	NA	NA	NA	NA	370 U	NA	410 L	NA	NA
Carbon disulfide	14,000	120 U	92 U	NA	12 L	NA	NA	NA	NA	93 U	NA	79 UL	NA	NA
Methylene chloride	810	120 U	92 U	NA	160 L	NA	NA	NA	NA	93 U	NA	79 UL	NA	NA
Toluene	11,000	120 U	92 U	NA	80 UL	NA	NA	NA	NA	93 U	NA	79 UL	NA	NA
Trichlorofluoromethane (Freon-11)	41,000	120 U	92 U	NA	80 UL	NA	NA	NA	NA	93 U	NA	79 UL	NA	NA
Semivolatile Organic Compounds (UG/KG)														
2-Methylnaphthalene	540	42 U	7.5 J	NA	160 UL	NA	NA	NA	NA	35 U	NA	160 UL	NA	NA
4-Methylphenol	14,000	85 J	700	NA	310 L	NA	NA	NA	NA	520	NA	610 L	NA	NA
Acenaphthene	8,100	16 J	7.9 J	NA	160 UL	NA	NA	NA	NA	16 J	NA	160 UL	NA	NA
Acenaphthylene	--	42 U	38 U	NA	160 UL	NA	NA	NA	NA	35 U	NA	160 UL	NA	NA
Acetophenone	14,000	62 J	64 J	NA	790 UL	NA	NA	NA	NA	57 J	NA	780 UL	NA	NA
Benzaldehyde	14,000	440	370	NA	790 UL	NA	NA	NA	NA	400	NA	780 UL	NA	NA
Benzo(a)pyrene	0.4	42 U	38 U	NA	160 UL	NA	NA	NA	NA	35 U	NA	160 UL	NA	NA
Benzo(k)fluoranthene	43	42 U	38 UL	NA	160 UL	NA	NA	NA	NA	35 U	NA	160 UL	NA	NA
Carbazole	--	42 U	38 U	NA	160 UL	NA	NA	NA	NA	35 U	NA	160 UL	NA	NA
Diethylphthalate	110,000	210 U	190 U	NA	790 UL	NA	NA	NA	NA	21 J	NA	780 UL	NA	NA
Fluoranthene	5,400	42 U	38 U	NA	160 UL	NA	NA	NA	NA	6.7 J	NA	160 UL	NA	NA
Fluorene	5,400	17 J	9.7 J	NA	160 UL	NA	NA	NA	NA	11 J	NA	160 UL	NA	NA
Naphthalene	2,700	13 J	9.7 J	NA	160 UL	NA	NA	NA	NA	9.9 J	NA	160 UL	NA	NA
Phenanthrene	--	27 J	38 U	NA	160 UL	NA	NA	NA	NA	21 J	NA	160 UL	NA	NA
Phenol	41,000	93 J	330	NA	1,000 L	NA	NA	NA	NA	150 J	NA	340 L	NA	NA
Total Metals (MG/KG)														
Aluminum	140	60.3 J	38.2 J	42 J	42 B	52 B	81.3 J	31.9 J	18 B	37 J	99	23 B	57 B	95 B
Antimony	0.054	5.2 U	4.4 U	3.6 U	0.9 B	1.1 B	4.1 U	4.3 U	1.1 B	4.4 U	4.1 U	4.3 U	0.71 B	0.63 B
Arsenic	0.0021	5.2 U	4.4 U	3.6 U	3.9 U	3.4 U	4.1 U	4.3 U	3.9 U	4.4 U	4.1 U	4.3 U	3.6 U	3.1 U
Barium	27	6 J	8.1 J	4.4 J	2.6 J	4.6 J	6.8 J	3.7 J	4.3 J	2.6 J	3.4 J	3.1 J	3.9 J	5.6 J
Beryllium	0.27	2.1 U	1.8 U	1.4 U	1.6 U	1.4 U	1.6 U	1.7 U	1.6 U	1.8 U	1.7 U	1.7 U	1.4 U	1.2 U
Cadmium	0.14	**0.28 J**	**0.24 J**	**0.15 J**	0.19 B	0.16 B	0.12 J	0.11 J	0.16 B	**0.2 J**	0.12 J	0.18 B	0.13 B	0.13 B
Calcium	--	30,500 J	59,900 J	49,500	51,000 K	50,000 K	59,000 J	33,700 J	29,000 K	2,150 J	74,400	26,000 K	43,000 K	39,000 K
Chromium	--	0.67 J	0.97 J	1 J	0.59 J	0.56 J	1 J	0.74 J	2 U	0.85 J	1.5 J	2.2 U	0.51 J	0.58 J
Cobalt	0.041	26.2 U	**0.5 J**	**0.4 J**	**0.39 J**	**0.46 J**	**0.58 J**	**0.39 J**	20 U	**0.41 J**	**0.65 J**	22 U	**0.47 J**	**0.79 J**
Copper	5.4	**8.5 J**	**8.9 J**	4.3 J	2.7 J	3 J	**8 J**	**6.9 J**	**11**	4.9 J	4.8 J	3.4 J	2.8 J	4.6 J
Cyanide	0.081	2.6 U	2.4 U	1.7 U	1 B	0.52 B	2.2 U	2.1 U	1.3 B	2.2 U	2.1 U	1.2 B	0.62 B	0.71 B
Iron	95	**174**	**119**	**132**	**140**	**160**	**236 J**	**653 J**	62 B	**124**	**345**	**110**	**410 J**	**980 J**
Lead	--	1.6 U	1.3 U	1.1 U	1.2 U	1 U	1.2 U	1.3 U	1.2 U	1.3 U	1.2 U	1.3 U	1.1 U	0.93 U
Magnesium	--	1,650 J	1,790 J	1,420 J	1,600 J	1,400 J	1,590 J	1,380 J	1,300 J	921 J	2,020 J	1,200 J	1,400 J	1,400 J
Manganese	19	**34.3**	**49.3**	**223**	**57 J**	**210 J**	**186**	**97.2**	15 J	**19.2**	**79.5**	**39 J**	**140 J**	**110 J**
Mercury	--	0.15	0.21	0.058 J	0.16 U	0.13 U	0.089 J	0.079 J	0.12 J	0.14	0.18	0.11 J	0.13 U	0.13 U
Nickel	--	21 U	17.8 U	14.3 U	16 U	14 U	16.4 U	17.2 U	16 U	17.7 U	1.6 J	17 U	14 U	12 U
Potassium	--	16,200	14,000	10,000	13,000	12,000	12,300	13,000	12,000	13,700	13,400	13,000	12,000	12,000
Selenium	0.68	**3**	**2.3**	**4.1**	5.2 B	**6.1**	**4.5**	**4.2**	2.8 B	**2.4**	**3.3**	4.1 B	4.9 B	4.4 B
Silver	0.68	2.6 U	2.2 U	1.8 U	1.9 U	1.7 U	2 U	2.2 U	0.36 J	2.2 U	2.1 U	2.2 U	1.8 U	1.6 U
Sodium	--	5,040	4,240	4,080	5,100	4,500	5,080	3,970	4,400	3,220	4,930	5,000	4,400	4,400
Thallium	0.0014	5.2 U	4.4 U	3.6 U	3.9 U	3.4 U	4.1 U	4.3 U	3.9 U	4.4 U	4.1 U	4.3 U	3.6 U	3.1 U
Vanadium	0.68	**2.1 J**	**2.1 J**	**3.1 J**	**1.3 J**	17 U	**2.9 J**	**1.8 J**	20 U	22.2 U	**1.1 J**	**0.98 J**	18 U	0.63 J
Zinc	41	**85.7**	**81.4**	**76.8**	**70 J**	**73 J**	**87.6**	**76.8**	**87 J**	33.5	**85.4**	**50 J**	**67 J**	**81 J**
Wet Chemistry														
% Moisture (pct)	--	81	78.8	71.2	NA	NA	77	76.1	NA	76.8	76.3	NA	NA	NA
Lipids (%) (pct)	--	0.68	0.56	2.8	2.1	2.6	2	2.3	2.4	1.5	1.2	0.43	3.4	2.3

C:\Users\kmalley\Documents\Work\Klyukin_Rebekah\Jan 7 - FYR ABL\Appendixes\Appendix E_FYR Data\[ABL_Site 1_Fish_RDE Table.xls], mmorri13, 11/13/2012

Notes:

Shading indicates detections

Bold, underlined indicates exceedance

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

U - The material was analyzed for, but not detected

UL - Analyte not detected, quantitation limit is probably higher

MG/KG - Milligrams per kilogram

PCT - Percent

UG/KG - Micrograms per kilogram

CTO-WE13
ABL, Site 1
Validated Fish Tissue Exceedance Analytical Results
2008-2012 LTM

Station ID	1SD-4/1SW-4			1SD-5/1SW-5				5SD-1/5SW-1			BIOTA1	
Sample ID	AS01-S510(10)-R07	AS01-B511(10)-R08	AS01-S510(10)-R08	AS01-B612(10)-R07	AS01-S611(10)-R07	AS01-B612(10)-R08	AS01-S611(10)-R08	AS01-B112(10)-R07	AS01-S111(10)-R07	AS01-S111(10)-R08	AS01-B112(08)-R06	AS01-S111(08)-R06
Sample Date	06/22/10	06/25/12	06/25/12	06/22/10	06/22/10	06/25/12	06/25/12	06/24/10	06/24/10	06/27/12	08/14/08	08/14/08
Chemical Name												
Volatile Organic Compounds (UG/KG)												
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	NA	57 L	NA	120 U	NA	110 UL	NA	69 U	NA	NA	42 U	NA
Acetone	NA	620 L	NA	480 U	NA	440 L	NA	280 U	NA	NA	1,000 J	NA
Carbon disulfide	NA	120 UL	NA	120 U	NA	27 L	NA	69 U	NA	NA	42 U	NA
Methylene chloride	NA	140 L	NA	120 U	NA	120 L	NA	69 U	NA	NA	170 J	NA
Toluene	NA	120 UL	NA	120 U	NA	110 UL	NA	69 U	NA	NA	52 J	NA
Trichlorofluoromethane (Freon-11)	NA	120 UL	NA	120 U	NA	110 UL	NA	69 U	NA	NA	10 J	NA
Semivolatile Organic Compounds (UG/KG)												
2-Methylnaphthalene	NA	160 UL	NA	11 J	NA	160 UL	NA	NA	NA	NA	1,200 UL	NA
4-Methylphenol	NA	800 UL	NA	71 J	NA	760 UL	NA	NA	NA	NA	2,300 UL	NA
Acenaphthene	NA	160 UL	NA	15 J	NA	160 UL	NA	NA	NA	NA	1,200 UL	NA
Acenaphthylene	NA	160 UL	NA	5.3 J	NA	160 UL	NA	NA	NA	NA	1,200 UL	NA
Acetophenone	NA	800 UL	NA	170 J	NA	760 UL	NA	NA	NA	NA	1,400 L	NA
Benzaldehyde	NA	460 L	NA	650	NA	310 L	NA	NA	NA	NA	900 L	NA
Benzo(a)pyrene	NA	160 UL	NA	**47**	NA	160 UL	NA	NA	NA	NA	1,200 UL	NA
Benzo(k)fluoranthene	NA	160 UL	NA	12 J	NA	160 UL	NA	NA	NA	NA	1,200 UL	NA
Carbazole	NA	160 UL	NA	8.2 J	NA	160 UL	NA	NA	NA	NA	1,200 UL	NA
Diethylphthalate	NA	800 UL	NA	220 U	NA	760 UL	NA	NA	NA	NA	1,200 UL	NA
Fluoranthene	NA	160 UL	NA	50	NA	160 UL	NA	NA	NA	NA	1,200 UL	NA
Fluorene	NA	160 UL	NA	18 J	NA	160 UL	NA	NA	NA	NA	1,200 UL	NA
Naphthalene	NA	160 UL	NA	20 J	NA	160 UL	NA	NA	NA	NA	1,200 UL	NA
Phenanthrene	NA	160 UL	NA	50	NA	160 UL	NA	NA	NA	NA	1,200 UL	NA
Phenol	NA	160 UL	NA	140 J	NA	160 UL	NA	NA	NA	NA	3,300 L	NA
Total Metals (MG/KG)												
Aluminum	10 J	25 B	19 B	56.3 J	140	25 B	50 B	16 J	89.1 J	16 B	**203**	80.3
Antimony	3.8 U	0.78 B	0.74 B	5.6 U	4.1 U	4.2 U	3.6 U	3.4 U	4.8 U	0.87 B	1.5 U	1.8 B
Arsenic	3.8 U	4.3 U	4 U	5.6 U	**1 J**	4.2 U	3.6 U	3.4 U	**1.5 J**	3.6 U	1.4 U	1.1 U
Barium	5.4 J	2.2 J	3.3 J	10 J	9.7 J	2.5 J	3.7 J	2.9 J	6 J	2.2 J	5.9 J	6.3 J
Beryllium	1.5 U	1.7 U	1.6 U	2.2 U	1.6 U	1.7 U	1.5 U	1.4 U	1.9 U	1.5 U	0.08 U	0.06 U
Cadmium	1.9 U	0.23 B	0.14 B	**0.28 J**	**0.15 J**	0.16 B	0.18 B	0.13 J	**0.16 J**	0.14 B	0.39 U	0.31 U
Calcium	75,000	32,000 K	47,000 K	9,390	104,000	35,000 K	38,000 K	37,100	25,400 K	36,000 K	34,900	42,200
Chromium	1.1 J	2.2 U	0.41 J	2.8 U	1.9 J	0.42 J	0.5 J	1.5 J	0.99 J	0.31 J	2 J	1.7 J
Cobalt	19.1 U	22 U	20 U	**0.74 J**	**0.65 J**	21 U	**0.55 J**	17.1 U	**0.81 J**	18 U	1.8 U	1.4 U
Copper	3.4 J	**7 J**	2.6 J	**11.8 J**	**6.2 J**	2.9 J	2.9 J	3.5 J	**13.8**	3.2 J	4.6	**7.1**
Cyanide	1.9 U	0.93 B	0.49 B	2.8 U	2 U	2.2 U	0.49 B	1.7 U	2.4 U	1.1 B	0.44 U	**0.55 J**
Iron	47.1	**100**	45 B	**229**	**311**	**240**	**160**	72.7	**1,080 L**	60 B	**794**	**219**
Lead	1.1 U	1.3 U	1.2 U	1.7 U	1.2 U	1.3 U	1.1 U	1 U	1.4 U	1.1 U	1.7	0.74 J
Magnesium	1,860 J	1,400 J	1,600 J	1,250 J	2,100	1,400 J	1,300 J	1,300 J	1,340 J	1,200 J	1,360 J	1,310 J
Manganese	**57.6**	**36 J**	**110 J**	**49.5**	**319**	**24 J**	**190 J**	**35.6**	**54.2**	**77 J**	**49.9 K**	**79.2 K**
Mercury	0.13	0.061 J	0.093 J	0.2	0.068 J	0.081 J	0.12 U	0.053 J	0.17	0.058 J	0.07 UL	0.3 L
Nickel	15.2 U	17 U	16 U	22.5 U	16.3 U	17 U	15 U	13.7 U	19.2 U	15 U	1.3 J	0.9 J
Potassium	12,100	14,000	14,000	16,500	11,800	14,000	11,000	10,400	14,000	12,000	11,400	9,190
Selenium	**3.3**	5.2 B	4.6 B	**3.7**	**5**	3.1 B	**6.2**	**3.3**	**5**	4.7 B	**3 L**	**2.5 L**
Silver	1.9 U	2.2 U	2 U	2.8 U	2 U	2.1 U	1.8 U	1.7 U	2.4 U	1.8 U	0.22 U	0.21 J
Sodium	4,850	5,200	4,700	4,960	5,080	5,300	4,100	3,890	4,950	4,500	4,410	4,020
Thallium	3.8 U	4.3 U	4 U	5.6 U	**1.1 J**	4.2 U	3.6 U	3.4 U	**1.7 J**	3.6 U	1.7 U	1.3 U
Vanadium	**2 J**	22 U	20 U	28.1 U	**4.2 J**	**1.2 J**	18 U	**3 J**	**1.6 J**	18 U	**0.93 J**	0.49 J
Zinc	**84.2**	**57 J**	**59 J**	**58.8**	**103**	**49 J**	**75 J**	**58.2**	**87.6**	**77 J**	**57**	**84.7**
Wet Chemistry												
% Moisture (pct)	74	NA	NA	82.4	74.5	NA	NA	71.4	78.7	NA	NA	NA
Lipids (%) (pct)	0.6	2.6	1.3	0.74	2	0.69	3	3.3	1.1	2.8	NA	NA

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Notes:

Shading indicates detections

Bold, underlined indicates exceedance

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

U - The material was analyzed for, but not detected

UL - Analyte not detected, quantitation limit is probably higher

MG/KG - Milligrams per kilogram

PCT - Percent

UG/KG - Micrograms per kilogram

CTO-WE13
ABL, Site 1
Validated Fish Tissue Exceedance Analytical Results
2008-2012 LTM

Station ID	BIOTA2			BIOTA3	BIOTA4		BIOTA5		BIOTA6
Sample ID	AS01-B213(08)P-R06	AS01-B213(08)-R06	AS01-S212(08)-R06	AS01-S311(08)-R06	AS01-S410(08)P-R06	AS01-S410(08)-R06	AS01-B511(08)-R06	AS01-S510(08)-R06	AS01-S611(08)-R06
Sample Date	08/14/08	08/14/08	08/14/08	08/13/08	08/13/08	08/13/08	08/12/08	08/12/08	08/12/08
Chemical Name									
Volatile Organic Compounds (UG/KG)									
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	24 U	29 U	NA	NA	NA	NA	19 U	NA	NA
Acetone	1,400 J	740	NA	NA	NA	NA	720 J	NA	NA
Carbon disulfide	24 U	29 U	NA	NA	NA	NA	19 U	NA	NA
Methylene chloride	86 J	53	NA	NA	NA	NA	17 J	NA	NA
Toluene	16 J	8.3 J	NA	NA	NA	NA	4.4 J	NA	NA
Trichlorofluoromethane (Freon-11)	24 U	29 U	NA	NA	NA	NA	19 U	NA	NA
Semivolatile Organic Compounds (UG/KG)									
2-Methylnaphthalene	1,200 UL	1,500 UL	NA	NA	NA	NA	940 U	NA	NA
4-Methylphenol	2,400 UL	2,900 UL	NA	NA	NA	NA	1,800 U	NA	NA
Acenaphthene	1,200 UL	1,500 UL	NA	NA	NA	NA	940 U	NA	NA
Acenaphthylene	1,200 UL	1,500 UL	NA	NA	NA	NA	940 U	NA	NA
Acetophenone	1,200 L	2,000 L	NA	NA	NA	NA	940 U	NA	NA
Benzaldehyde	2,100 L	1,400 L	NA	NA	NA	NA	810 L	NA	NA
Benzo(a)pyrene	1,200 UL	1,500 UL	NA	NA	NA	NA	940 UL	NA	NA
Benzo(k)fluoranthene	1,200 UL	1,500 UL	NA	NA	NA	NA	940 UL	NA	NA
Carbazole	1,200 UL	1,500 UL	NA	NA	NA	NA	940 U	NA	NA
Diethylphthalate	1,200 UL	1,500 UL	NA	NA	NA	NA	940 U	NA	NA
Fluoranthene	1,200 UL	1,500 UL	NA	NA	NA	NA	940 U	NA	NA
Fluorene	1,200 UL	1,500 UL	NA	NA	NA	NA	940 U	NA	NA
Naphthalene	1,200 UL	1,500 UL	NA	NA	NA	NA	940 U	NA	NA
Phenanthrene	1,200 UL	1,500 UL	NA	NA	NA	NA	940 U	NA	NA
Phenol	1,200 UL	3,700 L	NA	NA	NA	NA	940 U	NA	NA
Total Metals (MG/KG)									
Aluminum	19 U	69.2 J	96.4	61.1 J	**222**	117	115	70 J	**146**
Antimony	1.7 B	1.9 U	**2.3 J**	1.7 B	**2.4 J**	**2.1 J**	1.6 B	1.5 U	1.8 B
Arsenic	1.5 U	1.8 U	1.2 U	1.3 U	1.2 U	1.1 U	1.1 U	1.3 U	**1.7 J**
Barium	2.6 J	8.6 J	6.6 J	6.9 J	5.1 J	4.1 J	4.5 J	4 J	7.2 J
Beryllium	0.09 U	0.1 U	0.07 U	0.07 U	0.09 J	0.06 J	0.06 U	0.08 U	0.07 U
Cadmium	0.43 U	0.49 U	0.32 U	0.35 U	0.35 U	0.29 U	0.31 U	0.37 U	0.36 U
Calcium	34,400	68,300	48,800	59,900	40,300	29,300	24,700	32,300	47,000
Chromium	1.4 J	2.5 J	1.6 J	1.7 J	1.8 J	1.3 J	1.1 J	1.4 J	1.8 J
Cobalt	2 U	2.3 U	1.5 U	1.6 U	1.6 U	1.4 U	1.4 U	1.7 U	1.7 U
Copper	2.9	**6.6**	4.7	2.9	3.1	2.3	3.4	3.5	4.5
Cyanide	**2 J**	**3**	0.37 U	0.41 U	0.38 U	0.32 U	0.36 U	**0.58 J**	0.41 U
Iron	81.8	**660**	**301**	**266**	**1,330**	**757**	**375**	**154**	**686**
Lead	0.81 J	1.5 J	1.5	0.59 U	1.6	0.92 J	0.71 J	0.95 J	1.1 J
Magnesium	1,420 J	1,900 J	1,470 J	1,680 J	1,370 J	1,040 J	1,270 J	1,330 J	1,550 J
Manganese	**22.3 K**	**87.8 K**	**142 K**	**73.7 K**	**104 K**	**73.3 K**	**151 K**	**114 K**	**134 K**
Mercury	0.13 L	0.11 L	0.057 UL	0.069 UL	0.064 UL	0.056 UL	0.059 UL	0.07 UL	0.068 UL
Nickel	0.36 U	0.9 J	1.8 J	0.67 J	2.1 J	1.6 J	1.1 J	1.5 J	2 J
Potassium	12,700	13,600	9,820	10,700	10,200	8,710	11,400	11,200	10,700
Selenium	**3.4 L**	**4.7 L**	**3.4 L**	**2.8 L**	**3.2 L**	**2.5 L**	**1.8 L**	**5.5 L**	**3.8 L**
Silver	0.24 U	0.43 J	0.3 J	0.2 U	0.36 J	0.2 J	0.38 J	0.28 J	0.21 U
Sodium	4,780	6,560	4,410	4,790	4,310	3,890	3,360	4,760	4,650
Thallium	1.8 U	2.1 U	1.4 U	1.5 U	1.5 U	1.3 U	1.3 U	1.6 U	1.5 U
Vanadium	0.64 J	**1.5 J**	**0.75 J**	**0.83 J**	**1.2 J**	**0.79 J**	0.52 J	0.51 J	**0.85 J**
Zinc	**55.3**	**95.9**	**89.3**	**91.1**	**84.3**	**53.4**	**67.2**	**103**	**104**
Wet Chemistry									
% Moisture (pct)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lipids (%) (pct)	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Notes:

Shading indicates detections

Bold, underlined indicates exceedance

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MG/KG - Milligrams per kilogram

PCT - Percent

UG/KG - Micrograms per kilogram

CTO-WE13
ABL, Site 1
Validated Groundwater Exceedance Analytical Results
2008-2012 Monitoring Well and Extraction Well Data

Station ID	**CLEAN MCL-Groundwater**	1EW04	1EW05	1EW06		1EW07		1EW08				1EW09
Sample ID		AS01-1EW04-R20	AS01-1EW05-CM20	AS01-1EW06-CM19	AS01-1EW06-CM19-S	AS01-1EW07-CM21	AS01-1EW07P-CM21	AS01-1EW08-CM19	AS01-1EW08-CM19-S	AS01-1EW08-CM20	AS01-1EW08-R20	AS01-1EW09-CM21
Sample Date		08/30/12	03/30/12	11/19/11	11/29/11	06/27/12	06/27/12	11/19/11	11/29/11	03/30/12	08/30/12	06/27/12
Chemical Name												
Volatile Organic Compounds (UG/L)												
1,1,1-Trichloroethane	200	0.5 U	0.25 U	0.25 U	NA	0.25 U	0.25 U	0.25 U	NA	0.25 U	0.5 U	0.25 U
1,1,2,2-Tetrachloroethane	--	0.4 U	0.2 U	0.2 U	NA	0.2 U	0.2 U	0.2 U	NA	0.2 U	0.4 U	0.2 U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	--	**5.02 J**	**2.81 J**	**2.45 J**	NA	**0.321 J**	0.25 UJ	0.25 U	NA	0.25 U	**6.52 J**	0.25 U
1,1,2-Trichloroethane	5	0.5 U	0.25 U	0.25 U	NA	0.25 U	0.25 U	0.25 U	NA	0.25 U	0.5 U	0.25 U
1,1-Dichloroethane	--	0.25 U	0.125 U	0.125 U	NA	0.125 U	0.125 U	0.125 U	NA	0.125 U	0.25 U	0.125 U
1,1-Dichloroethene	7	1 U	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.5 U	NA	0.5 U	**0.52 J**	0.5 U
1,2-Dichloroethane	5	0.5 U	0.25 U	0.25 U	NA	0.25 U	0.25 U	0.25 U	NA	0.25 U	0.5 U	0.25 U
1,2-Dichloroethene (total)	70	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	5	0.4 U	0.2 U	0.2 U	NA	0.2 U	0.2 U	0.2 U	NA	0.2 U	0.4 U	0.2 U
Acetone	--	5 UJ	2.5 U	2.5 R	NA	2.5 U	2.5 U	2.5 U	NA	2.5 U	5 U	2.5 R
Benzene	5	0.25 U	0.125 U	0.125 U	NA	0.125 U	0.125 U	0.125 U	NA	0.125 U	0.25 U	0.125 U
Bromodichloromethane	80	**0.321 J**	0.25 U	0.25 U	NA	0.25 U	0.25 U	0.25 U	NA	0.25 U	0.5 U	0.25 U
Carbon disulfide	--	1 U	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.5 U	NA	0.5 U	1 U	0.5 U
Carbon tetrachloride	5	0.5 U	0.25 U	0.25 U	NA	0.25 U	0.25 U	0.25 U	NA	0.25 U	0.5 U	0.25 U
Chlorobenzene	100	0.25 U	0.125 U	0.125 U	NA	0.125 U	0.125 U	0.125 U	NA	0.125 U	0.25 U	0.125 U
Chloroethane	--	1 U	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.5 U	NA	0.5 U	1 U	0.5 U
Chloroform	80	1.17 B	0.883 B	0.685 B	NA	**1.64 J**	**1.71 J**	**2 J**	NA	**1.32 J**	0.828 B	**0.809 J**
Chloromethane	--	1 U	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.5 U	NA	0.5 U	1 U	0.5 U
cis-1,2-Dichloroethene	70	0.5 U	**1.01 J**	0.25 U	NA	**1.15 J**	**1.2 J**	0.25 U	NA	0.25 U	**240**	0.25 U
Cyclohexane	--	2 U	0.25 U	0.25 U	NA	0.25 U	0.25 U	0.25 U	NA	0.25 U	2 U	0.25 U
Dibromochloromethane	80	**0.354 J**	0.25 U	0.25 U	NA	0.25 U	0.25 U	0.25 U	NA	0.25 U	0.5 U	0.25 U
Ethylbenzene	700	0.5 U	0.25 U	0.25 U	NA	0.25 U	0.25 U	0.25 U	NA	0.25 U	0.5 U	0.25 U
Methyl acetate	--	2 U	0.25 U	0.25 U	NA	0.25 U	0.25 U	0.25 UJ	NA	0.25 U	2 U	0.25 UJ
Methylcyclohexane	--	2 U	0.25 UJ	0.25 U	NA	0.25 U	0.25 U	0.25 U	NA	0.25 UJ	2 U	0.25 U
Methylene chloride	5	0.5 U	0.25 U	0.25 U	NA	0.25 U	0.25 U	0.25 U	NA	0.25 U	0.5 U	0.25 U
Methyl-tert-butyl ether (MTBE)	--	1 U	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.5 U	NA	0.5 U	1 U	0.5 U
Styrene	100	0.25 U	0.125 U	0.125 U	NA	0.125 U	0.125 U	0.125 U	NA	0.125 U	0.25 U	0.125 U
Tetrachloroethene	5	**0.723 J**	**0.938 J**	**0.519 J**	NA	**0.668 J**	**0.719 J**	**0.726 J**	NA	**0.401 J**	**1.77 J**	**0.467 J**
Toluene	1,000	0.5 U	0.25 U	0.25 U	NA	0.25 U	0.25 U	0.25 U	NA	0.25 U	0.5 U	0.25 U
trans-1,2-Dichloroethene	100	0.5 U	0.25 U	0.25 U	NA	0.25 U	0.25 U	0.25 U	NA	0.25 U	**1.44**	0.25 U
Trichloroethene	5	**2.82**	**24.1**	**21.6**	NA	**26.5**	**28.5**	**15.1**	NA	**8.74**	**272**	**10.5**
Trichlorofluoromethane (Freon-11)	--	1 U	0.25 U	0.25 U	NA	0.25 U	0.25 U	0.25 U	NA	0.25 U	1 U	0.25 U
Vinyl chloride	2	0.5 U	0.25 U	0.25 U	NA	0.25 U	0.25 U	0.25 U	NA	0.25 U	**12.7**	0.25 U
Semivolatile Organic Compounds (UG/L)												
No Detections		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives (UG/L)												
HMX	--	NA	**0.897 J**	**1.12**	NA	**0.658 J**	**0.654 J**	**0.722 J**	NA	0.255 U	NA	**1.57**
Nitroglycerin	--	NA	0.255 U	0.272 U	NA	0.25 U	0.263 U	0.281 U	NA	0.255 U	NA	0.255 U
Perchlorate	--	NA	**66.5**	**69**	NA	**53.6**	**53**	**31.5**	NA	**13.3**	NA	**17**
RDX	--	NA	**1.66**	**3.67**	NA	**3.52**	**3.43**	**2.67**	NA	0.255 U	NA	**0.773 J**
Total Metals (UG/L)												
Aluminum	--	NA	50 U	50 U	NA	50 U	50 U	50 U	NA	50 U	NA	50 U
Antimony	6	NA	0.5 U	0.5 U	NA	0.5 U	0.5 U	0.5 U	NA	0.5 U	NA	0.5 U
Arsenic	10	NA	**0.53 J**	**0.937 J**	NA	0.5 U	0.5 U	0.5 U	NA	0.5 U	NA	0.5 U
Barium	2,000	NA	**93.8**	**119**	NA	**98.3**	**97.9**	**75.8**	NA	**75.3**	NA	**66.5**
Beryllium	4	NA	1 U	1 U	NA	1 U	1 U	1 U	NA	1 U	NA	1 U
Cadmium	5	NA	0.25 UL	0.25 U	NA	0.25 U	0.25 U	0.25 U	NA	0.25 U	NA	0.25 U
Calcium	--	NA	**86,600**	**101,000**	NA	**84,500**	**80,600**	**81,600**	NA	**82,600**	NA	**68,600**
Chromium	100	NA	10 U	**19.1 J**	NA	**11.7 J**	10 U	10 U	NA	10 U	NA	10 U
Cobalt	--	NA	10 U	10 U	NA	10 U	10 U	10 U	NA	10 U	NA	10 U
Copper	1,300	NA	10 U	10 U	NA	10 U	10 U	10 U	NA	**26**	NA	10 U
Cyanide	200	NA	5 U	5 U	NA	5 U	5 U	5 U	NA	5 U	NA	5 U
Iron	--	NA	**50.7 J**	**510 J**	NA	**600**	50 U	**85 J**	NA	50 U	NA	50 U
Lead	15	NA	**4.15 J**	**5.34**	NA	2.5 U	**4.18 J**	2.5 U	NA	2.5 U	NA	**4.01 J**
Magnesium	--	NA	**16,900**	**17,200**	NA	**14,400**	**14,100**	**12,500**	NA	**14,100**	NA	**12,200**
Manganese	--	NA	5 U	**5.99 J**	NA	5 U	5 U	5 U	NA	5 U	NA	5 U
Nickel	--	NA	20 U	20 U	NA	20 U	20 U	20 U	NA	20 U	NA	20 U
Potassium	--	NA	**1,530**	**1,730**	NA	**1,230**	**1,330**	**1,250**	NA	**1,260**	NA	**1,090**
Selenium	50	NA	5 U	**10.7**	NA	5 U	5 U	5 U	NA	5 U	NA	5 U
Silver	--	NA	2 U	2 UL	NA	**3.56 J**	**2.17 J**	2 UL	NA	2 U	NA	**2.36 J**
Sodium	--	NA	**66,400**	**69,300**	NA	**60,200**	**59,900**	**58,000**	NA	**53,100**	NA	**63,900**
Thallium	2	NA	0.1 U	0.1 U	NA	0.1 U	0.1 U	0.1 U	NA	0.1 U	NA	0.1 U
Vanadium	--	NA	5 U	5 U	NA	**9.38 J**	**6.54 J**	5 U	NA	5 U	NA	5 U

CTO-WE13
ABL, Site 1
Validated Groundwater Exceedance Analytical Results
2008-2012 Monitoring Well and Extraction Well Data

Station ID	**CLEAN MCL-Groundwater**	1EW04	1EW05	1EW06		1EW07		1EW08				1EW09
Sample ID		AS01-1EW04-R20	AS01-1EW05-CM20	AS01-1EW06-CM19	AS01-1EW06-CM19-S	AS01-1EW07-CM21	AS01-1EW07P-CM21	AS01-1EW08-CM19	AS01-1EW08-CM19-S	AS01-1EW08-CM20	AS01-1EW08-R20	AS01-1EW09-CM21
Sample Date		08/30/12	03/30/12	11/19/11	11/29/11	06/27/12	06/27/12	11/19/11	11/29/11	03/30/12	08/30/12	06/27/12
Chemical Name												
Zinc	--	NA	10 U	**20.2**	NA	**35.5**	10 U	10 U	NA	**11.3 J**	NA	10 U
Dissolved Metals (UG/L)												
Arsenic, Dissolved	10	NA	**0.516 J**	**0.644 J**	NA	0.5 U	0.5 U	0.5 U	NA	**0.614 J**	NA	0.5 U
Barium, Dissolved	2,000	NA	**97.1**	**116**	NA	**98.7**	**96.5**	**78.1**	NA	**79.2**	NA	**65.8**
Calcium, Dissolved	--	NA	**86,700**	**98,500**	NA	**81,000**	**78,700**	**83,700**	NA	**87,000**	NA	**68,500**
Chromium, Dissolved	100	NA	10 U	10 U	NA	10 U	10 U	10 U	NA	10 U	NA	10 U
Copper, Dissolved	1,300	NA	10 U	10 U	NA	10 U	10 U	10 U	NA	**24.8**	NA	10 U
Iron, Dissolved	--	NA	50 U	**111**	NA	50 U	50 U	**80.2 J**	NA	50 U	NA	50 U
Lead, Dissolved	15	NA	**3.41 J**	**2.91 J**	NA	**4.68 J**	**2.82 J**	2.5 U	NA	2.5 U	NA	**2.58 J**
Magnesium, Dissolved	--	NA	**16,400**	**17,800**	NA	**13,900**	**13,700**	**13,200**	NA	**14,400**	NA	**12,100**
Manganese, Dissolved	--	NA	5 U	5 U	NA	5 U	5 U	5 U	NA	5 U	NA	5 U
Mercury, Dissolved	2	NA	0.1 U	0.1 U	NA	0.1 U	0.1 U	0.1 U	NA	0.1 U	NA	0.1 U
Nickel, Dissolved	--	NA	20 U	20 U	NA	20 U	20 U	20 U	NA	20 U	NA	20 U
Potassium, Dissolved	--	NA	**1,470**	**1,760**	NA	**1,170**	**1,120**	**1,320**	NA	**1,280**	NA	**1,100**
Selenium, Dissolved	50	NA	5 U	**10.3**	NA	5 U	5 U	**6.63 J**	NA	5 U	NA	5 U
Silver, Dissolved	--	NA	2 U	2 UL	NA	**2.51 J**	**2.18 J**	2 UL	NA	2 U	NA	**2.29 J**
Sodium, Dissolved	--	NA	**65,500**	**66,800**	NA	**59,100**	**59,300**	**59,000**	NA	**55,200**	NA	**63,800**
Vanadium, Dissolved	--	NA	5 U	5 U	NA	**6.6 J**	**6.16 J**	5 U	NA	5 U	NA	**5.08 J**
Zinc, Dissolved	--	NA	10 U	10 U	NA	10 U	10 U	10 U	NA	**11.4 J**	NA	10 U

C:\Users\kmalley\Documents\Work\Klyukin_Rebekah\Jan 7 - FYR ABL\Appendixes\Appendix E_FYR Data\[ABL_Site 1_GW_RDE Table.xls], mmorri13, 11/13/2012

Notes:

Exceeds all criteria

Bold indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

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R - Unreliable Result

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UQ

UG/L - Micrograms per liter

CTO-WE13
ABL, Site 1
Validated Groundwater Exceedance Analytical Results
2008-2012 Monitoring Well and Extraction Well Data

Station ID	CLEAN MCL-Groundwater	1EW10					1EW11	1EW12		1EW13		1EW14		
Sample ID		AS01-1EW10-CM19	AS01-1EW10P-CM19	AS01-1EW10-CM19-S	AS01-1EW10P-CM19-S	AS01-1EW10-CM20	AS01-1EW11-CM21	AS01-1EW12-CM21	AS01-1EW12-R20	AS01-1EW13P-R20	AS01-1EW13-R20	AS01-1EW14-CM19	AS01-1EW14-CM19-S	AS01-1EW14-CM20
Sample Date		11/19/11	11/19/11	11/29/11	11/29/11	03/30/12	06/27/12	06/28/12	08/29/12	08/30/12	08/30/12	11/19/11	11/29/11	03/30/12
Chemical Name														
Volatile Organic Compounds (UG/L)														
1,1,1-Trichloroethane	200	0.25 U	0.25 U	NA	NA	0.25 U	0.25 U	0.25 U	0.5 U	**0.418 J**	**0.353 J**	**1.97 J**	NA	**3.68 J**
1,1,2,2-Tetrachloroethane	--	0.2 U	0.2 U	NA	NA	0.2 U	0.2 U	0.2 U	0.4 U	0.4 U	0.4 U	0.2 U	NA	2 U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	--	0.25 U	0.25 U	NA	NA	0.25 U	0.25 U	0.25 U	4 U	4 U	4 U	0.25 U	NA	2.5 U
1,1,2-Trichloroethane	5	0.25 U	0.25 U	NA	NA	0.25 U	0.25 U	0.25 U	0.5 U	0.5 U	0.5 U	0.25 U	NA	2.5 U
1,1-Dichloroethane	--	0.125 U	0.125 U	NA	NA	0.125 U	0.125 U	0.125 U	0.25 U	0.25 U	0.25 U	0.125 U	NA	1.25 U
1,1-Dichloroethene	7	0.5 U	0.5 U	NA	NA	0.5 U	0.5 U	0.5 U	1 U	1 U	1 U	**0.558 J**	NA	5 U
1,2-Dichloroethane	5	0.25 U	0.25 U	NA	NA	0.25 U	0.25 U	0.25 U	0.5 U	0.5 U	0.5 U	0.25 U	NA	2.5 U
1,2-Dichloroethene (total)	70	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	5	0.2 U	0.2 U	NA	NA	0.2 U	0.2 U	0.2 U	0.4 U	0.4 U	0.4 U	0.2 U	NA	2 U
Acetone	--	2.5 R	2.5 R	NA	NA	2.5 U	2.5 R	2.5 U	5 UJ	5 R	5 U	2.5 R	NA	25 U
Benzene	5	0.125 U	0.125 U	NA	NA	0.125 U	0.125 U	0.125 U	0.25 U	0.25 U	0.25 U	0.125 U	NA	1.25 U
Bromodichloromethane	80	0.25 U	0.25 U	NA	NA	0.25 U	0.25 U	0.25 U	0.5 U	0.5 U	0.5 U	0.25 U	NA	2.5 U
Carbon disulfide	--	0.5 U	0.5 U	NA	NA	0.5 U	0.5 U	0.5 U	1 U	1 U	1 U	0.5 U	NA	5 U
Carbon tetrachloride	5	0.25 U	0.25 U	NA	NA	0.25 U	0.25 U	0.25 U	0.5 U	0.5 U	0.5 U	0.25 U	NA	2.5 U
Chlorobenzene	100	0.125 U	0.125 U	NA	NA	0.125 U	0.125 U	0.125 U	0.25 U	0.25 U	0.25 U	**0.232 J**	NA	1.25 U
Chloroethane	--	0.5 U	0.5 U	NA	NA	0.5 U	0.5 U	0.5 U	1 U	1 U	1 U	0.5 U	NA	5 U
Chloroform	80	0.125 U	0.125 U	NA	NA	0.125 U	**0.312 J**	0.125 U	0.25 U	0.25 U	0.25 U	0.182 B	NA	1.25 U
Chloromethane	--	0.5 U	0.5 U	NA	NA	0.5 U	0.5 U	0.5 U	1 U	1 U	1 U	0.5 U	NA	5 U
cis-1,2-Dichloroethene	70	**1.59 J**	**1.56 J**	NA	NA	**1.09 J**	**2.23 J**	**2.32 J**	**1.2**	**3.57**	**3.8**	**114**	NA	**141**
Cyclohexane	--	0.25 U	0.25 U	NA	NA	0.25 U	0.25 U	0.25 U	2 U	2 U	2 U	0.25 U	NA	2.5 U
Dibromochloromethane	80	0.25 U	0.25 U	NA	NA	0.25 U	0.25 U	0.25 U	0.5 U	0.5 U	0.5 U	0.25 U	NA	2.5 U
Ethylbenzene	700	0.25 U	0.25 U	NA	NA	0.25 U	0.25 U	0.25 U	0.5 U	0.5 U	0.5 U	0.25 U	NA	2.5 U
Methyl acetate	--	0.25 U	0.25 U	NA	NA	0.25 U	0.25 U	0.25 U	2 U	2 U	2 U	0.25 U	NA	2.5 U
Methylcyclohexane	--	0.25 U	0.25 U	NA	NA	0.25 UJ	0.25 U	0.25 U	2 U	2 U	2 U	0.25 U	NA	2.5 UJ
Methylene chloride	5	0.25 U	0.25 U	NA	NA	0.25 U	0.25 U	0.25 U	0.5 U	0.5 U	0.5 U	0.25 U	NA	2.5 U
Methyl-tert-butyl ether (MTBE)	--	0.5 U	0.5 U	NA	NA	0.5 U	0.5 U	0.5 U	1 U	1 U	1 U	0.5 U	NA	5 U
Styrene	100	0.125 U	0.125 U	NA	NA	0.125 U	0.125 U	0.125 U	0.25 U	0.25 U	0.25 U	0.125 U	NA	1.25 U
Tetrachloroethene	5	**1.06 J**	**1.1 J**	NA	NA	**0.659 J**	**1.31 J**	**0.351 J**	**0.512 J**	**0.415 J**	**0.451 J**	**0.718 J**	NA	2.5 U
Toluene	1,000	0.25 U	0.25 U	NA	NA	0.25 U	0.25 U	0.25 U	0.5 U	0.5 U	0.5 U	0.25 U	NA	2.5 U
trans-1,2-Dichloroethene	100	0.25 U	0.25 U	NA	NA	0.25 U	0.25 U	0.25 U	0.5 U	0.5 U	0.5 U	**0.975 J**	NA	2.5 U
Trichloroethene	5	**26.2**	**26.1**	NA	NA	**28.3**	**11.5**	**21.4**	**18.4**	**94.3**	**93.7**	**1,630**	NA	**2,110**
Trichlorofluoromethane (Freon-11)	--	0.25 U	0.25 U	NA	NA	0.25 U	0.25 U	0.25 U	1 U	1 U	1 U	0.25 U	NA	2.5 U
Vinyl chloride	2	0.25 U	0.25 U	NA	NA	0.25 U	0.25 U	0.25 U	0.5 U	0.5 U	0.5 U	0.25 U	NA	2.5 U
Semivolatile Organic Compounds (UG/L)														
No Detections		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives (UG/L)														
HMX	--	**9.5**	**10.1**	NA	NA	**8.91**	**3.69**	**1.06**	NA	NA	NA	**6.22**	NA	**4.38**
Nitroglycerin	--	0.294 U	0.275 U	NA	NA	0.258 U	0.26 U	0.26 U	NA	NA	NA	0.266 U	NA	0.255 U
Perchlorate	--	**12.7**	**13**	NA	NA	**23.3**	**107**	**24.2**	NA	NA	NA	**845**	NA	**1,160**
RDX	--	**6.04**	**6.36**	NA	NA	**9.95**	**3.57**	**7.88**	NA	NA	NA	**34.6**	NA	**41.2**
Total Metals (UG/L)														
Aluminum	--	50 U	50 U	NA	NA	50 U	50 U	50 U	NA	NA	NA	50 U	NA	50 U
Antimony	6	0.5 U	0.5 U	NA	NA	0.5 U	0.5 U	0.5 U	NA	NA	NA	0.5 U	NA	0.5 U
Arsenic	10	**0.59 J**	**0.534 J**	NA	NA	0.5 U	0.5 U	0.5 U	NA	NA	NA	0.5 U	NA	0.5 U
Barium	2,000	**94.6**	**96.6**	NA	NA	**76.9**	**99.6**	**91.5**	NA	NA	NA	**82.9**	NA	**71.5**
Beryllium	4	1 U	1 U	NA	NA	1 U	1 U	1 U	NA	NA	NA	1 U	NA	1 U
Cadmium	5	0.25 U	0.25 U	NA	NA	0.25 U	0.25 U	0.25 U	NA	NA	NA	0.25 U	NA	0.25 UL
Calcium	--	**84,400**	**83,500**	NA	NA	**67,900**	**69,600**	**60,400**	NA	NA	NA	**53,300**	NA	**44,400**
Chromium	100	**207**	**196**	NA	NA	10 U	10 U	10 U	NA	NA	NA	10 U	NA	10 U
Cobalt	--	10 U	10 U	NA	NA	10 U	10 U	10 U	NA	NA	NA	10 U	NA	10 U
Copper	1,300	**98.5**	**89.6**	NA	NA	10 U	10 U	10 U	NA	NA	NA	10 U	NA	10 U
Cyanide	200	5 U	5 U	NA	NA	5 U	5 U	5 U	NA	NA	NA	5 U	NA	5 U
Iron	--	**1,070 J**	**983 J**	NA	NA	50 U	50 U	50 U	NA	NA	NA	**57.9 J**	NA	50 U
Lead	15	**14.8 J**	**10.7 J**	NA	NA	2.5 U	**3.69 J**	**3.76 J**	NA	NA	NA	**2.52 J**	NA	2.5 U
Magnesium	--	**13,900**	**14,000**	NA	NA	**12,300**	**13,100**	**11,900**	NA	NA	NA	**10,100**	NA	**8,820**
Manganese	--	**20.4**	**20.6**	NA	NA	5 U	5 U	5 U	NA	NA	NA	**89.6**	NA	**39.2**
Nickel	--	**87.7**	**89.3**	NA	NA	20 U	20 U	20 U	NA	NA	NA	20 U	NA	20 U
Potassium	--	**943 J**	**918 J**	NA	NA	**806 J**	**752 J**	**884 J**	NA	NA	NA	**763 J**	NA	**550 J**
Selenium	50	**6.08 J**	**5.85 J**	NA	NA	5 U	5 U	5 U	NA	NA	NA	5 U	NA	5 U
Silver	--	2 UL	2 UL	NA	NA	2 U	**2.28 J**	2 U	NA	NA	NA	2 UL	NA	2 U
Sodium	--	**76,700**	**77,400**	NA	NA	**73,900**	**64,400**	**35,500**	NA	NA	NA	**13,800**	NA	**8,630**
Thallium	2	0.1 U	0.1 U	NA	NA	0.1 U	0.1 U	0.1 U	NA	NA	NA	0.1 U	NA	0.1 U
Vanadium	--	5 U	5 U	NA	NA	5 U	**5.09 J**	**5.77 J**	NA	NA	NA	5 U	NA	5 U

CTO-WE13
ABL, Site 1
Validated Groundwater Exceedance Analytical Results
2008-2012 Monitoring Well and Extraction Well Data

Station ID	CLEAN MCL-Groundwater	1EW10					1EW11	1EW12		1EW13		1EW14		
Sample ID		AS01-1EW10-CM19	AS01-1EW10P-CM19	AS01-1EW10-CM19-S	AS01-1EW10P-CM19-S	AS01-1EW10-CM20	AS01-1EW11-CM21	AS01-1EW12-CM21	AS01-1EW12-R20	AS01-1EW13P-R20	AS01-1EW13-R20	AS01-1EW14-CM19	AS01-1EW14-CM19-S	AS01-1EW14-CM20
Sample Date		11/19/11	11/19/11	11/29/11	11/29/11	03/30/12	06/27/12	06/28/12	08/29/12	08/30/12	08/30/12	11/19/11	11/29/11	03/30/12
Chemical Name														
Zinc	--	**24.2**	**24.4**	NA	NA	10 U	**30.4**	10 U	NA	NA	NA	10 U	NA	10 U
Dissolved Metals (UG/L)														
Arsenic, Dissolved	10	0.5 U	**0.539 J**	NA	NA	0.5 U	0.5 U	0.5 U	NA	NA	NA	0.5 U	NA	0.5 U
Barium, Dissolved	2,000	**93.9**	**96.5**	NA	NA	**78.4**	**102**	**92**	NA	NA	NA	**83.2**	NA	**74.1**
Calcium, Dissolved	--	**83,200**	**84,700**	NA	NA	**69,400**	**70,900**	**59,700**	NA	NA	NA	**53,700**	NA	**45,600**
Chromium, Dissolved	100	**17.3 J**	**17.3 J**	NA	NA	10 U	10 U	10 U	NA	NA	NA	10 U	NA	10 U
Copper, Dissolved	1,300	**61.5 J**	**93.6 J**	NA	NA	10 U	10 U	10 U	NA	NA	NA	10 U	NA	10 U
Iron, Dissolved	--	**174**	**180**	NA	NA	50 U	50 U	50 U	NA	NA	NA	**53.3 J**	NA	50 U
Lead, Dissolved	15	**4.11 J**	**3.86 J**	NA	NA	**2.57 J**	**3.91 J**	**3.57 J**	NA	NA	NA	2.5 U	NA	**2.76 J**
Magnesium, Dissolved	--	**13,900**	**14,400**	NA	NA	**12,200**	**13,500**	**11,700**	NA	NA	NA	**9,700**	NA	**9,230**
Manganese, Dissolved	--	**19.4**	**20.2**	NA	NA	5 U	5 U	5 U	NA	NA	NA	**84**	NA	**27**
Mercury, Dissolved	2	0.1 U	0.1 U	NA	NA	0.1 U	0.1 U	0.1 U	NA	NA	NA	**0.183 J**	NA	0.1 U
Nickel, Dissolved	--	**84.2**	**86.2**	NA	NA	20 U	20 U	20 U	NA	NA	NA	20 U	NA	20 U
Potassium, Dissolved	--	**966 J**	**950 J**	NA	NA	**803 J**	**798 J**	**755 J**	NA	NA	NA	**727 J**	NA	**566 J**
Selenium, Dissolved	50	**9.62 J**	**6.52 J**	NA	NA	5 U	5 U	5 U	NA	NA	NA	5 U	NA	5 U
Silver, Dissolved	--	2 UL	2 UL	NA	NA	2 U	**2.47 J**	**2.35 J**	NA	NA	NA	2 UL	NA	2 U
Sodium, Dissolved	--	**76,000**	**78,100**	NA	NA	**73,600**	**66,900**	**35,700**	NA	NA	NA	**13,600**	NA	**8,990**
Vanadium, Dissolved	--	5 U	5 U	NA	NA	5 U	**5.72 J**	5 U	NA	NA	NA	5 U	NA	5 U
Zinc, Dissolved	--	**22.3 J**	**31.4 J**	NA	NA	10 U	**30.9**	10 U	NA	NA	NA	10 U	NA	10 U

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Notes:

Exceeds all criteria

Bold indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

UQ

UG/L - Micrograms per liter

CTO-WE13
ABL, Site 1
Validated Groundwater Exceedance Analytical Results
2008-2012 Monitoring Well and Extraction Well Data

Station ID	CLEAN MCL-Groundwater	1EW16				1EW17	1EW18	1EW19					1EW24	1EW28
Sample ID		AS01-1EW16-CM20	AS01-1EW16P-CM20	AS01-1EW16-CM21	AS01-1EW16-R20	AS01-1EW17-CM19	AS01-1EW18-R20	AS01-1EW19-CM19	AS01-1EW19-CM19-S	AS01-1EW19-CM20	AS01-1EW19-CM21	AS01-1EW19-R20	AS01-1EW24-R20	AS01-1EW28-R20
Sample Date		03/30/12	03/30/12	06/28/12	08/29/12	11/29/11	08/29/12	11/19/11	11/29/11	03/30/12	06/28/12	08/29/12	08/30/12	08/29/12
Chemical Name														
Volatile Organic Compounds (UG/L)														
1,1,1-Trichloroethane	200	**9.53**	**9.28**	**10.4**	**11.1**	**284**	**712 J**	**205**	NA	**80.1 J**	**102**	**149**	**0.393 J**	**0.477 J**
1,1,2,2-Tetrachloroethane	--	0.2 U	0.2 U	0.2 U	0.4 U	0.2 U	0.4 U	0.2 U	NA	5 U	0.2 U	10 U	0.4 U	0.4 U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	--	0.25 U	0.25 U	0.25 U	4 U	0.25 U	4 U	0.25 U	NA	6.25 U	**2.29 J**	100 U	4 U	4 U
1,1,2-Trichloroethane	5	0.25 U	0.25 U	0.25 U	0.5 U	**1.05 J**	**1.78**	**1.03 J**	NA	6.25 U	**0.28 J**	12.5 U	0.5 U	0.5 U
1,1-Dichloroethane	--	**0.286 J**	**0.283 J**	**0.308 J**	**0.32 J**	**12.6**	**28**	**13.8**	NA	3.13 U	**4.84 J**	**6.89 J**	0.25 U	0.25 U
1,1-Dichloroethene	7	**0.642 J**	**0.699 J**	**1.11 J**	**0.935 J**	**40.3**	**77.9**	**38.1**	NA	12.5 U	**16.4**	**21.7 J**	**2 J**	1 U
1,2-Dichloroethane	5	0.25 U	0.25 U	0.25 U	0.5 U	0.25 U	0.5 U	0.25 U	NA	6.25 U	0.25 U	12.5 U	0.5 U	0.5 U
1,2-Dichloroethene (total)	70	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	5	0.2 U	0.2 U	0.2 U	0.4 U	**16.9**	0.4 U	0.2 U	NA	5 U	0.2 U	10 U	0.4 U	0.4 U
Acetone	--	2.5 U	2.5 U	2.5 U	5 U	2.5 R	5 R	2.5 R	NA	62.5 U	2.5 U	125 R	5 R	5 U
Benzene	5	0.125 U	0.125 U	0.125 U	0.25 U	**0.195 J**	**0.64**	**0.269 J**	NA	3.13 U	0.125 U	6.25 U	0.25 U	0.25 U
Bromodichloromethane	80	0.25 U	0.25 U	0.25 U	0.5 U	0.25 U	0.5 U	0.25 U	NA	6.25 U	0.25 U	12.5 U	0.5 U	0.5 U
Carbon disulfide	--	0.5 U	0.5 U	0.5 U	1 U	0.5 U	1 U	0.5 U	NA	12.5 U	0.5 U	25 U	1 U	1 U
Carbon tetrachloride	5	0.25 U	0.25 U	0.25 U	0.5 U	0.25 U	0.5 U	0.25 U	NA	6.25 U	0.25 U	12.5 U	0.5 U	0.5 U
Chlorobenzene	100	0.125 U	0.125 U	0.125 U	0.25 U	**1.11 J**	**2.14**	**1.12 J**	NA	3.13 U	**0.444 J**	6.25 U	0.25 U	0.25 U
Chloroethane	--	0.5 U	0.5 U	0.5 U	1 U	0.5 U	1 U	0.5 U	NA	12.5 U	0.5 U	25 U	1 U	1 U
Chloroform	80	0.125 U	0.127 B	0.125 U	0.157 B	0.316 B	0.641 B	0.54 B	NA	3.13 U	**0.325 J**	6.25 U	0.25 U	0.533 B
Chloromethane	--	0.5 U	0.5 U	0.5 U	1 U	0.5 U	1 U	0.5 U	NA	12.5 U	0.5 U	25 U	1 U	1 U
cis-1,2-Dichloroethene	70	**22**	**21.2**	**24.2**	**26**	**822**	**2,480**	**1,060**	NA	**413**	**448 J**	**685**	**419**	**20.9**
Cyclohexane	--	0.25 U	0.25 U	0.25 U	2 U	**0.54 J**	2 U	0.25 U	NA	6.25 U	0.25 U	50 U	2 U	2 U
Dibromochloromethane	80	0.25 U	0.25 U	0.25 U	0.5 U	0.25 U	0.5 U	0.25 U	NA	6.25 U	0.25 U	12.5 U	0.5 U	0.5 U
Ethylbenzene	700	0.25 U	0.25 U	0.25 U	0.5 U	0.25 U	0.5 U	0.25 U	NA	6.25 U	0.25 U	12.5 U	0.5 U	0.5 U
Methyl acetate	--	0.25 U	0.25 U	0.25 U	2 U	**1.48 J**	2 U	0.25 U	NA	6.25 U	0.25 U	50 UJ	2 U	2 U
Methylcyclohexane	--	0.25 UJ	0.25 UJ	0.25 U	2 U	**55.6**	2 U	0.25 U	NA	6.25 UJ	0.25 U	50 U	2 U	2 U
Methylene chloride	5	0.25 U	0.25 U	0.25 U	0.5 U	**0.655 J**	**15**	**0.299 J**	NA	6.25 U	0.25 U	12.5 U	0.5 U	0.5 U
Methyl-tert-butyl ether (MTBE)	--	0.5 U	0.5 U	**0.683 J**	**1.07 J**	**0.829 J**	1 U	0.5 U	NA	12.5 U	0.5 U	25 U	1 U	1 U
Styrene	100	0.125 U	0.125 U	0.125 U	0.25 U	0.125 U	0.25 U	0.125 U	NA	3.13 U	0.125 U	6.25 U	0.25 U	0.25 U
Tetrachloroethene	5	0.25 U	0.25 U	0.25 U	0.5 U	**0.68 J**	**2.01 J**	**1.34 J**	NA	6.25 U	**0.725 J**	12.5 U	0.5 U	**0.346 J**
Toluene	1,000	0.25 U	0.25 U	0.25 U	0.5 U	0.25 U	1.88 B	0.25 U	NA	6.25 U	0.25 U	12.5 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	100	**0.314 J**	**0.328 J**	**0.28 J**	**0.377 J**	**9.56**	**18.8**	**9.15**	NA	6.25 U	**4.48 J**	12.5 U	**5.24**	0.5 U
Trichloroethene	5	**489**	**495**	**450**	**529**	**8,750**	**33,300**	**10,100**	NA	**4,380**	**5,040**	**7,550**	**202**	**49.8**
Trichlorofluoromethane (Freon-11)	--	0.25 U	0.25 U	0.25 U	1 U	0.25 U	1 U	0.25 U	NA	6.25 U	0.25 U	25 U	1 U	1 U
Vinyl chloride	2	0.25 U	0.25 U	0.25 U	0.5 U	**4.96**	**7.9**	**6.49**	NA	6.25 U	**1.52 J**	12.5 U	**3.63**	0.5 U
Semivolatile Organic Compounds (UG/L)														
No Detections		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives (UG/L)														
HMX	--	**9.26**	**8.87**	**4.24**	NA	**0.38 J**	NA	0.255 U	NA	0.258 U	**0.615 J**	NA	NA	NA
Nitroglycerin	--	0.258 U	0.26 U	0.258 U	NA	0.25 U	NA	0.255 U	NA	0.258 U	0.263 U	NA	NA	NA
Perchlorate	--	**1,960**	**1,900**	**973**	NA	**775**	NA	**452**	NA	**528**	**236**	NA	NA	NA
RDX	--	**192**	**181**	**93**	NA	**10**	NA	**1.9**	NA	**1.41**	**1.45**	NA	NA	NA
Total Metals (UG/L)														
Aluminum	--	50 U	50 U	**72.3 J**	NA	50 U	NA	50 U	NA	50 U	50 U	NA	NA	NA
Antimony	6	0.5 U	0.5 U	0.5 U	NA	0.5 U	NA	0.5 U	NA	0.5 U	0.5 U	NA	NA	NA
Arsenic	10	0.5 U	0.5 U	0.5 U	NA	**0.56 J**	NA	0.5 U	NA	0.5 U	0.5 U	NA	NA	NA
Barium	2,000	**72**	**69.9**	**68.6**	NA	**59.1**	NA	**61.4**	NA	**66.9**	**69.6**	NA	NA	NA
Beryllium	4	1 U	1 U	1 U	NA	1 U	NA	1 U	NA	1 U	1 U	NA	NA	NA
Cadmium	5	0.25 U	0.25 U	0.25 U	NA	0.25 U	NA	0.25 U	NA	0.25 UL	0.25 U	NA	NA	NA
Calcium	--	**54,100**	**52,000**	**54,200**	NA	**63,900**	NA	**77,900**	NA	**69,800**	**81,000**	NA	NA	NA
Chromium	100	10 U	10 U	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	NA	NA	NA
Cobalt	--	10 U	10 U	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	NA	NA	NA
Copper	1,300	10 U	10 U	**12.3 J**	NA	10 U	NA	10 U	NA	10 U	10 U	NA	NA	NA
Cyanide	200	5 U	5 U	5 U	NA	**41.6**	NA	5 U	NA	5 U	5 U	NA	NA	NA
Iron	--	50 U	50 U	50 U	NA	**86.2 J**	NA	**112 J**	NA	50 U	**108**	NA	NA	NA
Lead	15	2.5 U	2.5 U	**3.51 J**	NA	2.5 U	NA	2.5 U	NA	**3.38 J**	**4.57 J**	NA	NA	NA
Magnesium	--	**11,100**	**10,800**	**11,600**	NA	**11,500**	NA	**13,700**	NA	**14,000**	**16,200**	NA	NA	NA
Manganese	--	**39.8**	**38.9**	**20.5**	NA	**961**	NA	**610**	NA	**33**	**249**	NA	NA	NA
Nickel	--	20 U	20 U	20 U	NA	20 U	NA	20 U	NA	20 U	20 U	NA	NA	NA
Potassium	--	500 U	500 U	**603 J**	NA	**929 J**	NA	**844 J**	NA	**706 J**	**1,180**	NA	NA	NA
Selenium	50	5 U	5 U	5 U	NA	5 U	NA	**6.76 J**	NA	5 U	5 U	NA	NA	NA
Silver	--	2 U	2 U	2 U	NA	**2.13**	NA	2 UL	NA	2 U	**2.39 J**	NA	NA	NA
Sodium	--	**9,450**	**9,170**	**9,660**	NA	**10,000**	NA	**17,700**	NA	**15,200**	**20,500**	NA	NA	NA
Thallium	2	0.1 U	0.1 U	0.1 U	NA	0.1 U	NA	0.1 U	NA	0.1 U	0.1 U	NA	NA	NA
Vanadium	--	5 U	5 U	**5.62 J**	NA	5 U	NA	5 U	NA	5 U	**7.71 J**	NA	NA	NA

CTO-WE13
ABL, Site 1
Validated Groundwater Exceedance Analytical Results
2008-2012 Monitoring Well and Extraction Well Data

Station ID	**CLEAN MCL-Groundwater**	1EW16				1EW17	1EW18	1EW19					1EW24	1EW28
Sample ID		AS01-1EW16-CM20	AS01-1EW16P-CM20	AS01-1EW16-CM21	AS01-1EW16-R20	AS01-1EW17-CM19	AS01-1EW18-R20	AS01-1EW19-CM19	AS01-1EW19-CM19-S	AS01-1EW19-CM20	AS01-1EW19-CM21	AS01-1EW19-R20	AS01-1EW24-R20	AS01-1EW28-R20
Sample Date		03/30/12	03/30/12	06/28/12	08/29/12	11/29/11	08/29/12	11/19/11	11/29/11	03/30/12	06/28/12	08/29/12	08/30/12	08/29/12
Chemical Name														
Zinc	--	10 U	10 U	**15.8 J**	NA	**11.6 J**	NA	**21.2**	NA	**15.8 J**	**13.4 J**	NA	NA	NA
Dissolved Metals (UG/L)														
Arsenic, Dissolved	10	0.5 U	0.5 U	0.5 U	NA	**0.65 J**	NA	0.5 U	NA	0.5 U	0.5 U	NA	NA	NA
Barium, Dissolved	2,000	**70.7**	**71.7**	**62.8**	NA	**60.2**	NA	**61**	NA	**63.7**	**63.3**	NA	NA	NA
Calcium, Dissolved	--	**54,000**	**52,700**	**49,800**	NA	**65,600**	NA	**77,300**	NA	**68,600**	**81,900**	NA	NA	NA
Chromium, Dissolved	100	10 U	10 U	10 U	NA	10 U	NA	10 U	NA	10 U	10 U	NA	NA	NA
Copper, Dissolved	1,300	10 U	10 U	**10.4 J**	NA	10 U	NA	10 U	NA	10 U	10 U	NA	NA	NA
Iron, Dissolved	--	50 U	50 U	50 U	NA	**75.1 J**	NA	**97.4 J**	NA	50 U	50 U	NA	NA	NA
Lead, Dissolved	15	2.5 U	2.5 U	**3.21 J**	NA	2.5 U	NA	2.5 U	NA	2.5 U	2.5 U	NA	NA	NA
Magnesium, Dissolved	--	**10,800**	**11,000**	**10,400**	NA	**11,700**	NA	**14,100**	NA	**13,500**	**17,700**	NA	NA	NA
Manganese, Dissolved	--	**38.8**	**39.1**	**16.3**	NA	**945**	NA	**570**	NA	**28.6**	**91.5**	NA	NA	NA
Mercury, Dissolved	2	0.1 U	0.1 U	0.1 U	NA	0.1 U	NA	0.1 U	NA	0.1 U	0.1 U	NA	NA	NA
Nickel, Dissolved	--	20 U	20 U	20 U	NA	20 U	NA	20 U	NA	20 U	20 U	NA	NA	NA
Potassium, Dissolved	--	500 U	500 U	500 U	NA	**963 J**	NA	**866 J**	NA	**687 J**	**1,280**	NA	NA	NA
Selenium, Dissolved	50	5 U	5 U	5 U	NA	25 U	NA	5 U	NA	5 U	5 U	NA	NA	NA
Silver, Dissolved	--	2 U	2 U	2 U	NA	**2.52**	NA	2 UL	NA	2 U	**2.41 J**	NA	NA	NA
Sodium, Dissolved	--	**9,170**	**9,130**	**8,820**	NA	**9,990**	NA	**17,800**	NA	**14,700**	**22,100**	NA	NA	NA
Vanadium, Dissolved	--	5 U	5 U	5 U	NA	5 U	NA	5 U	NA	5 U	**6.25 J**	NA	NA	NA
Zinc, Dissolved	--	10 U	10 U	**12.5 J**	NA	**10.9 J**	NA	**17 J**	NA	**16 J**	10 U	NA	NA	NA

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Notes:

Exceeds all criteria

Bold indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

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UG/L - Micrograms per liter

CTO-WE13
ABL, Site 1
Validated Groundwater Exceedance Analytical Results
2008-2012 Monitoring Well and Extraction Well Data

Station ID	**CLEAN MCL-Groundwater**	1EW29	1EW30	1EW31	1EW33		1GW02							
Sample ID		AS01-1EW29-R20	AS01-1EW30-R20	AS01-1EW31-R20	AS01-1EW33P-R20	AS01-1EW33-R20	AS01-1GW02-CM14	AS01-1GW02-R14	AS01-1GW02-CM15	AS01-1GW02-R15	AS01-1GW02-CM16	AS01-1GW02-R16	AS01-1GW02-R17	AS01-1GW02-CM17
Sample Date		08/29/12	08/30/12	08/29/12	08/30/12	08/30/12	01/31/08	01/31/08	10/15/08	10/15/08	07/14/09	07/14/09	04/14/10	04/14/10
Chemical Name														
Volatile Organic Compounds (UG/L)														
1,1,1-Trichloroethane	200	**51**	**0.846 J**	0.5 U	0.5 U	0.5 U	NA	10 U	NA	5 U	NA	1 U	5 U	NA
1,1,2,2-Tetrachloroethane	--	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	NA	10 U	NA	5 U	NA	1 U	5 U	NA
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	--	4 U	4 U	4 U	**3.17 J**	**3.03 J**	NA	10 U	NA	5 U	NA	**0.79 J**	5 U	NA
1,1,2-Trichloroethane	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	10 U	NA	5 U	NA	1 U	5 U	NA
1,1-Dichloroethane	--	**9.78**	**0.24 J**	0.25 U	0.25 U	0.25 U	NA	10 U	NA	5 U	NA	1 U	5 U	NA
1,1-Dichloroethene	7	**15.9**	**4.01**	1 U	**0.64 J**	**0.626 J**	NA	10 U	NA	5 U	NA	1 U	5 U	NA
1,2-Dichloroethane	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	10 U	NA	5 U	NA	1 U	5 U	NA
1,2-Dichloroethene (total)	70	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	5	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	NA	10 U	NA	5 U	NA	1 U	5 U	NA
Acetone	--	5 U	5 R	5 UJ	5 U	5 U	NA	10 U	NA	20 U	NA	5 U	10 R	NA
Benzene	5	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	NA	10 U	NA	5 U	NA	1 U	5 U	NA
Bromodichloromethane	80	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	10 U	NA	5 U	NA	1 U	5 U	NA
Carbon disulfide	--	1 U	1 U	1 U	1 U	1 U	NA	10 U	NA	5 U	NA	1 U	5 U	NA
Carbon tetrachloride	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	10 U	NA	5 U	NA	1 U	5 U	NA
Chlorobenzene	100	**0.423 J**	**1.36**	0.25 U	0.25 U	0.25 U	NA	10 U	NA	5 U	NA	1 U	5 U	NA
Chloroethane	--	1 U	1 U	1 U	1 U	1 U	NA	10 U	NA	5 U	NA	1 U	5 U	NA
Chloroform	80	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	NA	10 U	NA	5 U	NA	1 U	5 U	NA
Chloromethane	--	1 U	1 U	1 U	1 U	1 U	NA	10 U	NA	5 U	NA	1 U	5 U	NA
cis-1,2-Dichloroethene	70	**789**	**1,470**	**1.6**	**287**	**287**	NA	10 U	NA	**3.2 J**	NA	**1.9**	**1.1 J**	NA
Cyclohexane	--	2 U	2 U	2 U	2 U	2 U	NA	10 U	NA	5 U	NA	1 U	5 U	NA
Dibromochloromethane	80	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	10 U	NA	5 U	NA	1 U	5 U	NA
Ethylbenzene	700	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	10 U	NA	5 U	NA	1 U	5 U	NA
Methyl acetate	--	2 U	2 U	2 U	2 U	2 U	NA	10 U	NA	5 U	NA	1 U	5 U	NA
Methylcyclohexane	--	2 U	2 U	2 U	2 U	2 U	NA	10 U	NA	5 U	NA	1 U	5 U	NA
Methylene chloride	5	0.5 U	**1.8**	0.5 U	0.5 U	0.5 U	NA	10 U	NA	5 U	NA	1 U	5 U	NA
Methyl-tert-butyl ether (MTBE)	--	1 U	**5.91**	1 U	1 U	1 U	NA	10 U	NA	5 U	NA	1 U	5 U	NA
Styrene	100	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	NA	10 U	NA	5 U	NA	1 U	5 U	NA
Tetrachloroethene	5	**0.503 J**	**0.316 J**	0.5 U	**3.57 J**	**3.33 J**	NA	10 U	NA	5 U	NA	1 U	5 U	NA
Toluene	1,000	0.5 U	0.91 B	0.5 U	0.5 U	0.5 U	NA	10 U	NA	5 U	NA	1 U	5 U	NA
trans-1,2-Dichloroethene	100	**3.97**	**8.38**	0.5 U	**1.44**	**1.41**	NA	10 U	NA	5 U	NA	1 U	5 U	NA
Trichloroethene	5	**4,290**	**2,390**	**2.51**	**161**	**157**	NA	**2 J**	NA	**19**	NA	**17**	**6.52**	NA
Trichlorofluoromethane (Freon-11)	--	1 U	1 U	1 U	1 U	1 U	NA	10 U	NA	5 U	NA	**0.66 J**	5 U	NA
Vinyl chloride	2	**6.5**	**17.1**	0.5 U	**40.8**	**40.3**	NA	10 U	NA	5 U	NA	1 U	2 U	NA
Semivolatile Organic Compounds (UG/L)														
No Detections		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives (UG/L)														
HMX	--	NA	NA	NA	NA	NA	1.03 U	NA	**0.26 J**	NA	**1.1**	NA	NA	1.04 U
Nitroglycerin	--	NA	NA	NA	NA	NA	1.03 U	NA	0.255 U	NA	1.1 U	NA	NA	1.04 U
Perchlorate	--	NA	NA	NA	NA	NA	0.2 U	NA	**5**	NA	**6.8**	NA	NA	0.2 U
RDX	--	NA	NA	NA	NA	NA	1.03 U	NA	0.255 U	NA	**1.9**	NA	NA	1.04 U
Total Metals (UG/L)														
Aluminum	--	NA	NA	NA	NA	NA	50 U	NA	50 U	NA	**17.4 J**	NA	NA	100 U
Antimony	6	NA	NA	NA	NA	NA	0.25 U	NA	**1.6**	NA	10 U	NA	NA	1 U
Arsenic	10	NA	NA	NA	NA	NA	5 U	NA	**51.9**	NA	**2.5 J**	NA	NA	**3.09**
Barium	2,000	NA	NA	NA	NA	NA	2.5 U	NA	**27.2**	NA	**35.3 J**	NA	NA	**15.5**
Beryllium	4	NA	NA	NA	NA	NA	0.5 U	NA	0.5 U	NA	4 U	NA	NA	2 U
Cadmium	5	NA	NA	NA	NA	NA	0.25 U	NA	0.25 U	NA	5 U	NA	NA	0.5 U
Calcium	--	NA	NA	NA	NA	NA	**14,100 J**	NA	**63,200 K**	NA	**93,200**	NA	NA	**43,000**
Chromium	100	NA	NA	NA	NA	NA	2.5 U	NA	3.1 B	NA	5 U	NA	NA	20 U
Cobalt	--	NA	NA	NA	NA	NA	2.5 U	NA	2.5 U	NA	50 U	NA	NA	20 U
Copper	1,300	NA	NA	NA	NA	NA	5 U	NA	5 U	NA	25 U	NA	NA	20 U
Cyanide	200	NA	NA	NA	NA	NA	NA	NA	5 U	NA	10 U	NA	NA	10 U
Iron	--	NA	NA	NA	NA	NA	**16,800**	NA	**14,000**	NA	**40,800**	NA	NA	**41,700**
Lead	15	NA	NA	NA	NA	NA	0.25 U	NA	**2.08**	NA	10 U	NA	NA	5 U
Magnesium	--	NA	NA	NA	NA	NA	**17,500**	NA	**21,900**	NA	**25,300**	NA	NA	**19,100**
Manganese	--	NA	NA	NA	NA	NA	**250**	NA	**234**	NA	**374**	NA	NA	**577**
Nickel	--	NA	NA	NA	NA	NA	5 U	NA	5 U	NA	40 U	NA	NA	40 U
Potassium	--	NA	NA	NA	NA	NA	**2,040**	NA	**2,110**	NA	**1,800 J**	NA	NA	**1,790**
Selenium	50	NA	NA	NA	NA	NA	**0.916 J**	NA	0.5 U	NA	10 U	NA	NA	10 U
Silver	--	NA	NA	NA	NA	NA	5 U	NA	0.25 U	NA	5 U	NA	NA	4 U
Sodium	--	NA	NA	NA	NA	NA	**17,600**	NA	**20,200**	NA	**21,100**	NA	NA	**18,600**
Thallium	2	NA	NA	NA	NA	NA	0.118 B	NA	0.05 U	NA	15 U	NA	NA	0.2 U
Vanadium	--	NA	NA	NA	NA	NA	5 U	NA	5 U	NA	50 U	NA	NA	10 U

CTO-WE13
ABL, Site 1
Validated Groundwater Exceedance Analytical Results
2008-2012 Monitoring Well and Extraction Well Data

Station ID	**CLEAN MCL-Groundwater**	1EW29	1EW30	1EW31	1EW33		1GW02							
Sample ID		AS01-1EW29-R20	AS01-1EW30-R20	AS01-1EW31-R20	AS01-1EW33P-R20	AS01-1EW33-R20	AS01-1GW02-CM14	AS01-1GW02-R14	AS01-1GW02-CM15	AS01-1GW02-R15	AS01-1GW02-CM16	AS01-1GW02-R16	AS01-1GW02-R17	AS01-1GW02-CM17
Sample Date		08/29/12	08/30/12	08/29/12	08/30/12	08/30/12	01/31/08	01/31/08	10/15/08	10/15/08	07/14/09	07/14/09	04/14/10	04/14/10
Chemical Name														
Zinc	--	NA	NA	NA	NA	NA	**7.89 J**	NA	12.9 B	NA	4.5 B	NA	NA	20 U
Dissolved Metals (UG/L)														
Arsenic, Dissolved	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium, Dissolved	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium, Dissolved	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper, Dissolved	1,300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead, Dissolved	15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury, Dissolved	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium, Dissolved	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Notes:

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UG/L - Micrograms per liter

CTO-WE13
ABL, Site 1
Validated Groundwater Exceedance Analytical Results
2008-2012 Monitoring Well and Extraction Well Data

Station ID	CLEAN MCL-Groundwater	1GW02					1GW04							
Sample ID		AS01-1GW02-CM18	AS01-1GW02-R18	AS01-1GW02-R19	AS01-1GW02P-R20	AS01-1GW02-R20	AS01-1GW04-CM14	AS01-1GW04-R14	AS01-1GW04-CM15	AS01-1GW04-R15	AS01-1GW04-CM16	AS01-1GW04-R16	AS01-1GW04-CM17	AS01-1GW04-R17
Sample Date		01/14/11	01/14/11	10/17/11	08/21/12	08/21/12	01/30/08	01/30/08	10/15/08	10/15/08	07/14/09	07/14/09	04/15/10	04/15/10
Chemical Name														
Volatile Organic Compounds (UG/L)														
1,1,1-Trichloroethane	200	NA	**0.299 J**	0.5 U	0.5 U	0.5 U	NA	10 U	NA	5 U	NA	5 U	NA	5 U
1,1,2,2-Tetrachloroethane	--	NA	0.2 U	0.5 U	0.4 U	0.4 U	NA	10 U	NA	5 U	NA	5 U	NA	5 U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	--	NA	2 U	**0.537 J**	4 U	4 U	NA	10 U	NA	5 U	NA	5 U	NA	5 U
1,1,2-Trichloroethane	5	NA	0.25 U	0.5 U	0.5 U	0.5 U	NA	10 U	NA	5 U	NA	5 U	NA	5 U
1,1-Dichloroethane	--	NA	0.125 U	0.5 U	0.25 U	0.25 U	NA	10 U	NA	5 U	NA	5 U	NA	5 U
1,1-Dichloroethene	7	NA	0.5 U	0.5 U	1 U	1 U	NA	10 U	NA	5 U	NA	5 U	NA	5 U
1,2-Dichloroethane	5	NA	0.25 U	0.5 U	0.5 U	0.5 U	NA	10 U	NA	5 U	NA	5 U	NA	5 U
1,2-Dichloroethene (total)	70	NA	NA	NA	NA	NA	NA	**10**	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	5	NA	0.2 U	0.5 U	0.4 U	0.4 U	NA	10 U	NA	5 U	NA	5 U	NA	5 U
Acetone	--	NA	2.5 R	5 U	5 R	5 R	NA	10 U	NA	20 U	NA	25 U	NA	10 R
Benzene	5	NA	0.125 U	0.5 U	0.25 U	0.25 U	NA	10 U	NA	5 U	NA	5 U	NA	5 U
Bromodichloromethane	80	NA	0.25 U	0.5 U	0.5 U	0.5 U	NA	10 U	NA	5 U	NA	5 U	NA	5 U
Carbon disulfide	--	NA	0.5 U	0.5 U	1 U	1 U	NA	10 U	NA	5 U	NA	5 U	NA	5 U
Carbon tetrachloride	5	NA	0.25 U	0.5 U	0.5 U	0.5 U	NA	10 U	NA	5 U	NA	5 U	NA	5 U
Chlorobenzene	100	NA	0.125 U	0.5 U	0.25 U	0.25 U	NA	10 U	NA	5 U	NA	5 U	NA	5 U
Chloroethane	--	NA	0.5 U	1 U	1 U	1 U	NA	10 U	NA	5 U	NA	5 U	NA	5 U
Chloroform	80	NA	0.125 U	0.5 U	0.25 U	0.25 U	NA	10 U	NA	5 U	NA	5 U	NA	**0.176 J**
Chloromethane	--	NA	0.5 U	0.5 U	1 U	1 U	NA	10 U	NA	5 U	NA	5 U	NA	5 U
cis-1,2-Dichloroethene	70	NA	**0.669 J**	**1.35**	0.5 U	0.5 U	NA	**10**	NA	**22**	NA	**2.4 J**	NA	**6.58**
Cyclohexane	--	NA	1 U	0.5 U	2 U	2 U	NA	10 U	NA	5 U	NA	5 U	NA	5 U
Dibromochloromethane	80	NA	0.25 U	0.5 U	0.5 U	0.5 U	NA	10 U	NA	5 U	NA	5 U	NA	5 U
Ethylbenzene	700	NA	0.25 U	0.5 U	0.5 U	0.5 U	NA	10 U	NA	5 U	NA	5 U	NA	5 U
Methyl acetate	--	NA	1 U	1 U	2 U	2 U	NA	10 U	NA	5 U	NA	5 U	NA	5 U
Methylcyclohexane	--	NA	1 U	0.5 U	2 U	2 U	NA	10 U	NA	5 U	NA	5 U	NA	5 U
Methylene chloride	5	NA	0.25 U	1 U	0.5 U	0.5 U	NA	10 U	NA	5 U	NA	5 U	NA	0.333 B
Methyl-tert-butyl ether (MTBE)	--	NA	0.5 U	0.5 U	1 U	1 U	NA	10 U	NA	5 U	NA	5 U	NA	5 U
Styrene	100	NA	0.125 U	0.5 U	0.25 U	0.25 U	NA	10 U	NA	5 U	NA	5 U	NA	5 U
Tetrachloroethene	5	NA	0.25 U	0.5 U	0.5 U	0.5 U	NA	**5 J**	NA	**4.5 J**	NA	**6.1**	NA	**6.52**
Toluene	1,000	NA	0.25 U	0.5 U	0.5 U	0.5 U	NA	10 U	NA	5 U	NA	5 U	NA	5 U
trans-1,2-Dichloroethene	100	NA	0.25 U	0.5 U	0.5 U	0.5 U	NA	10 U	NA	**0.88 J**	NA	5 U	NA	5 U
Trichloroethene	5	NA	**5.72**	**21.9**	**2.53**	**2.46**	NA	**69**	NA	**97**	NA	**66**	NA	**75.1**
Trichlorofluoromethane (Freon-11)	--	NA	**1.59 J**	**0.543 J**	**1.04**	**1.01**	NA	10 U	NA	5 U	NA	5 U	NA	5 U
Vinyl chloride	2	NA	0.25 U	0.5 U	0.5 U	0.5 U	NA	10 U	NA	5 U	NA	5 U	NA	2 U
Semivolatile Organic Compounds (UG/L)														
No Detections		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives (UG/L)														
HMX	--	**1.43**	NA	NA	NA	NA	1.03 U	NA	0.26 UJ	NA	**0.29**	NA	1.03 U	NA
Nitroglycerin	--	0.25 U	NA	NA	NA	NA	1.03 U	NA	0.26 UJ	NA	0.98 U	NA	**0.49 J**	NA
Perchlorate	--	**4.93**	NA	NA	NA	NA	**6.2**	NA	**6.9**	NA	**20**	NA	**26.5**	NA
RDX	--	**2.14**	NA	NA	NA	NA	1.03 U	NA	0.26 UJ	NA	**1.6**	NA	**1.33**	NA
Total Metals (UG/L)														
Aluminum	--	50 U	NA	NA	NA	NA	**593**	NA	**16,900**	NA	**241**	NA	**1,430**	NA
Antimony	6	0.5 U	NA	NA	NA	NA	0.25 U	NA	**2.27**	NA	10 U	NA	**2.39**	NA
Arsenic	10	**3.36**	NA	NA	NA	NA	5 U	NA	**107**	NA	10 U	NA	**50.9**	NA
Barium	2,000	**40.9**	NA	NA	NA	NA	**131**	NA	**657**	NA	**38 J**	NA	**59.8**	NA
Beryllium	4	1 U	NA	NA	NA	NA	0.5 U	NA	**1.44 J**	NA	4 U	NA	2 U	NA
Cadmium	5	0.25 U	NA	NA	NA	NA	0.25 U	NA	**1.64**	NA	5 U	NA	0.5 U	NA
Calcium	--	**115,000**	NA	NA	NA	NA	**60,700**	NA	**59,400 K**	NA	**46,500**	NA	**45,600**	NA
Chromium	100	10 U	NA	NA	NA	NA	**3.92 J**	NA	7.38 B	NA	5 U	NA	20 U	NA
Cobalt	--	10 U	NA	NA	NA	NA	2.5 U	NA	**14.4 J**	NA	50 U	NA	20 U	NA
Copper	1,300	10 U	NA	NA	NA	NA	5 U	NA	**27.7**	NA	25 U	NA	20 U	NA
Cyanide	200	5 U	NA	NA	NA	NA	NA	NA	5 U	NA	10 U	NA	10 U	NA
Iron	--	**44,100**	NA	NA	NA	NA	**1,930**	NA	**54,700**	NA	**287**	NA	**2,280**	NA
Lead	15	2.5 U	NA	NA	NA	NA	**0.577 J**	NA	**12.7**	NA	10 U	NA	5 U	NA
Magnesium	--	**29,600**	NA	NA	NA	NA	**11,900**	NA	**12,900**	NA	**8,650**	NA	**8,570**	NA
Manganese	--	**358**	NA	NA	NA	NA	**30.7**	NA	**1,040**	NA	**2.7 J**	NA	**66.4**	NA
Nickel	--	20 U	NA	NA	NA	NA	5 U	NA	**28.2 J**	NA	**1.3 J**	NA	40 U	NA
Potassium	--	**2,090**	NA	NA	NA	NA	**999 J**	NA	**4,970**	NA	**607 J**	NA	**1,020**	NA
Selenium	50	50 U	NA	NA	NA	NA	**0.539 J**	NA	**0.81 J**	NA	10 U	NA	10 U	NA
Silver	--	2 U	NA	NA	NA	NA	5 U	NA	0.25 U	NA	5 U	NA	4 U	NA
Sodium	--	**23,400**	NA	NA	NA	NA	**31,800**	NA	**33,400**	NA	**19,600**	NA	**16,600**	NA
Thallium	2	0.1 U	NA	NA	NA	NA	0.344 B	NA	**0.0868 J**	NA	15 U	NA	0.2 U	NA
Vanadium	--	5 U	NA	NA	NA	NA	5 U	NA	**43.1**	NA	**1.2 J**	NA	10 U	NA

CTO-WE13
ABL, Site 1
Validated Groundwater Exceedance Analytical Results
2008-2012 Monitoring Well and Extraction Well Data

Station ID	**CLEAN MCL-Groundwater**	1GW02					1GW04							
Sample ID		AS01-1GW02-CM18	AS01-1GW02-R18	AS01-1GW02-R19	AS01-1GW02P-R20	AS01-1GW02-R20	AS01-1GW04-CM14	AS01-1GW04-R14	AS01-1GW04-CM15	AS01-1GW04-R15	AS01-1GW04-CM16	AS01-1GW04-R16	AS01-1GW04-CM17	AS01-1GW04-R17
Sample Date		01/14/11	01/14/11	10/17/11	08/21/12	08/21/12	01/30/08	01/30/08	10/15/08	10/15/08	07/14/09	07/14/09	04/15/10	04/15/10
Chemical Name														
Zinc	--	10 U	NA	NA	NA	NA	8.35 B	NA	**97**	NA	11.8 B	NA	**5.31 J**	NA
Dissolved Metals (UG/L)														
Arsenic, Dissolved	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium, Dissolved	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium, Dissolved	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper, Dissolved	1,300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead, Dissolved	15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury, Dissolved	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium, Dissolved	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Notes:

Exceeds all criteria

Bold indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

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UQ

UG/L - Micrograms per liter

CTO-WE13
ABL, Site 1
Validated Groundwater Exceedance Analytical Results
2008-2012 Monitoring Well and Extraction Well Data

Station ID	CLEAN MCL-Groundwater	1GW04					1GW05							
Sample ID		AS01-1GW04-CM18	AS01-1GW04-R18	AS01-1GW04-R19	AS01-1GW04P-R20	AS01-1GW04-R20	AS01-1GW05-CM14	AS01-1GW05-R14	AS01-1GW05-CM15	AS01-1GW05-R15	AS01-1GW05-CM16	AS01-1GW05-R16	AS01-1GW05-R17	AS01-1GW05-CM17
Sample Date		01/14/11	01/14/11	10/14/11	08/29/12	08/29/12	01/29/08	01/29/08	10/15/08	10/15/08	07/13/09	07/13/09	04/15/10	04/15/10
Chemical Name														
Volatile Organic Compounds (UG/L)														
1,1,1-Trichloroethane	200	NA	0.25 U	0.5 U	0.5 U	0.5 U	NA	10 U	NA	25 U	NA	12 U	5 U	NA
1,1,2,2-Tetrachloroethane	--	NA	0.2 U	0.5 U	0.4 U	0.4 U	NA	10 U	NA	25 U	NA	12 U	5 U	NA
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	--	NA	2 U	1 U	4 U	4 U	NA	**10**	NA	**46**	NA	**16**	**6.38**	NA
1,1,2-Trichloroethane	5	NA	0.25 U	0.5 U	0.5 U	0.5 U	NA	10 U	NA	**18 J**	NA	12 U	5 U	NA
1,1-Dichloroethane	--	NA	0.125 U	0.5 U	0.25 U	0.25 U	NA	10 U	NA	25 U	NA	12 U	5 U	NA
1,1-Dichloroethene	7	NA	0.5 U	0.5 U	1 U	1 U	NA	10 U	NA	25 U	NA	12 U	5 U	NA
1,2-Dichloroethane	5	NA	0.25 U	0.5 U	0.5 U	0.5 U	NA	10 U	NA	25 U	NA	12 U	5 U	NA
1,2-Dichloroethene (total)	70	NA	NA	NA	NA	NA	NA	**84**	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	5	NA	0.2 U	0.5 U	0.4 U	0.4 U	NA	10 U	NA	25 U	NA	12 U	5 U	NA
Acetone	--	NA	2.5 R	5 U	5 R	5 R	NA	10 U	NA	100 U	NA	62 U	10 R	NA
Benzene	5	NA	0.125 U	0.5 U	0.25 U	0.25 U	NA	10 U	NA	25 U	NA	12 U	5 U	NA
Bromodichloromethane	80	NA	0.25 U	0.5 U	0.5 U	0.5 U	NA	10 U	NA	25 U	NA	12 U	5 U	NA
Carbon disulfide	--	NA	0.5 U	0.5 U	1 U	1 U	NA	10 U	NA	25 U	NA	12 U	5 U	NA
Carbon tetrachloride	5	NA	0.25 U	0.5 U	0.5 U	0.5 U	NA	10 U	NA	25 U	NA	12 U	5 U	NA
Chlorobenzene	100	NA	0.125 U	0.5 U	0.25 U	0.25 U	NA	10 U	NA	25 U	NA	12 U	5 U	NA
Chloroethane	--	NA	0.5 U	1 U	1 U	1 U	NA	10 U	NA	25 U	NA	12 U	5 U	NA
Chloroform	80	NA	**0.146 J**	0.5 U	0.281 B	0.31 B	NA	10 U	NA	25 U	NA	12 U	**4.15 J**	NA
Chloromethane	--	NA	0.5 U	0.5 U	1 U	1 U	NA	10 U	NA	25 U	NA	12 U	5 U	NA
cis-1,2-Dichloroethene	70	NA	**27.4**	**43.2**	**27.2**	**27.8**	NA	**84**	NA	**410**	NA	**120**	**27.5**	NA
Cyclohexane	--	NA	1 U	0.5 U	2 U	2 U	NA	10 U	NA	25 U	NA	12 U	5 U	NA
Dibromochloromethane	80	NA	0.25 U	0.5 U	0.5 U	0.5 U	NA	10 U	NA	25 U	NA	12 U	5 U	NA
Ethylbenzene	700	NA	0.25 U	0.5 U	0.5 U	0.5 U	NA	10 U	NA	25 U	NA	12 U	5 U	NA
Methyl acetate	--	NA	1 U	1 U	2 U	2 U	NA	10 U	NA	25 U	NA	12 U	5 U	NA
Methylcyclohexane	--	NA	1 U	0.5 U	2 U	2 U	NA	10 U	NA	25 U	NA	12 U	5 U	NA
Methylene chloride	5	NA	0.25 U	1 U	0.5 U	0.5 U	NA	10 U	NA	25 U	NA	**11 J**	0.329 B	NA
Methyl-tert-butyl ether (MTBE)	--	NA	0.5 U	0.5 U	1 U	1 U	NA	10 U	NA	25 U	NA	12 U	5 U	NA
Styrene	100	NA	0.125 U	0.5 U	0.25 U	0.25 U	NA	10 U	NA	25 U	NA	12 U	5 U	NA
Tetrachloroethene	5	NA	**5.15**	**1.76**	**5.69 J**	**5.88 J**	NA	**22**	NA	**41**	NA	**35**	**47.9**	NA
Toluene	1,000	NA	0.25 U	0.5 U	0.5 U	0.5 U	NA	10 U	NA	25 U	NA	12 U	5 U	NA
trans-1,2-Dichloroethene	100	NA	**0.679 J**	**0.295 J**	0.5 U	0.5 U	NA	10 U	NA	25 U	NA	12 U	**0.676 J**	NA
Trichloroethene	5	NA	**88.7**	**15**	**77.4**	**78.9**	NA	**250**	NA	**950**	NA	**330**	**286**	NA
Trichlorofluoromethane (Freon-11)	--	NA	0.5 U	1 U	1 U	1 U	NA	10 U	NA	25 U	NA	12 U	5 U	NA
Vinyl chloride	2	NA	0.25 U	0.5 U	0.5 U	0.5 U	NA	**2 J**	NA	25 U	NA	12 U	2 U	NA
Semivolatile Organic Compounds (UG/L)														
No Detections		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives (UG/L)														
HMX	--	**0.291 J**	NA	NA	NA	NA	**0.685 J**	NA	**0.901 J**	NA	**2.3**	NA	NA	**2.13**
Nitroglycerin	--	0.25 U	NA	NA	NA	NA	1.02 U	NA	0.26 U	NA	0.97 U	NA	NA	1.03 U
Perchlorate	--	**2.59**	NA	NA	NA	NA	**28**	NA	**120**	NA	**210**	NA	NA	**323**
RDX	--	**0.599 J**	NA	NA	NA	NA	1.02 U	NA	**1.81 J**	NA	**9.1**	NA	NA	**15.7**
Total Metals (UG/L)														
Aluminum	--	**7,910**	NA	NA	NA	NA	**126**	NA	50 U	NA	**9.2 J**	NA	NA	100 U
Antimony	6	0.5 U	NA	NA	NA	NA	0.25 U	NA	0.25 U	NA	10 U	NA	NA	1 U
Arsenic	10	**47.2**	NA	NA	NA	NA	5 U	NA	0.25 U	NA	10 U	NA	NA	1 U
Barium	2,000	**1,390**	NA	NA	NA	NA	**36.1**	NA	**36.5**	NA	**26.2 J**	NA	NA	**20.1**
Beryllium	4	1 U	NA	NA	NA	NA	0.5 U	NA	0.5 U	NA	4 U	NA	NA	2 U
Cadmium	5	**0.682**	NA	NA	NA	NA	0.25 U	NA	0.25 U	NA	5 U	NA	NA	0.5 U
Calcium	--	**65,600**	NA	NA	NA	NA	**47,100**	NA	**51,000 K**	NA	**53,400**	NA	NA	**46,300**
Chromium	100	10 U	NA	NA	NA	NA	2.5 U	NA	3.82 B	NA	5 U	NA	NA	20 U
Cobalt	--	10 U	NA	NA	NA	NA	**9.34 J**	NA	**3.77 J**	NA	1 B	NA	NA	20 U
Copper	1,300	**10.8 J**	NA	NA	NA	NA	5 U	NA	5 U	NA	25 U	NA	NA	20 U
Cyanide	200	5 U	NA	NA	NA	NA	NA	NA	5 U	NA	10 U	NA	NA	10 U
Iron	--	**27,900**	NA	NA	NA	NA	**776**	NA	**90.2 J**	NA	100 U	NA	NA	**50.4 J**
Lead	15	**5.68**	NA	NA	NA	NA	**0.996 J**	NA	0.25 U	NA	10 U	NA	NA	5 U
Magnesium	--	**12,400**	NA	NA	NA	NA	**11,500**	NA	**11,200**	NA	**12,600**	NA	NA	**12,200**
Manganese	--	**397**	NA	NA	NA	NA	**588**	NA	**107**	NA	**57.3**	NA	NA	**78.2**
Nickel	--	20 U	NA	NA	NA	NA	**8.94 J**	NA	5 U	NA	**2.2 J**	NA	NA	40 U
Potassium	--	**3,130**	NA	NA	NA	NA	**1,420**	NA	**1,220**	NA	**749 J**	NA	NA	**660 J**
Selenium	50	50 U	NA	NA	NA	NA	0.5 U	NA	**0.883 J**	NA	10 U	NA	NA	10 U
Silver	--	2 U	NA	NA	NA	NA	5 U	NA	0.25 U	NA	5 U	NA	NA	4 U
Sodium	--	**38,000**	NA	NA	NA	NA	**42,400**	NA	**36,100**	NA	**35,600**	NA	NA	**32,400**
Thallium	2	**0.11 J**	NA	NA	NA	NA	0.33 B	NA	0.05 U	NA	15 U	NA	NA	0.2 U
Vanadium	--	**13.3**	NA	NA	NA	NA	5 U	NA	5 U	NA	50 U	NA	NA	10 U

CTO-WE13
ABL, Site 1
Validated Groundwater Exceedance Analytical Results
2008-2012 Monitoring Well and Extraction Well Data

Station ID	**CLEAN MCL-Groundwater**	1GW04					1GW05							
Sample ID		AS01-1GW04-CM18	AS01-1GW04-R18	AS01-1GW04-R19	AS01-1GW04P-R20	AS01-1GW04-R20	AS01-1GW05-CM14	AS01-1GW05-R14	AS01-1GW05-CM15	AS01-1GW05-R15	AS01-1GW05-CM16	AS01-1GW05-R16	AS01-1GW05-R17	AS01-1GW05-CM17
Sample Date		01/14/11	01/14/11	10/14/11	08/29/12	08/29/12	01/29/08	01/29/08	10/15/08	10/15/08	07/13/09	07/13/09	04/15/10	04/15/10
Chemical Name														
Zinc	--	**51.1**	NA	NA	NA	NA	13.5 B	NA	11.2 B	NA	6.8 B	NA	NA	**8.74 J**
Dissolved Metals (UG/L)														
Arsenic, Dissolved	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium, Dissolved	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium, Dissolved	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper, Dissolved	1,300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead, Dissolved	15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury, Dissolved	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium, Dissolved	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Notes:

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Bold indicates detections

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UG/L - Micrograms per liter

CTO-WE13
ABL, Site 1
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Station ID	CLEAN MCL-Groundwater	1GW05					1GW09							
Sample ID		AS01-1GW05-CM18	AS01-1GW05-R18	AS01-1GW05P-R19	AS01-1GW05-R19	AS01-1GW05-R20	AS01-1GW09-CM14	AS01-1GW09-R14	AS01-1GW09-CM15	AS01-1GW09-R15	AS01-1GW09-CM16	AS01-1GW09-R16	AS01-1GW09-R17	AS01-1GW09-CM17
Sample Date		01/13/11	01/13/11	10/13/11	10/13/11	08/27/12	01/29/08	01/29/08	10/16/08	10/16/08	07/13/09	07/13/09	04/15/10	04/15/10
Chemical Name														
Volatile Organic Compounds (UG/L)														
1,1,1-Trichloroethane	200	NA	0.25 U	2.5 U	1.25 U	0.5 U	NA	**10 J**	NA	200 U	NA	120 U	**83.7**	NA
1,1,2,2-Tetrachloroethane	--	NA	0.2 U	2.5 U	1.25 U	0.4 U	NA	10 U	NA	200 U	NA	120 U	5 U	NA
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	--	NA	**5.41**	**7.31 J**	**7.24**	**4.43 J**	NA	10 U	NA	200 U	NA	120 U	5 U	NA
1,1,2-Trichloroethane	5	NA	0.25 U	2.5 U	1.25 U	0.5 U	NA	10 U	NA	200 U	NA	120 U	**0.397 J**	NA
1,1-Dichloroethane	--	NA	0.125 U	2.5 U	1.25 U	0.25 U	NA	**15 J**	NA	**51 J**	NA	**30 J**	**30.7**	NA
1,1-Dichloroethene	7	NA	0.5 U	2.5 U	1.25 U	1 U	NA	**11 J**	NA	200 U	NA	120 U	**17.7**	NA
1,2-Dichloroethane	5	NA	0.25 U	2.5 U	1.25 U	0.5 U	NA	10 U	NA	200 U	NA	120 U	5 U	NA
1,2-Dichloroethene (total)	70	NA	NA	NA	NA	NA	NA	**1,800**	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	5	NA	0.2 U	2.5 U	1.25 U	0.4 U	NA	10 U	NA	200 U	NA	120 U	5 U	NA
Acetone	--	NA	2.5 R	25 U	12.5 U	5 U	NA	10 U	NA	800 U	NA	620 U	10 R	NA
Benzene	5	NA	0.125 U	2.5 U	1.25 U	0.25 U	NA	10 U	NA	200 U	NA	120 U	5 U	NA
Bromodichloromethane	80	NA	0.25 U	2.5 U	1.25 U	**0.317 J**	NA	10 U	NA	200 U	NA	120 U	5 U	NA
Carbon disulfide	--	NA	0.5 U	2.5 U	1.25 U	1 U	NA	10 U	NA	200 U	NA	120 U	5 U	NA
Carbon tetrachloride	5	NA	0.25 U	2.5 U	1.25 U	0.5 U	NA	10 U	NA	200 U	NA	120 U	5 U	NA
Chlorobenzene	100	NA	0.125 U	2.5 U	1.25 U	0.25 U	NA	10 U	NA	200 U	NA	120 U	0.211 B	NA
Chloroethane	--	NA	0.5 U	5 U	2.5 U	1 U	NA	10 U	NA	200 U	NA	120 U	**0.63 J**	NA
Chloroform	80	NA	**0.727 J**	2.5 U	**0.971 J**	1.41 B	NA	10 U	NA	200 U	NA	120 U	5 U	NA
Chloromethane	--	NA	0.5 U	2.5 U	1.25 U	1 U	NA	10 U	NA	200 U	NA	120 U	5 U	NA
cis-1,2-Dichloroethene	70	NA	**55.9**	**87.9**	**88.4**	**10.1**	NA	**1,800**	NA	**6,800**	NA	**3,400**	**2,590**	NA
Cyclohexane	--	NA	1 U	2.5 U	1.25 U	2 U	NA	10 U	NA	200 U	NA	120 U	5 U	NA
Dibromochloromethane	80	NA	0.25 U	2.5 U	1.25 U	0.5 U	NA	10 U	NA	200 U	NA	120 U	5 U	NA
Ethylbenzene	700	NA	0.25 U	2.5 U	1.25 U	0.5 U	NA	10 U	NA	200 U	NA	120 U	5 U	NA
Methyl acetate	--	NA	1 U	5 U	2.5 U	2 U	NA	10 U	NA	200 U	NA	120 U	5 U	NA
Methylcyclohexane	--	NA	1 U	2.5 U	1.25 U	2 U	NA	10 U	NA	200 U	NA	120 U	**10.4**	NA
Methylene chloride	5	NA	0.332 B	5 U	2.5 U	0.5 U	NA	10 U	NA	200 U	NA	**28 J**	0.781 B	NA
Methyl-tert-butyl ether (MTBE)	--	NA	0.5 U	2.5 U	1.25 U	1 U	NA	10 U	NA	200 U	NA	120 U	5 U	NA
Styrene	100	NA	0.125 U	2.5 U	1.25 U	0.25 U	NA	10 U	NA	200 U	NA	120 U	5 U	NA
Tetrachloroethene	5	NA	**22.8**	**33.4**	**34.3**	**13.7**	NA	10 U	NA	200 U	NA	120 U	5 U	NA
Toluene	1,000	NA	0.25 U	2.5 U	1.25 U	0.5 U	NA	10 U	NA	200 U	NA	120 U	**0.385 J**	NA
trans-1,2-Dichloroethene	100	NA	**1.07 J**	**1.27 J**	**1.18 J**	0.5 U	NA	**10 J**	NA	200 U	NA	120 U	**35.7**	NA
Trichloroethene	5	NA	**173**	**316**	**325**	**91.8**	NA	**380 J**	NA	**240**	NA	**490**	**722**	NA
Trichlorofluoromethane (Freon-11)	--	NA	0.5 U	5 U	2.5 U	1 U	NA	10 U	NA	200 U	NA	120 U	5 U	NA
Vinyl chloride	2	NA	**1.54 J**	2.5 U	1.25 U	0.5 U	NA	**30 J**	NA	200 U	NA	120 U	**30.7**	NA
Semivolatile Organic Compounds (UG/L)														
No Detections		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives (UG/L)														
HMX	--	**1.18**	NA	NA	NA	NA	1.02 U	NA	0.26 U	NA	0.15 U	NA	NA	1.03 U
Nitroglycerin	--	0.272 U	NA	NA	NA	NA	1.02 U	NA	0.26 U	NA	1 U	NA	NA	1.03 U
Perchlorate	--	**22.5**	NA	NA	NA	NA	0.2 U	NA	0.2 U	NA	0.5 U	NA	NA	0.2 U
RDX	--	**2.55**	NA	NA	NA	NA	1.02 U	NA	0.26 U	NA	0.25 U	NA	NA	1.03 U
Total Metals (UG/L)														
Aluminum	--	50 U	NA	NA	NA	NA	**97.9 J**	NA	50 U	NA	**31.8 J**	NA	NA	100 U
Antimony	6	0.5 U	NA	NA	NA	NA	**2.28**	NA	0.25 U	NA	10 U	NA	NA	1 U
Arsenic	10	**0.529 J**	NA	NA	NA	NA	**10.9**	NA	**12.2**	NA	**16.2**	NA	NA	**14.6**
Barium	2,000	**29.1**	NA	NA	NA	NA	**71.8**	NA	**76.7**	NA	**95.2 J**	NA	NA	**97.6**
Beryllium	4	0.5 U	NA	NA	NA	NA	0.5 U	NA	0.5 U	NA	4 U	NA	NA	2 U
Cadmium	5	0.25 U	NA	NA	NA	NA	0.25 U	NA	0.25 U	NA	5 U	NA	NA	0.5 U
Calcium	--	**65,900**	NA	NA	NA	NA	**58,200**	NA	**70,300 K**	NA	**83,400**	NA	NA	**89,900**
Chromium	100	2.5 U	NA	NA	NA	NA	**3.09 J**	NA	5.01 B	NA	5 U	NA	NA	20 U
Cobalt	--	**3.31 J**	NA	NA	NA	NA	2.5 U	NA	2.5 U	NA	50 U	NA	NA	20 U
Copper	1,300	5 U	NA	NA	NA	NA	5 U	NA	5 U	NA	25 U	NA	NA	20 U
Cyanide	200	8.83 B	NA	NA	NA	NA	NA	NA	5 U	NA	10 U	NA	NA	10 U
Iron	--	**301**	NA	NA	NA	NA	**1,210**	NA	**1,280**	NA	**1,630**	NA	NA	**1,770**
Lead	15	2.5 U	NA	NA	NA	NA	**0.701 J**	NA	0.25 U	NA	10 U	NA	NA	5 U
Magnesium	--	**13,700**	NA	NA	NA	NA	**15,600**	NA	**18,700**	NA	**21,100**	NA	NA	**22,300**
Manganese	--	**230**	NA	NA	NA	NA	**218**	NA	**195**	NA	**206**	NA	NA	**194**
Nickel	--	5 U	NA	NA	NA	NA	5 U	NA	5 U	NA	40 U	NA	NA	40 U
Potassium	--	**1,360**	NA	NA	NA	NA	**2,990**	NA	**3,210**	NA	**2,980 J**	NA	NA	**3,370**
Selenium	50	5 U	NA	NA	NA	NA	0.5 U	NA	**0.638 J**	NA	10 U	NA	NA	10 U
Silver	--	**3.95 J**	NA	NA	NA	NA	5 U	NA	0.25 U	NA	5 U	NA	NA	4 U
Sodium	--	**43,200**	NA	NA	NA	NA	**16,500**	NA	**17,000**	NA	**18,500**	NA	NA	**17,300**
Thallium	2	0.1 U	NA	NA	NA	NA	0.365 B	NA	0.05 U	NA	15 U	NA	NA	0.2 U
Vanadium	--	5 U	NA	NA	NA	NA	5 U	NA	5 U	NA	**2.2 J**	NA	NA	10 U

CTO-WE13
ABL, Site 1
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Station ID	**CLEAN MCL-Groundwater**	1GW05					1GW09							
Sample ID		AS01-1GW05-CM18	AS01-1GW05-R18	AS01-1GW05P-R19	AS01-1GW05-R19	AS01-1GW05-R20	AS01-1GW09-CM14	AS01-1GW09-R14	AS01-1GW09-CM15	AS01-1GW09-R15	AS01-1GW09-CM16	AS01-1GW09-R16	AS01-1GW09-R17	AS01-1GW09-CM17
Sample Date		01/13/11	01/13/11	10/13/11	10/13/11	08/27/12	01/29/08	01/29/08	10/16/08	10/16/08	07/13/09	07/13/09	04/15/10	04/15/10
Chemical Name														
Zinc	--	**10.5 J**	NA	NA	NA	NA	37.3 B	NA	16.1 B	NA	18.2 B	NA	NA	**8.44 J**
Dissolved Metals (UG/L)														
Arsenic, Dissolved	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium, Dissolved	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium, Dissolved	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper, Dissolved	1,300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead, Dissolved	15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury, Dissolved	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium, Dissolved	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Notes:

Exceeds all criteria

Bold indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

UQ

UG/L - Micrograms per liter

CTO-WE13
ABL, Site 1
Validated Groundwater Exceedance Analytical Results
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Station ID	CLEAN MCL-Groundwater	1GW09				1GW34							
Sample ID		AS01-1GW09-CM18	AS01-1GW09-R18	AS01-1GW09-R19	AS01-1GW09-R20	AS01-1GW34-CM14	AS01-1GW34-R14	AS01-1GW34-CM15	AS01-1GW34-R15	AS01-1GW34-CM16	AS01-1GW34-R16	AS01-1GW34-CM17	AS01-1GW34-R17
Sample Date		01/12/11	01/12/11	10/17/11	08/29/12	01/30/08	01/30/08	10/16/08	10/16/08	07/13/09	07/13/09	04/15/10	04/15/10
Chemical Name													
Volatile Organic Compounds (UG/L)													
1,1,1-Trichloroethane	200	NA	**59.4 J**	10 U	**60.9**	NA	**51 J**	NA	**76**	NA	120 U	NA	**54.6**
1,1,2,2-Tetrachloroethane	--	NA	4 U	10 U	8 U	NA	10 U	NA	5 U	NA	120 U	NA	5 U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	--	NA	40 U	20 U	80 U	NA	10 U	NA	5 U	NA	120 U	NA	5 U
1,1,2-Trichloroethane	5	NA	5 U	10 U	10 U	NA	10 U	NA	5 U	NA	120 U	NA	5 U
1,1-Dichloroethane	--	NA	**27.2 J**	**15.5 J**	**36.4**	NA	**2 J**	NA	**3.9 J**	NA	120 U	NA	**0.385 J**
1,1-Dichloroethene	7	NA	**13.8 J**	**14.1 J**	**19 J**	NA	**4 J**	NA	**6.1**	NA	120 U	NA	**2.16 J**
1,2-Dichloroethane	5	NA	5 U	10 U	10 U	NA	10 U	NA	5 U	NA	120 U	NA	5 U
1,2-Dichloroethene (total)	70	NA	NA	NA	NA	NA	**390 J**	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	5	NA	4 U	10 U	8 U	NA	10 U	NA	5 U	NA	120 U	NA	5 U
Acetone	--	NA	50 R	100 U	100 U	NA	10 U	NA	20 U	NA	620 U	NA	10 R
Benzene	5	NA	2.5 U	10 U	5 U	NA	10 U	NA	5 U	NA	120 U	NA	5 U
Bromodichloromethane	80	NA	5 U	10 U	10 U	NA	10 U	NA	5 U	NA	120 U	NA	5 U
Carbon disulfide	--	NA	10 U	10 U	20 U	NA	10 U	NA	5 U	NA	120 U	NA	5 U
Carbon tetrachloride	5	NA	5 U	10 U	10 U	NA	10 U	NA	5 U	NA	120 U	NA	5 U
Chlorobenzene	100	NA	2.5 U	10 U	5 U	NA	10 U	NA	5 U	NA	120 U	NA	0.27 B
Chloroethane	--	NA	10 U	20 U	20 U	NA	10 U	NA	5 U	NA	120 U	NA	5 U
Chloroform	80	NA	2.5 U	10 U	5 U	NA	10 U	NA	5 U	NA	120 U	NA	**0.463 J**
Chloromethane	--	NA	10 U	10 U	20 U	NA	10 U	NA	5 U	NA	120 U	NA	5 U
cis-1,2-Dichloroethene	70	NA	**3,260**	**2,410**	**4,160**	NA	**390 J**	NA	**1,000**	NA	**170**	NA	**143**
Cyclohexane	--	NA	20 U	10 U	40 U	NA	10 U	NA	5 U	NA	120 U	NA	5 U
Dibromochloromethane	80	NA	5 U	10 U	10 U	NA	10 U	NA	5 U	NA	120 U	NA	5 U
Ethylbenzene	700	NA	5 U	10 U	10 U	NA	10 U	NA	5 U	NA	120 U	NA	5 U
Methyl acetate	--	NA	20 U	20 U	40 U	NA	10 U	NA	5 U	NA	120 U	NA	5 U
Methylcyclohexane	--	NA	20 U	10 U	40 U	NA	10 U	NA	5 U	NA	120 U	NA	5 U
Methylene chloride	5	NA	5 U	20 U	10 U	NA	10 U	NA	5 U	NA	120 U	NA	0.39 B
Methyl-tert-butyl ether (MTBE)	--	NA	10 U	10 U	20 U	NA	10 U	NA	5 U	NA	120 U	NA	5 U
Styrene	100	NA	2.5 U	10 U	5 U	NA	10 U	NA	5 U	NA	120 U	NA	5 U
Tetrachloroethene	5	NA	5 U	10 U	10 U	NA	**2 J**	NA	**1.8 J**	NA	120 U	NA	**1.53 J**
Toluene	1,000	NA	5 U	10 U	10 U	NA	10 U	NA	5 U	NA	120 U	NA	5 U
trans-1,2-Dichloroethene	100	NA	**8.81 J**	**11.5 J**	**14.4 J**	NA	**4 J**	NA	**6.3**	NA	120 U	NA	**4.82 J**
Trichloroethene	5	NA	**732**	**253**	**859**	NA	**5,000**	NA	**7,300**	NA	**4,200**	NA	**3,120**
Trichlorofluoromethane (Freon-11)	--	NA	10 U	20 U	20 U	NA	10 U	NA	5 U	NA	120 U	NA	5 U
Vinyl chloride	2	NA	**22.7 J**	**18.5 J**	**20.3**	NA	10 U	NA	5 U	NA	120 U	NA	2 U
Semivolatile Organic Compounds (UG/L)													
No Detections		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives (UG/L)													
HMX	--	0.301 U	NA	NA	NA	**0.364 J**	NA	0.258 U	NA	**0.53**	NA	1.03 U	NA
Nitroglycerin	--	0.301 U	NA	NA	NA	1.02 U	NA	0.258 U	NA	0.96 U	NA	1.03 U	NA
Perchlorate	--	0.1 U	NA	NA	NA	**390**	NA	**46**	NA	**270**	NA	**47.5**	NA
RDX	--	0.301 U	NA	NA	NA	**15.4**	NA	**14.4 J**	NA	**17**	NA	**7.51**	NA
Total Metals (UG/L)													
Aluminum	--	50 U	NA	NA	NA	50 U	NA	65.4 B	NA	**70 J**	NA	**64.3 J**	NA
Antimony	6	0.5 U	NA	NA	NA	0.25 U	NA	0.25 U	NA	10 U	NA	1 U	NA
Arsenic	10	**15.1**	NA	NA	NA	5 U	NA	0.25 U	NA	10 U	NA	1 U	NA
Barium	2,000	**99**	NA	NA	NA	**68.4**	NA	**74.3**	NA	**44 J**	NA	**43.3**	NA
Beryllium	4	0.5 U	NA	NA	NA	0.5 U	NA	0.5 U	NA	4 U	NA	2 U	NA
Cadmium	5	0.25 U	NA	NA	NA	0.25 U	NA	0.25 U	NA	5 U	NA	0.5 U	NA
Calcium	--	**98,900**	NA	NA	NA	**35,600**	NA	**41,300 K**	NA	**22,800**	NA	**20,600**	NA
Chromium	100	2.5 U	NA	NA	NA	**6.76**	NA	10 B	NA	1.4 B	NA	**2.61 J**	NA
Cobalt	--	2.5 U	NA	NA	NA	2.5 U	NA	2.5 U	NA	50 U	NA	20 U	NA
Copper	1,300	5 U	NA	NA	NA	5 U	NA	5 U	NA	25 U	NA	20 U	NA
Cyanide	200	5 U	NA	NA	NA	NA	NA	5 U	NA	10 U	NA	10 U	NA
Iron	--	**1,870**	NA	NA	NA	**82.5 J**	NA	**206**	NA	**80.9 J**	NA	**145**	NA
Lead	15	2.5 U	NA	NA	NA	0.25 U	NA	0.25 U	NA	10 U	NA	5 U	NA
Magnesium	--	**25,700**	NA	NA	NA	**7,090**	NA	**8,090**	NA	**4,320 J**	NA	**3,800**	NA
Manganese	--	**188**	NA	NA	NA	**88.9**	NA	**45.3**	NA	**21**	NA	**122**	NA
Nickel	--	5 U	NA	NA	NA	5 U	NA	5 U	NA	40 U	NA	40 U	NA
Potassium	--	**3,500**	NA	NA	NA	**252 J**	NA	**473 J**	NA	5,000 U	NA	**714 J**	NA
Selenium	50	5 U	NA	NA	NA	0.5 U	NA	0.5 U	NA	10 U	NA	10 U	NA
Silver	--	**3.79 J**	NA	NA	NA	5 U	NA	0.25 U	NA	5 U	NA	4 U	NA
Sodium	--	**19,200**	NA	NA	NA	**6,700**	NA	**9,280**	NA	**2,920 J**	NA	**2,220**	NA
Thallium	2	0.1 U	NA	NA	NA	0.22 B	NA	0.05 U	NA	15 U	NA	0.2 U	NA
Vanadium	--	5 U	NA	NA	NA	5 U	NA	5 U	NA	50 U	NA	10 U	NA

CTO-WE13
ABL, Site 1
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Station ID	**CLEAN MCL-Groundwater**	1GW09				1GW34							
Sample ID		AS01-1GW09-CM18	AS01-1GW09-R18	AS01-1GW09-R19	AS01-1GW09-R20	AS01-1GW34-CM14	AS01-1GW34-R14	AS01-1GW34-CM15	AS01-1GW34-R15	AS01-1GW34-CM16	AS01-1GW34-R16	AS01-1GW34-CM17	AS01-1GW34-R17
Sample Date		01/12/11	01/12/11	10/17/11	08/29/12	01/30/08	01/30/08	10/16/08	10/16/08	07/13/09	07/13/09	04/15/10	04/15/10
Chemical Name													
Zinc	--	**5.56 J**	NA	NA	NA	5.64 B	NA	10.4 B	NA	4.8 B	NA	20 U	NA
Dissolved Metals (UG/L)													
Arsenic, Dissolved	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium, Dissolved	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium, Dissolved	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper, Dissolved	1,300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead, Dissolved	15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury, Dissolved	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium, Dissolved	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Notes:

Exceeds all criteria

Bold indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

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UQ

UG/L - Micrograms per liter

CTO-WE13
ABL, Site 1
Validated Groundwater Exceedance Analytical Results
2008-2012 Monitoring Well and Extraction Well Data

Station ID	CLEAN MCL-Groundwater	1GW34				1GW35							
Sample ID		AS01-1GW34-CM18	AS01-1GW34-R18	AS01-1GW34-R19	AS01-1GW34-R20	AS01-1GW35-CM14	AS01-1GW35-R14	AS01-1GW35-CM15	AS01-1GW35-R15	AS01-1GW35-CM16	AS01-1GW35P-CM16	AS01-1GW35P-R16	AS01-1GW35-R16
Sample Date		01/12/11	01/12/11	10/14/11	08/28/12	01/30/08	01/30/08	10/15/08	10/15/08	07/10/09	07/10/09	07/10/09	07/10/09
Chemical Name													
Volatile Organic Compounds (UG/L)													
1,1,1-Trichloroethane	200	NA	**48.4 J**	**23**	**52.9**	NA	10 U	NA	5 U	NA	NA	4 U	4 U
1,1,2,2-Tetrachloroethane	--	NA	4 U	2.5 U	0.4 U	NA	10 U	NA	5 U	NA	NA	4 U	4 U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	--	NA	40 U	5 U	4 U	NA	10 U	NA	5 U	NA	NA	4 U	4 U
1,1,2-Trichloroethane	5	NA	5 U	2.5 U	**0.358 J**	NA	10 U	NA	5 U	NA	NA	4 U	4 U
1,1-Dichloroethane	--	NA	**3.51 J**	2.5 U	**5.14**	NA	10 U	NA	5 U	NA	NA	4 U	4 U
1,1-Dichloroethene	7	NA	10 U	**1.37 J**	**7.09**	NA	10 U	NA	5 U	NA	NA	4 U	4 U
1,2-Dichloroethane	5	NA	5 U	2.5 U	0.5 U	NA	10 U	NA	5 U	NA	NA	4 U	4 U
1,2-Dichloroethene (total)	70	NA	NA	NA	NA	NA	**15**	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	5	NA	4 U	2.5 U	0.4 U	NA	10 U	NA	5 U	NA	NA	4 U	4 U
Acetone	--	NA	50 R	25 UJ	5 U	NA	10 U	NA	20 U	NA	NA	20 U	20 U
Benzene	5	NA	2.5 U	2.5 U	**0.134 J**	NA	10 U	NA	5 U	NA	NA	4 U	4 U
Bromodichloromethane	80	NA	5 U	2.5 U	0.5 U	NA	10 U	NA	5 U	NA	NA	4 U	4 U
Carbon disulfide	--	NA	10 U	2.5 U	1 U	NA	10 U	NA	5 U	NA	NA	4 U	4 U
Carbon tetrachloride	5	NA	5 U	2.5 U	0.5 U	NA	10 U	NA	5 U	NA	NA	4 U	4 U
Chlorobenzene	100	NA	2.5 U	2.5 U	**0.356 J**	NA	10 U	NA	5 U	NA	NA	4 U	4 U
Chloroethane	--	NA	10 U	5 U	1 U	NA	10 U	NA	5 U	NA	NA	4 U	4 U
Chloroform	80	NA	2.5 U	2.5 U	0.378 B	NA	10 U	NA	5 U	NA	NA	4 U	4 U
Chloromethane	--	NA	10 U	2.5 U	1 U	NA	10 U	NA	5 U	NA	NA	4 U	4 U
cis-1,2-Dichloroethene	70	NA	**532**	**123**	**383**	NA	**15**	NA	**11**	NA	NA	**23**	**23**
Cyclohexane	--	NA	20 U	2.5 U	2 U	NA	10 U	NA	5 U	NA	NA	4 U	4 U
Dibromochloromethane	80	NA	5 U	2.5 U	0.5 U	NA	10 U	NA	5 U	NA	NA	4 U	4 U
Ethylbenzene	700	NA	5 U	2.5 U	0.5 U	NA	10 U	NA	5 U	NA	NA	4 U	4 U
Methyl acetate	--	NA	20 U	5 U	2 U	NA	10 U	NA	5 U	NA	NA	4 U	4 U
Methylcyclohexane	--	NA	20 U	2.5 U	**30.6**	NA	10 U	NA	5 U	NA	NA	4 U	4 U
Methylene chloride	5	NA	5 U	5 U	0.5 U	NA	10 U	NA	5 U	NA	NA	4 U	4 U
Methyl-tert-butyl ether (MTBE)	--	NA	10 U	2.5 U	1 U	NA	10 U	NA	5 U	NA	NA	4 U	4 U
Styrene	100	NA	2.5 U	2.5 U	0.25 U	NA	10 U	NA	5 U	NA	NA	4 U	4 U
Tetrachloroethene	5	NA	5 U	2.5 U	**1.28 J**	NA	10 U	NA	5 U	NA	NA	**0.92 J**	**1.1 J**
Toluene	1,000	NA	5 U	2.5 U	0.5 U	NA	10 U	NA	5 U	NA	NA	4 U	4 U
trans-1,2-Dichloroethene	100	NA	5 U	2.5 U	**4.52**	NA	10 U	NA	5 U	NA	NA	4 U	4 U
Trichloroethene	5	NA	**4,130**	**2,700**	**3,160**	NA	**30**	NA	**31**	NA	NA	**68**	**68**
Trichlorofluoromethane (Freon-11)	--	NA	10 U	5 U	1 U	NA	10 U	NA	5 U	NA	NA	4 U	4 U
Vinyl chloride	2	NA	5 U	2.5 U	**1.71**	NA	10 U	NA	5 U	NA	NA	4 U	4 U
Semivolatile Organic Compounds (UG/L)													
No Detections		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives (UG/L)													
HMX	--	**0.534 J**	NA	NA	NA	1.03 U	NA	**0.508 J**	NA	**0.99**	**1**	NA	NA
Nitroglycerin	--	0.275 U	NA	NA	NA	1.03 U	NA	0.255 U	NA	1.1 U	1 U	NA	NA
Perchlorate	--	**65.2**	NA	NA	NA	**1.5**	NA	**83**	NA	**430**	**390**	NA	NA
RDX	--	**13.4**	NA	NA	NA	1.03 U	NA	0.255 U	NA	**7.4**	**7.4**	NA	NA
Total Metals (UG/L)													
Aluminum	--	**991**	NA	NA	NA	50 U	NA	50 U	NA	**125 J**	**119 J**	NA	NA
Antimony	6	0.5 U	NA	NA	NA	0.25 U	NA	0.25 U	NA	10 U	10 U	NA	NA
Arsenic	10	**0.968 J**	NA	NA	NA	5 U	NA	**0.297 J**	NA	10 U	10 U	NA	NA
Barium	2,000	**74.3**	NA	NA	NA	**57.9**	NA	**65.7**	NA	**59 J**	**61.4 J**	NA	NA
Beryllium	4	0.5 U	NA	NA	NA	0.5 U	NA	0.5 U	NA	4 U	4 U	NA	NA
Cadmium	5	0.25 U	NA	NA	NA	**0.285 J**	NA	0.25 U	NA	5 U	5 U	NA	NA
Calcium	--	**39,100**	NA	NA	NA	**40,800**	NA	**46,700 K**	NA	**44,700**	**46,000**	NA	NA
Chromium	100	**18.3 J**	NA	NA	NA	2.5 U	NA	3.93 B	NA	**8.4**	**9.6**	NA	NA
Cobalt	--	2.5 U	NA	NA	NA	2.5 U	NA	2.5 U	NA	50 U	50 U	NA	NA
Copper	1,300	**6.51 J**	NA	NA	NA	5 U	NA	5 U	NA	25 U	25 U	NA	NA
Cyanide	200	5 U	NA	NA	NA	NA	NA	5 U	NA	10 U	10 U	NA	NA
Iron	--	**1,390**	NA	NA	NA	25 U	NA	25 U	NA	**229**	**298**	NA	NA
Lead	15	2.5 U	NA	NA	NA	0.25 U	NA	0.25 U	NA	10 U	10 U	NA	NA
Magnesium	--	**7,220**	NA	NA	NA	**8,290**	NA	**9,150**	NA	**8,690**	**8,840**	NA	NA
Manganese	--	**360**	NA	NA	NA	**452**	NA	**324**	NA	**31.6**	**71.4**	NA	NA
Nickel	--	**5.39 J**	NA	NA	NA	5 U	NA	5 U	NA	**1.5 J**	**1.3 J**	NA	NA
Potassium	--	**783 J**	NA	NA	NA	**1,360**	NA	**1,660**	NA	**1,120 J**	**1,150 J**	NA	NA
Selenium	50	5 U	NA	NA	NA	**0.556 J**	NA	**1.21 J**	NA	10 U	10 U	NA	NA
Silver	--	**3.59 J**	NA	NA	NA	5 U	NA	0.25 U	NA	5 U	5 U	NA	NA
Sodium	--	**6,420**	NA	NA	NA	**30,000**	NA	**30,500**	NA	**26,500**	**27,200**	NA	NA
Thallium	2	0.1 U	NA	NA	NA	0.515 B	NA	0.05 U	NA	15 U	15 U	NA	NA
Vanadium	--	5 U	NA	NA	NA	5 U	NA	5 U	NA	50 U	50 U	NA	NA

CTO-WE13
ABL, Site 1
Validated Groundwater Exceedance Analytical Results
2008-2012 Monitoring Well and Extraction Well Data

Station ID	**CLEAN MCL-Groundwater**	1GW34				1GW35							
Sample ID		AS01-1GW34-CM18	AS01-1GW34-R18	AS01-1GW34-R19	AS01-1GW34-R20	AS01-1GW35-CM14	AS01-1GW35-R14	AS01-1GW35-CM15	AS01-1GW35-R15	AS01-1GW35-CM16	AS01-1GW35P-CM16	AS01-1GW35P-R16	AS01-1GW35-R16
Sample Date		01/12/11	01/12/11	10/14/11	08/28/12	01/30/08	01/30/08	10/15/08	10/15/08	07/10/09	07/10/09	07/10/09	07/10/09
Chemical Name													
Zinc	--	**11 J**	NA	NA	NA	5 U	NA	10.5 B	NA	3.5 B	4 B	NA	NA
Dissolved Metals (UG/L)													
Arsenic, Dissolved	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium, Dissolved	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium, Dissolved	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper, Dissolved	1,300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead, Dissolved	15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury, Dissolved	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium, Dissolved	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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UQ

UG/L - Micrograms per liter

Station ID	**CLEAN MCL-Groundwater**	1GW35				
Sample ID		AS01-1GW35-R17	AS01-1GW35-CM17	AS01-1GW35-CM18	AS01-1GW35P-CM18	AS01-1GW35P-R18
Sample Date		04/14/10	04/14/10	01/12/11	01/12/11	01/12/11
Chemical Name						
Volatile Organic Compounds (UG/L)						
1,1,1-Trichloroethane	200	5 U	NA	NA	NA	**0.257 J**
1,1,2,2-Tetrachloroethane	--	5 U	NA	NA	NA	0.2 U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	--	5 U	NA	NA	NA	2 U
1,1,2-Trichloroethane	5	5 U	NA	NA	NA	0.25 U
1,1-Dichloroethane	--	5 U	NA	NA	NA	0.125 U
1,1-Dichloroethene	7	5 U	NA	NA	NA	0.5 U
1,2-Dichloroethane	5	5 U	NA	NA	NA	0.25 U
1,2-Dichloroethene (total)	70	NA	NA	NA	NA	NA
1,2-Dichloropropane	5	5 U	NA	NA	NA	0.2 U
Acetone	--	10 R	NA	NA	NA	2.5 R
Benzene	5	5 U	NA	NA	NA	0.125 U
Bromodichloromethane	80	5 U	NA	NA	NA	0.25 U
Carbon disulfide	--	5 U	NA	NA	NA	0.5 U
Carbon tetrachloride	5	5 U	NA	NA	NA	0.25 U
Chlorobenzene	100	5 U	NA	NA	NA	0.125 U
Chloroethane	--	5 U	NA	NA	NA	0.5 U
Chloroform	80	**0.167 J**	NA	NA	NA	0.125 U
Chloromethane	--	5 U	NA	NA	NA	0.5 U
cis-1,2-Dichloroethene	70	**22.8**	NA	NA	NA	**11**
Cyclohexane	--	5 U	NA	NA	NA	1 U
Dibromochloromethane	80	5 U	NA	NA	NA	0.25 U
Ethylbenzene	700	5 U	NA	NA	NA	0.25 U
Methyl acetate	--	5 U	NA	NA	NA	1 U
Methylcyclohexane	--	5 U	NA	NA	NA	1 U
Methylene chloride	5	5 U	NA	NA	NA	0.269 B
Methyl-tert-butyl ether (MTBE)	--	5 U	NA	NA	NA	0.5 U
Styrene	100	5 U	NA	NA	NA	0.125 U
Tetrachloroethene	5	**1.91 J**	NA	NA	NA	**1.15 J**
Toluene	1,000	5 U	NA	NA	NA	0.25 U
trans-1,2-Dichloroethene	100	5 U	NA	NA	NA	0.25 U
Trichloroethene	5	**74.5**	NA	NA	NA	**70.3**
Trichlorofluoromethane (Freon-11)	--	5 U	NA	NA	NA	0.5 U
Vinyl chloride	2	**0.269 J**	NA	NA	NA	0.25 U
Semivolatile Organic Compounds (UG/L)						
No Detections		NA	NA	NA	NA	NA
Explosives (UG/L)						
HMX	--	NA	**4.57**	**1.31**	**1.34**	NA
Nitroglycerin	--	NA	**7.7**	0.269 U	0.281 U	NA
Perchlorate	--	NA	**1,950**	**183**	**184**	NA
RDX	--	NA	**6.83**	**13.7**	**16.3**	NA
Total Metals (UG/L)						
Aluminum	--	NA	100 U	**1,220 J**	**594 J**	NA
Antimony	6	NA	1 U	0.5 U	0.5 U	NA
Arsenic	10	NA	1 U	**1**	**0.675 J**	NA
Barium	2,000	NA	**67.6**	**91.3**	**86**	NA
Beryllium	4	NA	2 U	0.5 U	0.5 U	NA
Cadmium	5	NA	0.5 U	0.25 U	0.25 U	NA
Calcium	--	NA	**57,500**	**74,800**	**72,200**	NA
Chromium	100	NA	20 U	**59.3 J**	**36.1 J**	NA
Cobalt	--	NA	20 U	2.5 U	2.5 U	NA
Copper	1,300	NA	20 U	5 U	5 U	NA
Cyanide	200	NA	10 U	5 U	5 U	NA
Iron	--	NA	100 U	**1,540 J**	**789 J**	NA
Lead	15	NA	5 U	2.5 U	2.5 U	NA
Magnesium	--	NA	**9,490**	**12,000**	**12,300**	NA
Manganese	--	NA	10 U	**58.1 J**	**41.7 J**	NA
Nickel	--	NA	40 U	5 U	5 U	NA
Potassium	--	NA	**673 J**	**1,540**	**1,370**	NA
Selenium	50	NA	10 U	5 U	5 U	NA
Silver	--	NA	4 U	**3.5 J**	**3.45 J**	NA
Sodium	--	NA	**24,500**	**36,100**	**37,100**	NA
Thallium	2	NA	0.2 U	0.1 U	0.1 U	NA
Vanadium	--	NA	10 U	5 U	5 U	NA

Station ID	**CLEAN MCL-Groundwater**	1GW35				
Sample ID		AS01-1GW35-R17	AS01-1GW35-CM17	AS01-1GW35-CM18	AS01-1GW35P-CM18	AS01-1GW35P-R18
Sample Date		04/14/10	04/14/10	01/12/11	01/12/11	01/12/11
Chemical Name						
Zinc	--	NA	20 U	**8.38 J**	**6.57 J**	NA
Dissolved Metals (UG/L)						
Arsenic, Dissolved	10	NA	NA	NA	NA	NA
Barium, Dissolved	2,000	NA	NA	NA	NA	NA
Calcium, Dissolved	--	NA	NA	NA	NA	NA
Chromium, Dissolved	100	NA	NA	NA	NA	NA
Copper, Dissolved	1,300	NA	NA	NA	NA	NA
Iron, Dissolved	--	NA	NA	NA	NA	NA
Lead, Dissolved	15	NA	NA	NA	NA	NA
Magnesium, Dissolved	--	NA	NA	NA	NA	NA
Manganese, Dissolved	--	NA	NA	NA	NA	NA
Mercury, Dissolved	2	NA	NA	NA	NA	NA
Nickel, Dissolved	--	NA	NA	NA	NA	NA
Potassium, Dissolved	--	NA	NA	NA	NA	NA
Selenium, Dissolved	50	NA	NA	NA	NA	NA
Silver, Dissolved	--	NA	NA	NA	NA	NA
Sodium, Dissolved	--	NA	NA	NA	NA	NA
Vanadium, Dissolved	--	NA	NA	NA	NA	NA
Zinc, Dissolved	--	NA	NA	NA	NA	NA

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Notes:

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UG/L - Micrograms per liter

CTO-WE13
ABL, Site 1
Validated Groundwater Exceedance Analytical Results
2008-2012 Monitoring Well and Extraction Well Data

Station ID	**CLEAN MCL-Groundwater**	1GW35			1GW36							
Sample ID		AS01-1GW35-R18	AS01-1GW35-R19	AS01-1GW35-R20	AS01-1GW36-CM14	AS01-1GW36-R14	AS01-1GW36-CM15	AS01-1GW36-R15	AS01-1GW36-CM16	AS01-1GW36-R16	AS01-1GW36-R17	AS01-1GW36-CM17
Sample Date		01/12/11	10/13/11	08/28/12	01/31/08	01/31/08	10/15/08	10/15/08	07/10/09	07/10/09	04/14/10	04/14/10
Chemical Name												
Volatile Organic Compounds (UG/L)												
1,1,1-Trichloroethane	200	0.25 U	0.5 U	0.5 U	NA	10 U	NA	5 U	NA	1 U	5 U	NA
1,1,2,2-Tetrachloroethane	--	0.2 U	0.5 U	0.4 U	NA	10 U	NA	5 U	NA	1 U	5 U	NA
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	--	2 U	1 U	4 U	NA	10 U	NA	5 U	NA	1 U	5 U	NA
1,1,2-Trichloroethane	5	0.25 U	0.5 U	0.5 U	NA	10 U	NA	5 U	NA	1 U	5 U	NA
1,1-Dichloroethane	--	0.125 U	0.5 U	0.25 U	NA	10 U	NA	5 U	NA	1 U	5 U	NA
1,1-Dichloroethene	7	0.5 U	0.5 U	1 U	NA	10 U	NA	5 U	NA	1 U	5 U	NA
1,2-Dichloroethane	5	0.25 U	0.5 U	0.5 U	NA	10 U	NA	5 U	NA	1 U	5 U	NA
1,2-Dichloroethene (total)	70	NA	NA	NA	NA	**3 J**	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	5	0.2 U	0.5 U	0.4 U	NA	10 U	NA	5 U	NA	1 U	5 U	NA
Acetone	--	2.5 R	5 UJ	5 U	NA	10 U	NA	20 U	NA	5 U	10 R	NA
Benzene	5	0.125 U	0.5 U	0.25 U	NA	10 U	NA	5 U	NA	1 U	5 U	NA
Bromodichloromethane	80	0.25 U	0.5 U	0.5 U	NA	10 U	NA	5 U	NA	1 U	5 U	NA
Carbon disulfide	--	0.5 U	0.5 U	1 U	NA	10 U	NA	5 U	NA	1 U	5 U	NA
Carbon tetrachloride	5	0.25 U	0.5 U	0.5 U	NA	10 U	NA	5 U	NA	1 U	5 U	NA
Chlorobenzene	100	0.125 U	0.5 U	0.25 U	NA	10 U	NA	5 U	NA	1 U	5 U	NA
Chloroethane	--	0.5 U	1 U	1 U	NA	10 U	NA	5 U	NA	1 U	5 U	NA
Chloroform	80	0.125 U	0.5 U	0.136 B	NA	10 U	NA	5 U	NA	1 U	5 U	NA
Chloromethane	--	0.5 U	0.5 U	1 U	NA	10 U	NA	5 U	NA	1 U	5 U	NA
cis-1,2-Dichloroethene	70	**11.3**	**12**	**8.76**	NA	**3 J**	NA	**6.8**	NA	**5.2**	**5.01**	NA
Cyclohexane	--	1 U	0.5 U	2 U	NA	10 U	NA	5 U	NA	1 U	5 U	NA
Dibromochloromethane	80	0.25 U	0.5 U	0.5 U	NA	10 U	NA	5 U	NA	1 U	5 U	NA
Ethylbenzene	700	0.25 U	0.5 U	0.5 U	NA	10 U	NA	5 U	NA	1 U	5 U	NA
Methyl acetate	--	1 U	1 U	2 U	NA	10 U	NA	5 U	NA	1 U	5 U	NA
Methylcyclohexane	--	1 U	0.5 U	2 U	NA	10 U	NA	5 U	NA	1 U	5 U	NA
Methylene chloride	5	0.317 B	1 U	0.5 U	NA	10 U	NA	5 U	NA	1 U	0.579 B	NA
Methyl-tert-butyl ether (MTBE)	--	0.5 U	0.5 U	1 U	NA	**1 J**	NA	**3.8 J**	NA	**2.8**	**2.9 J**	NA
Styrene	100	0.125 U	0.5 U	0.25 U	NA	10 U	NA	5 U	NA	1 U	5 U	NA
Tetrachloroethene	5	**1.12 J**	**1.24**	**1.5 J**	NA	10 U	NA	5 U	NA	1 U	5 U	NA
Toluene	1,000	0.25 U	0.5 U	0.5 U	NA	10 U	NA	5 U	NA	1 U	5 U	NA
trans-1,2-Dichloroethene	100	0.25 U	0.5 U	0.5 U	NA	10 U	NA	5 U	NA	1 U	5 U	NA
Trichloroethene	5	**70.2**	**55**	**70.1**	NA	**1 J**	NA	**1.9 J**	NA	**1.2**	**1.02 J**	NA
Trichlorofluoromethane (Freon-11)	--	0.5 U	1 U	1 U	NA	10 U	NA	5 U	NA	1 U	5 U	NA
Vinyl chloride	2	0.25 U	0.5 U	0.5 U	NA	10 U	NA	5 U	NA	1 U	2 U	NA
Semivolatile Organic Compounds (UG/L)												
No Detections		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives (UG/L)												
HMX	--	NA	NA	NA	1.04 U	NA	0.263 U	NA	0.16 U	NA	NA	1.02 U
Nitroglycerin	--	NA	NA	NA	1.04 U	NA	0.263 U	NA	1.1 U	NA	NA	1.02 U
Perchlorate	--	NA	NA	NA	0.2 U	NA	0.2 U	NA	0.5 U	NA	NA	0.2 U
RDX	--	NA	NA	NA	1.04 U	NA	0.263 U	NA	0.27 U	NA	NA	1.02 U
Total Metals (UG/L)												
Aluminum	--	NA	NA	NA	50 U	NA	50 U	NA	**15.1 J**	NA	NA	100 U
Antimony	6	NA	NA	NA	0.25 U	NA	**1.6**	NA	10 U	NA	NA	1 U
Arsenic	10	NA	NA	NA	**9.42 J**	NA	**55**	NA	**7.2 J**	NA	NA	**9.07**
Barium	2,000	NA	NA	NA	**108**	NA	**135**	NA	**126 J**	NA	NA	**117**
Beryllium	4	NA	NA	NA	0.5 U	NA	0.5 U	NA	4 U	NA	NA	2 U
Cadmium	5	NA	NA	NA	0.25 U	NA	0.25 U	NA	5 U	NA	NA	0.5 U
Calcium	--	NA	NA	NA	**62,100 J**	NA	**86,500 K**	NA	**82,800**	NA	NA	**84,400**
Chromium	100	NA	NA	NA	2.5 U	NA	2.99 B	NA	5 U	NA	NA	20 U
Cobalt	--	NA	NA	NA	2.5 U	NA	2.5 U	NA	50 U	NA	NA	20 U
Copper	1,300	NA	NA	NA	5 U	NA	5 U	NA	25 U	NA	NA	20 U
Cyanide	200	NA	NA	NA	NA	NA	5 U	NA	10 U	NA	NA	10 U
Iron	--	NA	NA	NA	**12,700**	NA	**24,900**	NA	**6,140**	NA	NA	**10,100**
Lead	15	NA	NA	NA	0.25 U	NA	**1.95**	NA	10 U	NA	NA	5 U
Magnesium	--	NA	NA	NA	**17,600**	NA	**20,900**	NA	**20,300**	NA	NA	**18,700**
Manganese	--	NA	NA	NA	**314**	NA	**469**	NA	**352**	NA	NA	**377**
Nickel	--	NA	NA	NA	5 U	NA	5 U	NA	**1.4 J**	NA	NA	40 U
Potassium	--	NA	NA	NA	**2,030**	NA	**2,240**	NA	**1,910 J**	NA	NA	**1,980**
Selenium	50	NA	NA	NA	**0.796 J**	NA	0.5 U	NA	10 U	NA	NA	10 U
Silver	--	NA	NA	NA	5 U	NA	0.25 U	NA	5 U	NA	NA	4 U
Sodium	--	NA	NA	NA	**10,300**	NA	**10,400**	NA	**9,940**	NA	NA	**9,030**
Thallium	2	NA	NA	NA	0.104 B	NA	0.05 U	NA	15 U	NA	NA	0.2 U
Vanadium	--	NA	NA	NA	5 U	NA	5 U	NA	50 U	NA	NA	10 U

CTO-WE13
ABL, Site 1
Validated Groundwater Exceedance Analytical Results
2008-2012 Monitoring Well and Extraction Well Data

Station ID	**CLEAN MCL-Groundwater**	1GW35			1GW36							
Sample ID		AS01-1GW35-R18	AS01-1GW35-R19	AS01-1GW35-R20	AS01-1GW36-CM14	AS01-1GW36-R14	AS01-1GW36-CM15	AS01-1GW36-R15	AS01-1GW36-CM16	AS01-1GW36-R16	AS01-1GW36-R17	AS01-1GW36-CM17
Sample Date		01/12/11	10/13/11	08/28/12	01/31/08	01/31/08	10/15/08	10/15/08	07/10/09	07/10/09	04/14/10	04/14/10
Chemical Name												
Zinc	--	NA	NA	NA	5 U	NA	14.7 B	NA	4 B	NA	NA	20 U
Dissolved Metals (UG/L)												
Arsenic, Dissolved	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium, Dissolved	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium, Dissolved	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper, Dissolved	1,300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead, Dissolved	15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury, Dissolved	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium, Dissolved	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

C:\Users\kmalley\Documents\Work\Klyukin_Rebekah\Jan 7 - FYR ABL\Appendixes\Appendix E_FYR Data\[ABL_Site 1_GW_RDE Table.xls], mmorri13, 11/13/2012

Notes:

Exceeds all criteria

Bold indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

UQ

UG/L - Micrograms per liter

CTO-WE13
ABL, Site 1
Validated Groundwater Exceedance Analytical Results
2008-2012 Monitoring Well and Extraction Well Data

Station ID	CLEAN MCL-Groundwater	1GW36				1GW37							
Sample ID		AS01-1GW36-CM18	AS01-1GW36-R18	AS01-1GW36-R19	AS01-1GW36-R20	AS01-1GW37-CM14	AS01-1GW37-R14	AS01-1GW37-CM15	AS01-1GW37P-CM15	AS01-1GW37P-R15	AS01-1GW37-R15	AS01-1GW37-CM16	AS01-1GW37-R16
Sample Date		01/12/11	01/12/11	10/14/11	08/28/12	01/30/08	01/30/08	10/15/08	10/15/08	10/15/08	10/15/08	07/10/09	07/10/09
Chemical Name													
Volatile Organic Compounds (UG/L)													
1,1,1-Trichloroethane	200	NA	0.25 U	0.5 U	0.5 U	NA	10 U	NA	NA	5 U	5 U	NA	8 U
1,1,2,2-Tetrachloroethane	--	NA	0.2 U	0.5 U	0.4 U	NA	10 U	NA	NA	5 U	5 U	NA	8 U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	--	NA	2 U	1 U	4 U	NA	10 U	NA	NA	5 U	5 U	NA	8 U
1,1,2-Trichloroethane	5	NA	0.25 U	0.5 U	0.5 U	NA	10 U	NA	NA	5 U	5 U	NA	8 U
1,1-Dichloroethane	--	NA	0.125 U	0.5 U	0.25 U	NA	10 U	NA	NA	5 U	5 U	NA	8 U
1,1-Dichloroethene	7	NA	0.5 U	0.5 U	1 U	NA	10 U	NA	NA	5 U	5 U	NA	8 U
1,2-Dichloroethane	5	NA	0.25 U	0.5 U	0.5 U	NA	10 U	NA	NA	5 U	5 U	NA	8 U
1,2-Dichloroethene (total)	70	NA	NA	NA	NA	NA	**20**	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	5	NA	0.2 U	0.5 U	0.4 U	NA	10 U	NA	NA	5 U	5 U	NA	8 U
Acetone	--	NA	2.5 R	7.92 B	5 R	NA	10 U	NA	NA	20 U	20 U	NA	40 U
Benzene	5	NA	0.125 U	0.5 U	0.25 U	NA	10 U	NA	NA	5 U	5 U	NA	8 U
Bromodichloromethane	80	NA	0.25 U	0.5 U	0.5 U	NA	10 U	NA	NA	5 U	5 U	NA	8 U
Carbon disulfide	--	NA	0.5 U	0.5 U	1 U	NA	10 U	NA	NA	5 U	5 U	NA	8 U
Carbon tetrachloride	5	NA	0.25 U	0.5 U	0.5 U	NA	10 U	NA	NA	5 U	5 U	NA	8 U
Chlorobenzene	100	NA	0.125 U	0.5 U	0.25 U	NA	10 U	NA	NA	5 U	5 U	NA	8 U
Chloroethane	--	NA	0.5 U	1 U	1 U	NA	10 U	NA	NA	5 U	5 U	NA	8 U
Chloroform	80	NA	0.125 U	0.5 U	0.25 U	NA	10 U	NA	NA	5 U	5 U	NA	8 U
Chloromethane	--	NA	0.5 U	0.5 U	1 U	NA	10 U	NA	NA	5 U	5 U	NA	8 U
cis-1,2-Dichloroethene	70	NA	**4.8 J**	**2.75**	**1.28**	NA	**20**	NA	NA	**23**	**31**	NA	**3.9 J**
Cyclohexane	--	NA	1 U	0.5 U	2 U	NA	10 U	NA	NA	5 U	5 U	NA	8 U
Dibromochloromethane	80	NA	0.25 U	0.5 U	0.5 U	NA	10 U	NA	NA	5 U	5 U	NA	8 U
Ethylbenzene	700	NA	0.25 U	0.5 U	0.5 U	NA	10 U	NA	NA	5 U	5 U	NA	8 U
Methyl acetate	--	NA	1 U	1 U	2 U	NA	10 U	NA	NA	5 U	5 U	NA	8 U
Methylcyclohexane	--	NA	1 U	0.5 U	2 U	NA	10 U	NA	NA	5 U	5 U	NA	8 U
Methylene chloride	5	NA	0.25 U	6.53 B	0.5 U	NA	10 U	NA	NA	5 U	5 U	NA	8 U
Methyl-tert-butyl ether (MTBE)	--	NA	**4.94 J**	**1.79**	**0.705 J**	NA	10 U	NA	NA	5 U	5 U	NA	8 U
Styrene	100	NA	0.125 U	0.5 U	0.25 U	NA	10 U	NA	NA	5 U	5 U	NA	8 U
Tetrachloroethene	5	NA	0.25 U	0.5 U	0.5 U	NA	**9 J**	NA	NA	**7.4**	**5.7**	NA	**16**
Toluene	1,000	NA	0.25 U	0.5 U	0.5 U	NA	10 U	NA	NA	5 U	5 U	NA	8 U
trans-1,2-Dichloroethene	100	NA	0.25 U	0.5 U	0.5 U	NA	10 U	NA	NA	**1.2 J**	**1.2 J**	NA	8 U
Trichloroethene	5	NA	**1.21 J**	**0.482 J**	**0.284 J**	NA	**130**	NA	NA	**99**	**120**	NA	**140**
Trichlorofluoromethane (Freon-11)	--	NA	0.5 U	1 U	1 U	NA	10 U	NA	NA	5 U	5 U	NA	8 U
Vinyl chloride	2	NA	0.25 U	0.5 U	0.5 U	NA	10 U	NA	NA	5 U	5 U	NA	8 U
Semivolatile Organic Compounds (UG/L)													
No Detections		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives (UG/L)													
HMX	--	0.278 U	NA	NA	NA	**0.487 J**	NA	**0.322 J**	**0.339 J**	NA	NA	**0.59**	NA
Nitroglycerin	--	0.278 U	NA	NA	NA	1.02 U	NA	0.258 U	0.258 U	NA	NA	1 U	NA
Perchlorate	--	0.1 U	NA	NA	NA	**16**	NA	**20**	**19**	NA	NA	**21**	NA
RDX	--	0.278 U	NA	NA	NA	**2.83**	NA	**3.01 J**	**3.05 J**	NA	NA	**8.3**	NA
Total Metals (UG/L)													
Aluminum	--	50 U	NA	NA	NA	**72.1 J**	NA	185 B	188 B	NA	NA	**93.7 J**	NA
Antimony	6	0.5 U	NA	NA	NA	0.25 U	NA	0.25 U	0.25 U	NA	NA	10 U	NA
Arsenic	10	**5.81**	NA	NA	NA	5 U	NA	**0.518 J**	**0.382 J**	NA	NA	10 U	NA
Barium	2,000	**125**	NA	NA	NA	**49.7**	NA	**50.6**	**50.9**	NA	NA	**37.9 J**	NA
Beryllium	4	0.5 U	NA	NA	NA	0.5 U	NA	0.5 U	0.5 U	NA	NA	4 U	NA
Cadmium	5	0.25 U	NA	NA	NA	0.25 U	NA	0.25 U	0.25 U	NA	NA	5 U	NA
Calcium	--	**98,700**	NA	NA	NA	**53,700**	NA	**51,500 K**	**51,700 K**	NA	NA	**35,500**	NA
Chromium	100	2.5 U	NA	NA	NA	**89.2**	NA	**253**	**233**	NA	NA	**56.7**	NA
Cobalt	--	2.5 U	NA	NA	NA	2.5 U	NA	2.5 U	2.5 U	NA	NA	50 U	NA
Copper	1,300	5 U	NA	NA	NA	**6.42 J**	NA	**16.2 J**	**12.4 J**	NA	NA	**9 J**	NA
Cyanide	200	5 U	NA	NA	NA	NA	NA	5 U	5 U	NA	NA	10 U	NA
Iron	--	**9,890**	NA	NA	NA	**881**	NA	**1,760**	**1,520**	NA	NA	**1,280**	NA
Lead	15	2.5 U	NA	NA	NA	0.25 U	NA	0.25 U	0.25 U	NA	NA	10 U	NA
Magnesium	--	**19,900**	NA	NA	NA	**9,640**	NA	**8,620**	**8,850**	NA	NA	**6,090**	NA
Manganese	--	**493**	NA	NA	NA	**44.8**	NA	**78.2**	**69.8**	NA	NA	**29.2**	NA
Nickel	--	5 U	NA	NA	NA	**5.19 J**	NA	**9.33 J**	**8.68 J**	NA	NA	**4.4 J**	NA
Potassium	--	**2,170**	NA	NA	NA	**747 J**	NA	**671 J**	**763 J**	NA	NA	5,000 U	NA
Selenium	50	5 U	NA	NA	NA	0.5 U	NA	**0.548 J**	**0.589 J**	NA	NA	10 U	NA
Silver	--	**3.83 J**	NA	NA	NA	5 U	NA	0.25 U	0.25 U	NA	NA	5 U	NA
Sodium	--	**10,100**	NA	NA	NA	**23,600**	NA	**21,200**	**22,000**	NA	NA	**11,600**	NA
Thallium	2	0.1 U	NA	NA	NA	0.096 B	NA	0.05 U	0.05 U	NA	NA	15 U	NA
Vanadium	--	5 U	NA	NA	NA	5 U	NA	5 U	5 U	NA	NA	**2.3 J**	NA

CTO-WE13
ABL, Site 1
Validated Groundwater Exceedance Analytical Results
2008-2012 Monitoring Well and Extraction Well Data

Station ID	**CLEAN MCL-Groundwater**	1GW36				1GW37							
Sample ID		AS01-1GW36-CM18	AS01-1GW36-R18	AS01-1GW36-R19	AS01-1GW36-R20	AS01-1GW37-CM14	AS01-1GW37-R14	AS01-1GW37-CM15	AS01-1GW37P-CM15	AS01-1GW37P-R15	AS01-1GW37-R15	AS01-1GW37-CM16	AS01-1GW37-R16
Sample Date		01/12/11	01/12/11	10/14/11	08/28/12	01/30/08	01/30/08	10/15/08	10/15/08	10/15/08	10/15/08	07/10/09	07/10/09
Chemical Name													
Zinc	--	5 U	NA	NA	NA	5 U	NA	11.4 B	11.6 B	NA	NA	3.4 B	NA
Dissolved Metals (UG/L)													
Arsenic, Dissolved	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium, Dissolved	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium, Dissolved	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper, Dissolved	1,300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead, Dissolved	15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury, Dissolved	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium, Dissolved	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Notes:

Exceeds all criteria

Bold indicates detections

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B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

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UQ

UG/L - Micrograms per liter

CTO-WE13
ABL, Site 1
Validated Groundwater Exceedance Analytical Results
2008-2012 Monitoring Well and Extraction Well Data

Station ID	CLEAN MCL-Groundwater	1GW37						1GW38							
Sample ID		AS01-1GW37-R17	AS01-1GW37-CM17	AS01-1GW37-CM18	AS01-1GW37-R18	AS01-1GW37-R19	AS01-1GW37-R20	AS01-1GW38-CM14	AS01-1GW38P-CM14	AS01-1GW38P-R14	AS01-1GW38-R14	AS01-1GW38-CM15	AS01-1GW38-R15	AS01-1GW38-CM16	AS01-1GW38-R16
Sample Date		04/15/10	04/15/10	01/13/11	01/13/11	10/14/11	08/28/12	01/30/08	01/30/08	01/30/08	01/30/08	10/15/08	10/15/08	07/13/09	07/13/09
Chemical Name															
Volatile Organic Compounds (UG/L)															
1,1,1-Trichloroethane	200	5 U	NA	NA	0.25 U	0.5 U	0.5 U	NA	NA	10 U	10 U	NA	**1.1 J**	NA	25 U
1,1,2,2-Tetrachloroethane	--	5 U	NA	NA	0.2 U	0.5 U	0.4 U	NA	NA	10 U	10 U	NA	5 U	NA	25 U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	--	5 UL	NA	NA	2 U	1 U	4 U	NA	NA	**11**	**13**	NA	**31 J**	NA	**16 J**
1,1,2-Trichloroethane	5	5 U	NA	NA	0.25 U	0.5 U	0.5 U	NA	NA	10 U	10 U	NA	5 U	NA	25 U
1,1-Dichloroethane	--	5 U	NA	NA	0.125 U	0.5 U	0.25 U	NA	NA	10 U	10 U	NA	5 U	NA	25 U
1,1-Dichloroethene	7	5 U	NA	NA	0.5 U	0.5 U	1 U	NA	NA	10 U	**1 J**	NA	5 U	NA	25 U
1,2-Dichloroethane	5	5 U	NA	NA	0.25 U	0.5 U	0.5 U	NA	NA	10 U	10 U	NA	5 U	NA	25 U
1,2-Dichloroethene (total)	70	NA	NA	NA	NA	NA	NA	NA	NA	**700**	**670**	NA	NA	NA	NA
1,2-Dichloropropane	5	5 U	NA	NA	0.2 U	0.5 U	0.4 U	NA	NA	10 U	10 U	NA	5 U	NA	25 U
Acetone	--	10 R	NA	NA	2.5 R	5 U	5 R	NA	NA	10 U	10 U	NA	20 U	NA	120 U
Benzene	5	5 U	NA	NA	0.125 U	0.5 U	0.25 U	NA	NA	10 U	10 U	NA	5 U	NA	25 U
Bromodichloromethane	80	5 U	NA	NA	0.25 U	0.5 U	0.5 U	NA	NA	10 U	10 U	NA	5 U	NA	25 U
Carbon disulfide	--	5 U	NA	NA	0.5 U	0.5 U	1 U	NA	NA	10 U	10 U	NA	5 U	NA	25 U
Carbon tetrachloride	5	**0.341 J**	NA	NA	0.25 U	0.5 U	0.5 U	NA	NA	10 U	10 U	NA	5 U	NA	25 U
Chlorobenzene	100	5 U	NA	NA	0.125 U	0.5 U	0.25 U	NA	NA	10 U	10 U	NA	5 U	NA	25 U
Chloroethane	--	5 U	NA	NA	0.5 U	1 U	1 U	NA	NA	10 U	10 U	NA	5 U	NA	25 U
Chloroform	80	**0.337 J**	NA	NA	**0.213 J**	**0.261 J**	0.568 B	NA	NA	10 U	10 U	NA	5 U	NA	25 U
Chloromethane	--	5 U	NA	NA	0.5 U	0.5 U	1 U	NA	NA	10 U	10 U	NA	5 U	NA	25 U
cis-1,2-Dichloroethene	70	**3.59 J**	NA	NA	**64.2**	**42.6**	**13.3**	NA	NA	**700**	**670**	NA	**670**	NA	**290**
Cyclohexane	--	5 U	NA	NA	1 U	0.5 U	2 U	NA	NA	10 U	10 U	NA	5 U	NA	25 U
Dibromochloromethane	80	5 U	NA	NA	0.25 U	0.5 U	0.5 U	NA	NA	10 U	10 U	NA	5 U	NA	25 U
Ethylbenzene	700	5 U	NA	NA	0.25 U	0.5 U	0.5 U	NA	NA	10 U	10 U	NA	5 U	NA	25 U
Methyl acetate	--	5 U	NA	NA	1 U	1 U	2 U	NA	NA	10 U	10 U	NA	5 U	NA	25 U
Methylcyclohexane	--	**1.25 L**	NA	NA	1 U	0.5 U	2 U	NA	NA	10 U	10 U	NA	5 U	NA	25 U
Methylene chloride	5	0.331 B	NA	NA	0.25 U	1 U	0.5 U	NA	NA	10 U	10 U	NA	5 U	NA	**4.6 J**
Methyl-tert-butyl ether (MTBE)	--	5 U	NA	NA	0.5 U	0.5 U	1 U	NA	NA	10 U	10 U	NA	5 U	NA	25 U
Styrene	100	5 U	NA	NA	0.125 U	0.5 U	0.25 U	NA	NA	10 U	10 U	NA	5 U	NA	25 U
Tetrachloroethene	5	**21.6**	NA	NA	**5.79**	**12.9**	**21.3**	NA	NA	**80**	**73**	NA	**79**	NA	**65**
Toluene	1,000	5 U	NA	NA	0.25 U	0.5 U	0.5 U	NA	NA	10 U	10 U	NA	5 U	NA	25 U
trans-1,2-Dichloroethene	100	**0.315 J**	NA	NA	**0.474 J**	**0.934 J**	0.5 U	NA	NA	**4 J**	**4 J**	NA	**3.9 J**	NA	25 U
Trichloroethene	5	**173**	NA	NA	**89.1**	**91**	**184**	NA	NA	**400**	**360**	NA	**1,100**	NA	**510**
Trichlorofluoromethane (Freon-11)	--	5 U	NA	NA	0.5 U	1 U	1 U	NA	NA	10 U	10 U	NA	5 U	NA	25 U
Vinyl chloride	2	2 U	NA	NA	0.25 U	0.5 U	0.5 U	NA	NA	**6 J**	**6 J**	NA	**6.6**	NA	25 U
Semivolatile Organic Compounds (UG/L)															
No Detections		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives (UG/L)															
HMX	--	NA	**0.693 J**	**0.479 J**	NA	NA	NA	**1.18**	**1.34**	NA	NA	**1.27**	NA	**3.1**	NA
Nitroglycerin	--	NA	1.03 U	0.25 U	NA	NA	NA	1.03 U	1.03 U	NA	NA	0.258 U	NA	0.98 U	NA
Perchlorate	--	NA	**33.5**	**6.56**	NA	NA	NA	**40**	**41**	NA	NA	**140**	NA	**93**	NA
RDX	--	NA	**9.71**	**3.01**	NA	NA	NA	**1.27**	**1.61**	NA	NA	**2.78 J**	NA	**1.5 J**	NA
Total Metals (UG/L)															
Aluminum	--	NA	100 U	**704**	NA	NA	NA	50 U	50 U	NA	NA	50 U	NA	200 U	NA
Antimony	6	NA	1 U	0.5 U	NA	NA	NA	0.25 U	0.25 U	NA	NA	0.25 U	NA	10 U	NA
Arsenic	10	NA	1 U	**1.14**	NA	NA	NA	5 U	5 U	NA	NA	**0.253 J**	NA	10 U	NA
Barium	2,000	NA	**37**	**57.6**	NA	NA	NA	**54.2**	**52.4**	NA	NA	**52.2**	NA	**50.8 J**	NA
Beryllium	4	NA	2 U	0.5 U	NA	NA	NA	0.5 U	0.5 U	NA	NA	0.5 U	NA	4 U	NA
Cadmium	5	NA	0.5 U	0.25 U	NA	NA	NA	**0.251 J**	0.25 U	NA	NA	0.25 U	NA	5 U	NA
Calcium	--	NA	**32,700**	**56,300**	NA	NA	NA	**50,800**	**49,100**	NA	NA	**50,400 K**	NA	**58,700**	NA
Chromium	100	NA	**47.1**	**198**	NA	NA	NA	**2.65 J**	2.5 U	NA	NA	6.26 B	NA	5 U	NA
Cobalt	--	NA	20 U	**2.58 J**	NA	NA	NA	2.5 U	2.5 U	NA	NA	**2.64 J**	NA	50 U	NA
Copper	1,300	NA	20 U	**15.6 J**	NA	NA	NA	5 U	5 U	NA	NA	5 U	NA	25 U	NA
Cyanide	200	NA	10 U	5 U	NA	NA	NA	NA	NA	NA	NA	5 U	NA	10 U	NA
Iron	--	NA	**843**	**3,230**	NA	NA	NA	25 U	25 U	NA	NA	25 U	NA	100 U	NA
Lead	15	NA	5 U	2.5 U	NA	NA	NA	**1.62**	0.25 U	NA	NA	0.25 U	NA	10 U	NA
Magnesium	--	NA	**5,420**	**9,530**	NA	NA	NA	**10,100**	**10,100**	NA	NA	**10,100**	NA	**11,100**	NA
Manganese	--	NA	**14.5**	**188**	NA	NA	NA	**72.9**	**69.9**	NA	NA	**10.1 J**	NA	15 U	NA
Nickel	--	NA	40 U	**12.1 J**	NA	NA	NA	**7.73 J**	**7.16 J**	NA	NA	**5.37 J**	NA	**2.2 J**	NA
Potassium	--	NA	**442 J**	**966 J**	NA	NA	NA	**1,700**	**1,710**	NA	NA	**1,620**	NA	**1,300 J**	NA
Selenium	50	NA	10 U	5 U	NA	NA	NA	0.5 U	0.5 U	NA	NA	**1.24 J**	NA	10 U	NA
Silver	--	NA	4 U	**3.3 J**	NA	NA	NA	5 U	5 U	NA	NA	0.25 U	NA	5 U	NA
Sodium	--	NA	**7,270**	**22,100**	NA	NA	NA	**54,100**	**52,500**	NA	NA	**40,900**	NA	**34,600**	NA
Thallium	2	NA	0.2 U	0.1 U	NA	NA	NA	0.161 B	0.238 B	NA	NA	0.05 U	NA	15 U	NA
Vanadium	--	NA	10 U	5 U	NA	NA	NA	5 U	5 U	NA	NA	5 U	NA	**1.2 J**	NA

CTO-WE13
ABL, Site 1
Validated Groundwater Exceedance Analytical Results
2008-2012 Monitoring Well and Extraction Well Data

Station ID	CLEAN MCL-Groundwater	1GW37						1GW38							
Sample ID		AS01-1GW37-R17	AS01-1GW37-CM17	AS01-1GW37-CM18	AS01-1GW37-R18	AS01-1GW37-R19	AS01-1GW37-R20	AS01-1GW38-CM14	AS01-1GW38P-CM14	AS01-1GW38P-R14	AS01-1GW38-R14	AS01-1GW38-CM15	AS01-1GW38-R15	AS01-1GW38-CM16	AS01-1GW38-R16
Sample Date		04/15/10	04/15/10	01/13/11	01/13/11	10/14/11	08/28/12	01/30/08	01/30/08	01/30/08	01/30/08	10/15/08	10/15/08	07/13/09	07/13/09
Chemical Name															
Zinc	--	NA	20 U	5 U	NA	NA	NA	5.94 B	5.49 B	NA	NA	11.7 B	NA	4.8 B	NA
Dissolved Metals (UG/L)															
Arsenic, Dissolved	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium, Dissolved	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium, Dissolved	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper, Dissolved	1,300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead, Dissolved	15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury, Dissolved	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium, Dissolved	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Notes:

Exceeds all criteria

Bold indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

UQ

UG/L - Micrograms per liter

CTO-WE13
ABL, Site 1
Validated Groundwater Exceedance Analytical Results
2008-2012 Monitoring Well and Extraction Well Data

Station ID	CLEAN MCL-Groundwater	1GW38								1GW39				
Sample ID		AS01-1GW38P-R17	AS01-1GW38-R17	AS01-1GW38-CM17	AS01-1GW38P-CM17	AS01-1GW38-CM18	AS01-1GW38-R18	AS01-1GW38-R19	AS01-1GW38-R20	AS01-1GW39-CM14	AS01-1GW39-R14	AS01-1GW39-CM15	AS01-1GW39-R15	AS01-1GW39-CM16
Sample Date		04/14/10	04/14/10	04/14/10	04/14/10	01/13/11	01/13/11	10/13/11	08/27/12	01/31/08	01/31/08	10/15/08	10/15/08	07/14/09
Chemical Name														
Volatile Organic Compounds (UG/L)														
1,1,1-Trichloroethane	200	5 U	5 U	NA	NA	NA	0.625 U	5 U	0.5 U	NA	10 U	NA	5 U	NA
1,1,2,2-Tetrachloroethane	--	5 U	5 U	NA	NA	NA	0.5 U	5 U	0.4 U	NA	10 U	NA	5 U	NA
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	--	**9.73**	**9.72**	NA	NA	NA	**5.57 J**	**5.87 J**	**4.43 J**	NA	10 U	NA	5 U	NA
1,1,2-Trichloroethane	5	5 U	5 U	NA	NA	NA	0.625 U	5 U	0.5 U	NA	10 U	NA	5 U	NA
1,1-Dichloroethane	--	5 U	5 U	NA	NA	NA	0.313 U	5 U	0.25 U	NA	10 U	NA	5 U	NA
1,1-Dichloroethene	7	5 U	5 U	NA	NA	NA	1.25 U	5 U	1 U	NA	10 U	NA	5 U	NA
1,2-Dichloroethane	5	5 U	5 U	NA	NA	NA	0.625 U	5 U	0.5 U	NA	10 U	NA	5 U	NA
1,2-Dichloroethene (total)	70	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA
1,2-Dichloropropane	5	5 U	5 U	NA	NA	NA	0.5 U	5 U	0.4 U	NA	10 U	NA	5 U	NA
Acetone	--	10 R	10 R	NA	NA	NA	6.25 R	50 U	5 R	NA	10 U	NA	20 U	NA
Benzene	5	5 U	5 U	NA	NA	NA	0.313 U	5 U	0.25 U	NA	10 U	NA	5 U	NA
Bromodichloromethane	80	5 U	5 U	NA	NA	NA	0.625 U	5 U	**0.318 J**	NA	10 U	NA	5 U	NA
Carbon disulfide	--	5 U	5 U	NA	NA	NA	1.25 U	5 U	1 U	NA	10 U	NA	5 U	NA
Carbon tetrachloride	5	5 U	5 U	NA	NA	NA	0.625 U	5 U	0.5 U	NA	10 U	NA	5 U	NA
Chlorobenzene	100	5 U	5 U	NA	NA	NA	0.313 U	5 U	0.25 U	NA	10 U	NA	5 U	NA
Chloroethane	--	5 U	5 U	NA	NA	NA	1.25 U	10 U	1 U	NA	10 U	NA	5 U	NA
Chloroform	80	**0.351 J**	**0.387 J**	NA	NA	NA	**0.636 J**	5 U	1.22 B	NA	10 U	NA	5 U	NA
Chloromethane	--	5 U	5 U	NA	NA	NA	1.25 U	5 U	1 U	NA	10 U	NA	5 U	NA
cis-1,2-Dichloroethene	70	**61.4**	**64**	NA	NA	NA	**129**	**132**	**7.11**	NA	10 U	NA	**2.6 J**	NA
Cyclohexane	--	5 U	5 U	NA	NA	NA	2.5 U	5 U	2 U	NA	10 U	NA	5 U	NA
Dibromochloromethane	80	5 U	5 U	NA	NA	NA	0.625 U	5 U	0.5 U	NA	10 U	NA	5 U	NA
Ethylbenzene	700	5 U	5 U	NA	NA	NA	0.625 U	5 U	0.5 U	NA	10 U	NA	5 U	NA
Methyl acetate	--	5 U	5 U	NA	NA	NA	2.5 U	10 U	2 U	NA	10 U	NA	5 U	NA
Methylcyclohexane	--	5 U	5 U	NA	NA	NA	2.5 U	5 U	**1.04 J**	NA	10 U	NA	5 U	NA
Methylene chloride	5	0.492 B	0.29 B	NA	NA	NA	0.625 U	10 U	0.5 U	NA	10 U	NA	5 U	NA
Methyl-tert-butyl ether (MTBE)	--	5 U	5 U	NA	NA	NA	1.25 U	5 U	1 U	NA	10 U	NA	5 U	NA
Styrene	100	5 U	5 U	NA	NA	NA	0.313 U	5 U	0.25 U	NA	10 U	NA	5 U	NA
Tetrachloroethene	5	**59.6**	**62.5**	NA	NA	NA	**83**	**43.7**	**17.4**	NA	10 U	NA	5 U	NA
Toluene	1,000	5 U	5 U	NA	NA	NA	0.625 U	5 U	0.5 U	NA	10 U	NA	5 U	NA
trans-1,2-Dichloroethene	100	**0.714 J**	**0.741 J**	NA	NA	NA	**1.62 J**	5 U	0.5 U	NA	10 U	NA	5 U	NA
Trichloroethene	5	**168**	**177**	NA	NA	NA	**261**	**415**	**95.4**	NA	**35**	NA	**60**	NA
Trichlorofluoromethane (Freon-11)	--	5 U	5 U	NA	NA	NA	1.25 U	10 U	1 U	NA	10 U	NA	5 U	NA
Vinyl chloride	2	2 U	2 U	NA	NA	NA	0.625 U	5 U	0.5 U	NA	10 U	NA	5 U	NA
Semivolatile Organic Compounds (UG/L)														
No Detections		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives (UG/L)														
HMX	--	NA	NA	**3.22**	**3.07**	**2.34**	NA	NA	NA	**1.79**	NA	**0.936 J**	NA	**1.2**
Nitroglycerin	--	NA	NA	1.04 U	1.04 U	0.255 U	NA	NA	NA	1.02 U	NA	0.258 U	NA	0.97 U
Perchlorate	--	NA	NA	**75.4**	**70.4**	**105**	NA	NA	NA	**7.2**	NA	**4.6**	NA	**4.2**
RDX	--	NA	NA	**1.99**	**1.83**	**5.51**	NA	NA	NA	**4.83**	NA	**3.69 J**	NA	**3.7**
Total Metals (UG/L)														
Aluminum	--	NA	NA	100 U	100 U	50 U	NA	NA	NA	50 U	NA	115 B	NA	**96.2 J**
Antimony	6	NA	NA	1 U	1 U	0.5 U	NA	NA	NA	0.25 U	NA	0.25 U	NA	10 U
Arsenic	10	NA	NA	1 U	1 U	0.5 U	NA	NA	NA	5 U	NA	0.25 U	NA	10 U
Barium	2,000	NA	NA	**52.8**	**52.9**	**58.2**	NA	NA	NA	**32.8**	NA	**46.9**	NA	**35.8 J**
Beryllium	4	NA	NA	2 U	2 U	0.5 U	NA	NA	NA	0.5 U	NA	**0.514 J**	NA	4 U
Cadmium	5	NA	NA	0.5 U	0.5 U	0.25 U	NA	NA	NA	0.25 U	NA	0.25 U	NA	5 U
Calcium	--	NA	NA	**63,200**	**62,700**	**68,200**	NA	NA	NA	**137,000 J**	NA	**150,000 K**	NA	**136,000**
Chromium	100	NA	NA	20 U	20 U	2.5 U	NA	NA	NA	2.5 U	NA	3.98 B	NA	5 U
Cobalt	--	NA	NA	20 U	20 U	2.5 U	NA	NA	NA	2.5 U	NA	2.5 U	NA	50 U
Copper	1,300	NA	NA	20 U	20 U	5 U	NA	NA	NA	5 U	NA	5 U	NA	25 U
Cyanide	200	NA	NA	10 U	10 U	5 U	NA	NA	NA	NA	NA	5 U	NA	10 U
Iron	--	NA	NA	100 U	100 U	**43 J**	NA	NA	NA	89.3 B	NA	**242**	NA	57.3 B
Lead	15	NA	NA	5 U	5 U	2.5 U	NA	NA	NA	**0.322 J**	NA	0.25 U	NA	10 U
Magnesium	--	NA	NA	**10,700**	**10,800**	**12,200**	NA	NA	NA	**31,400**	NA	**33,700**	NA	**29,900**
Manganese	--	NA	NA	10 U	10 U	5 U	NA	NA	NA	**8.95 J**	NA	**15.2**	NA	**4.4 J**
Nickel	--	NA	NA	40 U	40 U	5 U	NA	NA	NA	5 U	NA	5 U	NA	40 U
Potassium	--	NA	NA	**1,210**	**1,230**	**1,700**	NA	NA	NA	**1,900**	NA	**2,380**	NA	**1,750 J**
Selenium	50	NA	NA	10 U	10 U	5 U	NA	NA	NA	**0.953 J**	NA	**0.786 J**	NA	10 U
Silver	--	NA	NA	4 U	4 U	**4.38**	NA	NA	NA	5 U	NA	0.25 U	NA	5 U
Sodium	--	NA	NA	**31,000**	**31,700**	**44,500**	NA	NA	NA	**24,300**	NA	**33,500**	NA	**31,000**
Thallium	2	NA	NA	0.2 U	0.2 U	0.1 U	NA	NA	NA	0.137 B	NA	0.05 U	NA	15 U
Vanadium	--	NA	NA	10 U	10 U	5 U	NA	NA	NA	10 U	NA	5 U	NA	50 U

CTO-WE13
ABL, Site 1
Validated Groundwater Exceedance Analytical Results
2008-2012 Monitoring Well and Extraction Well Data

Station ID	**CLEAN MCL-Groundwater**	1GW38								1GW39				
Sample ID		AS01-1GW38P-R17	AS01-1GW38-R17	AS01-1GW38-CM17	AS01-1GW38P-CM17	AS01-1GW38-CM18	AS01-1GW38-R18	AS01-1GW38-R19	AS01-1GW38-R20	AS01-1GW39-CM14	AS01-1GW39-R14	AS01-1GW39-CM15	AS01-1GW39-R15	AS01-1GW39-CM16
Sample Date		04/14/10	04/14/10	04/14/10	04/14/10	01/13/11	01/13/11	10/13/11	08/27/12	01/31/08	01/31/08	10/15/08	10/15/08	07/14/09
Chemical Name														
Zinc	--	NA	NA	20 U	20 U	5 U	NA	NA	NA	5 U	NA	15.3 B	NA	7.3 B
Dissolved Metals (UG/L)														
Arsenic, Dissolved	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium, Dissolved	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium, Dissolved	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper, Dissolved	1,300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead, Dissolved	15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury, Dissolved	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium, Dissolved	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Notes:

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L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

UQ

UG/L - Micrograms per liter

CTO-WE13
ABL, Site 1
Validated Groundwater Exceedance Analytical Results
2008-2012 Monitoring Well and Extraction Well Data

Station ID	**CLEAN MCL-Groundwater**	1GW39							1IW01		1IW02	
Sample ID		AS01-1GW39-R16	AS01-1GW39-R17	AS01-1GW39-CM17	AS01-1GW39-CM18	AS01-1GW39-R18	AS01-1GW39-R19	AS01-1GW39-R20	AS01-1GW-IW01-041612	AS01-1GW-IW01-041812	AS01-1GW-IW02-041612	AS01-1GW-IW02-041812
Sample Date		07/14/09	04/14/10	04/14/10	01/14/11	01/14/11	10/17/11	08/21/12	04/16/12	04/18/12	04/16/12	04/18/12
Chemical Name												
Volatile Organic Compounds (UG/L)												
1,1,1-Trichloroethane	200	2 U	5 U	NA	NA	**0.565 J**	**0.4 J**	**0.327 J**	**104**	**182**	**24**	**19.6**
1,1,2,2-Tetrachloroethane	--	2 U	5 U	NA	NA	0.2 U	0.5 U	0.4 U	12.5 U	25 U	2.5 U	2.5 U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	--	2 U	5 U	NA	NA	2 U	**1.06 J**	4 U	12.5 U	25 U	2.5 U	2.5 U
1,1,2-Trichloroethane	5	2 U	5 U	NA	NA	0.25 U	0.5 U	0.5 U	12.5 U	25 U	2.5 U	2.5 U
1,1-Dichloroethane	--	2 U	5 U	NA	NA	0.125 U	0.5 U	0.25 U	12.5 U	25 U	2.5 U	2.5 U
1,1-Dichloroethene	7	2 U	5 U	NA	NA	0.5 U	0.5 U	1 U	12.5 U	25 U	2.5 U	2.5 U
1,2-Dichloroethane	5	2 U	5 U	NA	NA	0.25 U	0.5 U	0.5 U	12.5 U	25 U	2.5 U	2.5 U
1,2-Dichloroethene (total)	70	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	5	2 U	5 U	NA	NA	0.2 U	0.5 U	0.4 U	12.5 U	25 U	2.5 U	2.5 U
Acetone	--	10 U	10 R	NA	NA	2.5 R	5 U	5 R	125 U	250 U	25 U	25 U
Benzene	5	2 U	5 U	NA	NA	0.125 U	0.5 U	0.25 U	12.5 U	25 U	2.5 U	2.5 U
Bromodichloromethane	80	2 U	5 U	NA	NA	0.25 U	0.5 U	0.5 U	12.5 U	25 U	2.5 U	2.5 U
Carbon disulfide	--	2 U	5 U	NA	NA	0.5 U	0.5 U	1 U	12.5 U	25 U	2.5 U	2.5 U
Carbon tetrachloride	5	2 U	5 U	NA	NA	0.25 U	0.5 U	0.5 U	12.5 U	25 U	2.5 U	2.5 U
Chlorobenzene	100	2 U	5 U	NA	NA	0.125 U	0.5 U	0.25 U	12.5 U	25 U	2.5 U	2.5 U
Chloroethane	--	2 U	5 U	NA	NA	0.5 U	1 U	1 U	12.5 U	25 U	2.5 U	2.5 U
Chloroform	80	2 U	**0.158 J**	NA	NA	**0.144 J**	0.5 U	0.25 U	12.5 U	25 U	2.5 U	2.5 U
Chloromethane	--	2 U	5 U	NA	NA	0.5 U	0.5 U	1 U	12.5 U	25 U	2.5 U	2.5 U
cis-1,2-Dichloroethene	70	**1.6 J**	**1.24 J**	NA	NA	0.25 U	**0.352 J**	0.5 U	**35**	**81.5**	**5.3**	**8.15**
Cyclohexane	--	2 U	5 U	NA	NA	1 U	0.5 U	2 U	12.5 U	25 U	2.5 U	2.5 U
Dibromochloromethane	80	2 U	5 U	NA	NA	0.25 U	0.5 U	0.5 U	12.5 U	25 U	2.5 U	2.5 U
Ethylbenzene	700	2 U	5 U	NA	NA	0.25 U	0.5 U	0.5 U	12.5 U	25 U	2.5 U	**1.25 J**
Methyl acetate	--	2 U	5 U	NA	NA	1 U	1 U	2 U	25 U	50 U	5 U	5 U
Methylcyclohexane	--	2 U	5 U	NA	NA	1 U	0.5 U	2 U	12.5 U	25 U	2.5 U	2.5 U
Methylene chloride	5	2 U	0.337 B	NA	NA	0.25 U	1 U	0.5 U	25 U	50 U	5 U	5 U
Methyl-tert-butyl ether (MTBE)	--	2 U	5 U	NA	NA	0.5 U	0.5 U	1 U	12.5 U	25 U	2.5 U	2.5 U
Styrene	100	2 U	5 U	NA	NA	0.125 U	0.5 U	0.25 U	12.5 U	25 U	2.5 U	2.5 U
Tetrachloroethene	5	2 U	5 U	NA	NA	**0.333 J**	0.5 U	0.5 U	12.5 U	25 U	2.5 U	2.5 U
Toluene	1,000	2 U	5 U	NA	NA	0.25 U	0.5 U	0.5 U	12.5 U	25 U	2.5 U	2.5 U
trans-1,2-Dichloroethene	100	2 U	5 U	NA	NA	0.25 U	0.5 U	0.5 U	12.5 U	25 U	2.5 U	2.5 U
Trichloroethene	5	**42**	**25.2**	NA	NA	**3.4 J**	**20**	**2.74**	**3,410**	**6,510**	**509**	**435**
Trichlorofluoromethane (Freon-11)	--	2 U	5 U	NA	NA	**2.06 J**	**0.985 J**	**1.54**	12.5 U	25 U	2.5 U	2.5 U
Vinyl chloride	2	2 U	2 U	NA	NA	0.25 U	0.5 U	0.5 U	12.5 U	25 U	2.5 U	2.5 U
Semivolatile Organic Compounds (UG/L)												
No Detections		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives (UG/L)												
HMX	--	NA	NA	**1.71**	**1.95**	NA	NA	NA	NA	NA	NA	NA
Nitroglycerin	--	NA	NA	1.03 U	0.255 U	NA	NA	NA	NA	NA	NA	NA
Perchlorate	--	NA	NA	**4.67**	**6.55**	NA	NA	NA	NA	NA	NA	NA
RDX	--	NA	NA	**4.95**	**3.24**	NA	NA	NA	NA	NA	NA	NA
Total Metals (UG/L)												
Aluminum	--	NA	NA	**586**	**972**	NA	NA	NA	NA	NA	NA	NA
Antimony	6	NA	NA	1 U	0.5 U	NA	NA	NA	NA	NA	NA	NA
Arsenic	10	NA	NA	1 U	**0.942 J**	NA	NA	NA	NA	NA	NA	NA
Barium	2,000	NA	NA	**31.3**	**74.9**	NA	NA	NA	NA	NA	NA	NA
Beryllium	4	NA	NA	2 U	1 U	NA	NA	NA	NA	NA	NA	NA
Cadmium	5	NA	NA	0.5 U	0.25 U	NA	NA	NA	NA	NA	NA	NA
Calcium	--	NA	NA	**109,000**	**136,000**	NA	NA	NA	NA	NA	NA	NA
Chromium	100	NA	NA	20 U	10 U	NA	NA	NA	NA	NA	NA	NA
Cobalt	--	NA	NA	20 U	10 U	NA	NA	NA	NA	NA	NA	NA
Copper	1,300	NA	NA	20 U	10 U	NA	NA	NA	NA	NA	NA	NA
Cyanide	200	NA	NA	10 U	5 U	NA	NA	NA	NA	NA	NA	NA
Iron	--	NA	NA	**607**	**2,230**	NA	NA	NA	NA	NA	NA	NA
Lead	15	NA	NA	5 U	2.5 U	NA	NA	NA	NA	NA	NA	NA
Magnesium	--	NA	NA	**24,300**	**30,500**	NA	NA	NA	NA	NA	NA	NA
Manganese	--	NA	NA	**39.2**	**64.8**	NA	NA	NA	NA	NA	NA	NA
Nickel	--	NA	NA	40 U	20 U	NA	NA	NA	NA	NA	NA	NA
Potassium	--	NA	NA	**1,690**	**2,480**	NA	NA	NA	NA	NA	NA	NA
Selenium	50	NA	NA	10 U	5 U	NA	NA	NA	NA	NA	NA	NA
Silver	--	NA	NA	4 U	**6.84**	NA	NA	NA	NA	NA	NA	NA
Sodium	--	NA	NA	**24,200**	**25,800**	NA	NA	NA	NA	NA	NA	NA
Thallium	2	NA	NA	0.2 U	0.1 U	NA	NA	NA	NA	NA	NA	NA
Vanadium	--	NA	NA	10 U	5 U	NA	NA	NA	NA	NA	NA	NA

CTO-WE13
ABL, Site 1
Validated Groundwater Exceedance Analytical Results
2008-2012 Monitoring Well and Extraction Well Data

Station ID	**CLEAN MCL-Groundwater**	1GW39							1IW01		1IW02	
Sample ID		AS01-1GW39-R16	AS01-1GW39-R17	AS01-1GW39-CM17	AS01-1GW39-CM18	AS01-1GW39-R18	AS01-1GW39-R19	AS01-1GW39-R20	AS01-1GW-IW01-041612	AS01-1GW-IW01-041812	AS01-1GW-IW02-041612	AS01-1GW-IW02-041812
Sample Date		07/14/09	04/14/10	04/14/10	01/14/11	01/14/11	10/17/11	08/21/12	04/16/12	04/18/12	04/16/12	04/18/12
Chemical Name												
Zinc	--	NA	NA	20 U	**25.7**	NA	NA	NA	NA	NA	NA	NA
Dissolved Metals (UG/L)												
Arsenic, Dissolved	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium, Dissolved	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium, Dissolved	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper, Dissolved	1,300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead, Dissolved	15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury, Dissolved	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium, Dissolved	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Notes:

Exceeds all criteria

Bold indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

UQ

UG/L - Micrograms per liter

CTO-WE13
ABL, Site 1
Validated Groundwater Exceedance Analytical Results
2008-2012 Monitoring Well and Extraction Well Data

Station ID	CLEAN MCL-Groundwater	1IW03		1IW05			1IW06			
Sample ID		AS01-1GW-IW03-011211	AS01-1GW-IW03-041812	AS01-1GW-IW05-011311	AS01-1GW-IW05-011311-D	AS01-1GW-IW05-041812	AS01-1GW-IW06-041612	AS01-1GW-IW06-041712-01	AS01-1GW-IW06-041712-02	AS01-1GW-IW06-041712-03
Sample Date		01/12/11	04/18/12	01/13/11	01/13/11	04/18/12	04/16/12	04/17/12	04/17/12	04/17/12
Chemical Name										
Volatile Organic Compounds (UG/L)										
1,1,1-Trichloroethane	200	**168 J**	**110**	**191**	**186**	**14.6**	**232**	**330**	**371**	**360**
1,1,2,2-Tetrachloroethane	--	**0.887 J**	25 U	0.2 U	0.2 U	2.5 U	25 U	50 U	50 U	50 U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	--	2 U	25 U	2 U	2 U	2.5 U	25 U	50 U	50 U	50 U
1,1,2-Trichloroethane	5	**0.312 J**	25 U	**0.399 J**	**0.287 J**	2.5 U	25 U	50 U	50 U	50 U
1,1-Dichloroethane	--	**0.281 J**	25 U	**0.552 J**	**0.519 J**	2.5 U	25 U	50 U	50 U	50 U
1,1-Dichloroethene	7	**3.88**	25 U	**4.97**	**4.45**	2.5 U	25 U	50 U	50 U	50 U
1,2-Dichloroethane	5	0.25 U	25 U	0.25 U	0.25 U	2.5 U	25 U	50 U	50 U	50 U
1,2-Dichloroethene (total)	70	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	5	0.2 UJ	25 U	0.2 U	0.2 U	2.5 U	25 U	50 U	50 U	50 U
Acetone	--	2.5 R	250 U	2.5 R	2.5 R	25 U	250 U	500 U	500 U	500 U
Benzene	5	**0.138 J**	25 U	0.125 U	0.125 U	2.5 U	25 U	50 U	50 U	50 U
Bromodichloromethane	80	0.25 U	25 U	0.25 U	0.25 U	2.5 U	25 U	50 U	50 U	50 U
Carbon disulfide	--	0.5 U	25 U	0.5 U	0.5 U	2.5 U	25 U	50 U	50 U	50 U
Carbon tetrachloride	5	**0.649 J**	25 U	**0.444 J**	**0.452 J**	2.5 U	25 U	50 U	50 U	50 U
Chlorobenzene	100	**0.913 J**	25 U	**0.717 J**	**0.633 J**	2.5 U	25 U	50 U	50 U	50 U
Chloroethane	--	0.5 U	25 U	0.5 U	0.5 U	2.5 U	25 U	50 U	50 U	50 U
Chloroform	80	**0.34 J**	25 U	**0.178 J**	**0.17 J**	2.5 U	25 U	50 U	50 U	50 U
Chloromethane	--	**0.559 J**	25 U	0.5 U	0.5 U	2.5 U	25 U	50 U	50 U	50 U
cis-1,2-Dichloroethene	70	**84.5 J**	**63**	**80.7**	**74.6**	**14.8**	**68.5**	**81 J**	**95 J**	**99 J**
Cyclohexane	--	1 U	25 U	1 U	1 U	2.5 U	25 U	50 U	50 U	50 U
Dibromochloromethane	80	0.25 U	25 U	0.25 U	0.25 U	2.5 U	25 U	50 U	50 U	50 U
Ethylbenzene	700	0.25 U	25 U	0.25 U	0.25 U	2.5 U	25 U	50 U	50 U	50 U
Methyl acetate	--	1 U	50 U	1 U	1 U	5 U	50 U	100 U	100 U	100 U
Methylcyclohexane	--	1 UJ	25 U	1 U	1 U	2.5 U	25 U	50 U	50 U	50 U
Methylene chloride	5	0.594 B	50 U	**12.7**	**11.5**	5 U	26.5 B	100 U	100 U	100 U
Methyl-tert-butyl ether (MTBE)	--	0.5 U	25 U	0.5 U	0.5 U	2.5 U	25 U	50 U	50 U	50 U
Styrene	100	0.125 U	25 U	0.125 U	0.125 U	2.5 U	25 U	50 U	50 U	50 U
Tetrachloroethene	5	**2.74**	25 U	**1.57**	**1.5**	2.5 U	25 U	50 U	50 U	50 U
Toluene	1,000	**0.906 J**	25 U	**3.45**	**3.3**	2.5 U	25 U	50 U	50 U	50 U
trans-1,2-Dichloroethene	100	**0.737 J**	25 U	**3.37**	**3.07**	2.5 U	25 U	50 U	50 U	50 U
Trichloroethene	5	**6,450 J**	**5,470**	**6,640**	**6,690**	**667**	**8,140**	**12,000**	**12,800**	**12,900**
Trichlorofluoromethane (Freon-11)	--	0.5 U	25 U	0.5 U	0.5 U	2.5 U	25 U	50 U	50 U	50 U
Vinyl chloride	2	0.25 U	25 U	0.25 U	0.25 U	2.5 U	25 U	50 U	50 U	50 U
Semivolatile Organic Compounds (UG/L)										
No Detections		NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives (UG/L)										
HMX	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitroglycerin	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perchlorate	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
RDX	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Metals (UG/L)										
Aluminum	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	6	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	10	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	4	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	5	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	100	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	1,300	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	200	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	15	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	50	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	2	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA

CTO-WE13
ABL, Site 1
Validated Groundwater Exceedance Analytical Results
2008-2012 Monitoring Well and Extraction Well Data

Station ID	**CLEAN MCL-Groundwater**	1IW03		1IW05			1IW06			
Sample ID		AS01-1GW-IW03-011211	AS01-1GW-IW03-041812	AS01-1GW-IW05-011311	AS01-1GW-IW05-011311-D	AS01-1GW-IW05-041812	AS01-1GW-IW06-041612	AS01-1GW-IW06-041712-01	AS01-1GW-IW06-041712-02	AS01-1GW-IW06-041712-03
Sample Date		01/12/11	04/18/12	01/13/11	01/13/11	04/18/12	04/16/12	04/17/12	04/17/12	04/17/12
Chemical Name										
Zinc	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Metals (UG/L)										
Arsenic, Dissolved	10	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium, Dissolved	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium, Dissolved	100	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper, Dissolved	1,300	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead, Dissolved	15	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury, Dissolved	2	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium, Dissolved	50	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Notes:

Exceeds all criteria

Bold indicates detections

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J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

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R - Unreliable Result

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UL - Analyte not detected, quantitation limit is probably higher

UQ

UG/L - Micrograms per liter

CTO-WE13
ABL, Site 1
Validated Groundwater Exceedance Analytical Results
2008-2012 Monitoring Well and Extraction Well Data

Station ID	CLEAN MCL-Groundwater	1IW06			1IW08		1MW01		1MW08		
Sample ID		AS01-1GW-IW06-041812-01	AS01-1GW-IW06-041812-02	AS01-1GW-IW06-041812-03	AS01-1GW-IW08-011211	AS01-1GW-IW08-041812	AS01-1GW-MW01-041612	AS01-1GW-MW01-041812	AS01-1GW-MW08-011211	AS01-1GW-MW08-041812	AS01-1GW-MW08-041812-D
Sample Date		04/18/12	04/18/12	04/18/12	01/12/11	04/18/12	04/16/12	04/18/12	01/12/11	04/18/12	04/18/12
Chemical Name											
Volatile Organic Compounds (UG/L)											
1,1,1-Trichloroethane	200	**346**	**330**	**435**	**262**	**229**	**350**	**825**	**509**	**208**	**215**
1,1,2,2-Tetrachloroethane	--	50 U	50 U	125 U	0.2 U	50 U	125 U	125 U	0.2 U	25 U	25 U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	--	50 U	50 U	125 U	2 U	50 U	125 U	125 U	2 U	25 U	25 U
1,1,2-Trichloroethane	5	50 U	50 U	125 U	**0.886 J**	50 U	125 U	125 U	**1.38**	25 U	25 U
1,1-Dichloroethane	--	50 U	50 U	125 U	**0.529 J**	50 U	125 U	125 U	**1.41**	25 U	25 U
1,1-Dichloroethene	7	50 U	50 U	125 U	**9.85**	50 U	125 U	125 U	**20.8**	25 U	25 U
1,2-Dichloroethane	5	50 U	50 U	125 U	0.25 U	50 U	125 U	125 U	0.25 U	25 U	25 U
1,2-Dichloroethene (total)	70	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	5	50 U	50 U	125 U	0.2 U	50 U	125 U	125 U	0.2 U	25 U	25 U
Acetone	--	500 U	500 U	1,250 U	2.5 R	500 U	1,250 U	1,250 U	2.5 R	250 U	250 U
Benzene	5	50 U	50 U	125 U	**0.229 J**	50 U	125 U	125 U	**0.331 J**	25 U	25 U
Bromodichloromethane	80	50 U	50 U	125 U	0.25 U	50 U	125 U	125 U	0.25 U	25 U	25 U
Carbon disulfide	--	50 U	50 U	125 U	**289**	50 U	125 U	125 U	**283**	25 U	25 U
Carbon tetrachloride	5	50 U	50 U	125 U	**0.906 J**	50 U	125 U	125 U	**0.76 J**	25 U	25 U
Chlorobenzene	100	50 U	50 U	125 U	**2.05**	50 U	125 U	125 U	**2.96**	25 U	25 U
Chloroethane	--	50 U	50 U	125 U	0.5 U	50 U	125 U	125 U	0.5 U	25 U	25 U
Chloroform	80	50 U	50 U	125 U	**0.344 J**	50 U	125 U	125 U	**0.793 J**	25 U	25 U
Chloromethane	--	50 U	50 U	125 U	0.5 U	50 U	125 U	125 U	0.5 U	25 U	25 U
cis-1,2-Dichloroethene	70	**112**	**133**	**138 J**	**94.9**	**225**	**155 J**	**288**	**639**	**680**	**716**
Cyclohexane	--	50 U	50 U	125 U	1 U	50 U	125 U	125 U	1 U	25 U	25 U
Dibromochloromethane	80	50 U	50 U	125 U	0.25 U	50 U	125 U	125 U	0.25 U	25 U	25 U
Ethylbenzene	700	50 U	50 U	125 U	0.25 U	50 U	125 U	125 U	0.25 U	25 U	25 U
Methyl acetate	--	100 U	100 U	250 U	1 U	100 U	250 U	250 U	1 U	50 U	50 U
Methylcyclohexane	--	50 U	50 U	125 U	1 U	50 U	125 U	125 U	1 U	25 U	25 U
Methylene chloride	5	100 U	100 U	250 U	**10.1**	100 U	250 U	240 B	4.67 B	50 U	50 U
Methyl-tert-butyl ether (MTBE)	--	50 U	50 U	125 U	0.5 U	50 U	125 U	125 U	0.5 U	25 U	25 U
Styrene	100	50 U	50 U	125 U	0.125 U	50 U	125 U	**77.5 J**	0.125 U	25 U	25 U
Tetrachloroethene	5	50 U	50 U	125 U	**2.74**	50 U	125 U	125 U	**3.6**	25 U	25 U
Toluene	1,000	50 U	50 U	125 U	**5.98**	50 U	125 U	**85 J**	**4.9**	25 U	25 U
trans-1,2-Dichloroethene	100	50 U	50 U	125 U	**1.14**	50 U	125 U	125 U	**5.59**	25 U	25 U
Trichloroethene	5	**12,700**	**13,000**	**15,200**	**13,100**	**9,500**	**18,100**	**45,700**	**18,100**	**4,840**	**4,870**
Trichlorofluoromethane (Freon-11)	--	50 U	50 U	125 U	0.5 U	50 U	125 U	125 U	0.5 U	25 U	25 U
Vinyl chloride	2	50 U	50 U	125 U	0.25 U	50 U	125 U	125 U	0.25 U	25 U	25 U
Semivolatile Organic Compounds (UG/L)											
No Detections		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives (UG/L)											
HMX	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitroglycerin	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perchlorate	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
RDX	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Metals (UG/L)											
Aluminum	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	1,300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	200	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

CTO-WE13
ABL, Site 1
Validated Groundwater Exceedance Analytical Results
2008-2012 Monitoring Well and Extraction Well Data

Station ID	**CLEAN MCL-Groundwater**	1IW06			1IW08		1MW01		1MW08		
Sample ID		AS01-1GW-IW06-041812-01	AS01-1GW-IW06-041812-02	AS01-1GW-IW06-041812-03	AS01-1GW-IW08-011211	AS01-1GW-IW08-041812	AS01-1GW-MW01-041612	AS01-1GW-MW01-041812	AS01-1GW-MW08-011211	AS01-1GW-MW08-041812	AS01-1GW-MW08-041812-D
Sample Date		04/18/12	04/18/12	04/18/12	01/12/11	04/18/12	04/16/12	04/18/12	01/12/11	04/18/12	04/18/12
Chemical Name											
Zinc	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Metals (UG/L)											
Arsenic, Dissolved	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium, Dissolved	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium, Dissolved	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper, Dissolved	1,300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead, Dissolved	15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury, Dissolved	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium, Dissolved	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Notes:

Exceeds all criteria

Bold indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

UQ

UG/L - Micrograms per liter

CTO-WE13
ABL, Site 1
Validated Groundwater Exceedance Analytical Results
2008-2012 Monitoring Well and Extraction Well Data

Station ID	CLEAN MCL-Groundwater	1MW09			AS01-SB75			AS01-SB76		AS01-SB77	
Sample ID		AS01-1GW-MW09-041612	AS01-1GW-MW09-041612-D	AS01-1GW-MW09-041812	AS01-1GW75-2025-041112	AS01-1GW75-2530-041112	AS01-1GW75-2530-041112-D	AS01-1GW76-2025-041012	AS01-1GW76-2732-041012	AS01-1GW77-2025-041012	AS01-1GW77-2631-041012
Sample Date		04/16/12	04/16/12	04/18/12	04/11/12	04/11/12	04/11/12	04/10/12	04/10/12	04/10/12	04/10/12
Chemical Name											
Volatile Organic Compounds (UG/L)											
1,1,1-Trichloroethane	200	**118**	**158**	**125**	**552**	**34.9**	**32.1**	**356**	5 U	**3,450 J**	**364 J**
1,1,2,2-Tetrachloroethane	--	12.5 U	25 U	25 U	125 U	5 U	5 U	25 U	5 U	2,500 U	200 U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	--	12.5 U	25 U	25 U	125 U	5 U	5 U	25 U	5 U	2,500 U	200 U
1,1,2-Trichloroethane	5	12.5 U	25 U	25 U	125 U	5 U	5 U	25 U	5 U	2,500 U	200 U
1,1-Dichloroethane	--	12.5 U	25 U	25 U	125 U	5 U	5 U	25 U	5 U	2,500 U	200 U
1,1-Dichloroethene	7	12.5 U	25 U	25 U	125 U	5 U	5 U	25 U	5 U	2,500 U	200 U
1,2-Dichloroethane	5	12.5 U	25 U	25 U	125 U	5 U	5 U	**20.5 J**	5 U	2,500 U	200 U
1,2-Dichloroethene (total)	70	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	5	12.5 U	25 U	25 U	125 U	5 U	5 U	25 U	5 U	2,500 U	200 U
Acetone	--	125 U	250 U	250 U	1,250 U	50 U	50 U	250 U	**22 J**	25,000 U	2,000 U
Benzene	5	12.5 U	25 U	25 U	125 U	5 U	5 U	25 U	5 U	2,500 U	200 U
Bromodichloromethane	80	12.5 U	25 U	25 U	125 U	5 U	5 U	25 U	5 U	2,500 U	200 U
Carbon disulfide	--	12.5 U	25 U	25 U	125 U	5 U	5 U	25 U	5 U	2,500 U	200 U
Carbon tetrachloride	5	12.5 U	25 U	25 U	125 U	5 U	5 U	25 U	5 U	2,500 U	200 U
Chlorobenzene	100	12.5 U	25 U	25 U	125 U	5 U	5 U	25 U	5 U	2,500 U	200 U
Chloroethane	--	12.5 U	25 U	25 U	125 U	5 U	5 U	25 U	5 U	2,500 U	200 U
Chloroform	80	12.5 U	25 U	25 U	125 U	5 U	5 U	25 U	5 U	2,500 U	200 U
Chloromethane	--	12.5 U	25 U	25 U	125 U	5 U	5 U	25 U	5 U	2,500 U	200 U
cis-1,2-Dichloroethene	70	**45.8**	**63.5**	**49.5 J**	**382**	**13.7**	**13.3**	**198**	**23.6**	2,500 U	**172 J**
Cyclohexane	--	12.5 U	25 U	25 U	125 U	5 U	5 U	25 U	5 U	2,500 U	200 U
Dibromochloromethane	80	12.5 U	25 U	25 U	125 U	5 U	5 U	25 U	5 U	2,500 U	200 U
Ethylbenzene	700	12.5 U	25 U	25 U	125 U	5 U	5 U	25 U	5 U	2,500 U	200 U
Methyl acetate	--	25 U	50 U	50 U	250 U	10 U	10 U	50 U	10 U	5,000 U	400 U
Methylcyclohexane	--	12.5 U	25 U	25 U	125 U	5 U	5 U	25 U	5 U	2,500 U	200 U
Methylene chloride	5	25 U	50 U	50 U	250 U	10 U	10 U	50 U	10 U	**2,650 J**	400 U
Methyl-tert-butyl ether (MTBE)	--	12.5 U	25 U	25 U	125 U	5 U	5 U	25 U	5 U	2,500 U	200 U
Styrene	100	12.5 U	25 U	25 U	125 U	5 U	5 U	25 U	5 U	2,500 U	200 U
Tetrachloroethene	5	12.5 U	25 U	25 U	125 U	5 U	5 U	25 U	5 U	2,500 U	200 U
Toluene	1,000	12.5 U	25 U	25 U	125 U	5 U	5 U	25 U	5 U	2,500 U	200 U
trans-1,2-Dichloroethene	100	12.5 U	25 U	25 U	125 U	5 U	5 U	25 U	5 U	2,500 U	200 U
Trichloroethene	5	**3,690**	**5,020**	**4,410**	**21,200**	**1,470**	**1,400**	**6,290**	**782**	**261,000**	**22,800**
Trichlorofluoromethane (Freon-11)	--	12.5 U	25 U	25 U	125 U	5 U	5 U	25 U	5 U	2,500 U	200 U
Vinyl chloride	2	12.5 U	25 U	25 U	125 U	5 U	5 U	25 U	5 U	2,500 U	200 U
Semivolatile Organic Compounds (UG/L)											
No Detections		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives (UG/L)											
HMX	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitroglycerin	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Perchlorate	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
RDX	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Metals (UG/L)											
Aluminum	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	1,300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	200	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

CTO-WE13
ABL, Site 1
Validated Groundwater Exceedance Analytical Results
2008-2012 Monitoring Well and Extraction Well Data

Station ID	**CLEAN MCL-Groundwater**	1MW09			AS01-SB75			AS01-SB76		AS01-SB77	
Sample ID		AS01-1GW-MW09-041612	AS01-1GW-MW09-041612-D	AS01-1GW-MW09-041812	AS01-1GW75-2025-041112	AS01-1GW75-2530-041112	AS01-1GW75-2530-041112-D	AS01-1GW76-2025-041012	AS01-1GW76-2732-041012	AS01-1GW77-2025-041012	AS01-1GW77-2631-041012
Sample Date		04/16/12	04/16/12	04/18/12	04/11/12	04/11/12	04/11/12	04/10/12	04/10/12	04/10/12	04/10/12
Chemical Name											
Zinc	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Metals (UG/L)											
Arsenic, Dissolved	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium, Dissolved	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium, Dissolved	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper, Dissolved	1,300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead, Dissolved	15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury, Dissolved	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium, Dissolved	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Notes:

Exceeds all criteria

Bold indicates detections

NA - Not analyzed

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R - Unreliable Result

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UL - Analyte not detected, quantitation limit is probably higher

UQ

UG/L - Micrograms per liter

CTO-WE13
ABL, Site 1
Validated Pore Water Detected Analytical Results
2009-2012 LTM

Station ID	1PW01							1PW02					
Sample ID	AS01-1PW01P-R16	AS01-1PW01-R16	AS01-1PW01-R17	AS01-1PW01P-R18	AS01-1PW01-R18	AS01-1PW01-R19	AS01-1PW01-R20	AS01-1PW02-R16	AS01-1PW02P-R17	AS01-1PW02-R17	AS01-1PW02-R18	AS01-1PW02-R19	AS01-1PW02-R20
Sample Date	09/29/09	09/29/09	04/26/10	07/20/11	07/20/11	10/18/11	09/14/12	09/29/09	04/26/10	04/26/10	07/20/11	10/18/11	09/14/12
Chemical Name													
Volatile Organic Compounds (UG/L)													
1,1-Dichloroethane	1 U	1 U	5 U	0.125 U	0.125 U	0.5 U	0.25 U	1 U	0.318 J	0.32 J	0.125 U	0.5 U	0.25 U
1,1-Dichloroethene	1 U	1 U	5 U	0.5 U	0.5 U	0.5 U	1 U	1 U	1.48 J	1.43 J	0.5 U	0.5 U	1 U
2-Butanone	5 U	5 U	6.38 B	3.22 J	3.36 J	5 U	5 R	5 U	6.04 B	7.2 B	2.9 J	5 U	5 R
cis-1,2-Dichloroethene	5.4	4.5	0.843 J	0.728 J	0.765 J	9.62	49.5	1 U	622	640	0.731 J	1.18	0.5 U
trans-1,2-Dichloroethene	1.4	1.3	5 U	0.25 U	0.25 U	0.5 U	0.269 J	1 U	2.49 J	2.43 J	0.25 U	0.5 U	0.5 U
Trichloroethene	0.15 J	1 U	5 U	0.25 U	0.25 U	0.5 U	0.316 J	1 U	28.2	27.5	0.25 U	0.5 U	0.5 U
Vinyl chloride	21	20	2.47	0.25 U	0.25 U	2.16	55.6	0.25 J	395	353	0.25 U	0.5 U	0.5 U

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Notes:

Shading indicates detections

NA - Not analyzed

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UG/L - Micrograms per liter

CTO-WE13
ABL, Site 1
Validated Pore Water Detected Analytical Results
2009-2012 LTM

Station ID	1PW03					1PW04			1PW05				
Sample ID	AS01-1PW03-R16	AS01-1PW03-R17	AS01-1PW03-R18	AS01-1PW03-R19	AS01-1PW03-R20	AS01-1PW04-R16	AS01-1PW04-R17	AS01-1PW04-R18	AS01-1PW05-R16	AS01-1PW05-R17	AS01-1PW05-R18	AS01-1PW05-R19	AS01-1PW05-R20
Sample Date	09/29/09	04/26/10	07/20/11	10/18/11	09/14/12	09/29/09	04/26/10	07/20/11	09/29/09	04/26/10	07/20/11	10/18/11	09/14/12
Chemical Name													
Volatile Organic Compounds (UG/L)													
1,1-Dichloroethane	1 U	5 U	0.125 U	0.5 U	0.25 U	1 U	5 U	0.817 J	1 U	5 U	0.125 U	0.5 U	0.25 U
1,1-Dichloroethene	1 U	5 U	0.5 U	0.5 U	1 U	1 U	5 U	0.527 J	1 U	5 U	0.5 U	0.5 U	1 U
2-Butanone	5 U	4.21 B	2.69 J	5 U	5 R	5 U	5.59 B	3.54 J	5 U	6.09 B	3.59 J	5 U	5 U
cis-1,2-Dichloroethene	1 U	5.39	0.577 J	0.5 U	18.8	1 U	5 U	136	1 U	5 U	0.25 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	1 U	0.263 J	0.25 U	0.5 U	0.303 J	1 U	5 U	0.512 J	1 U	5 U	0.25 U	0.5 U	0.5 U
Trichloroethene	1 U	0.671 J	0.25 U	0.5 U	1.97	1 U	5 U	0.507 J	1 U	5 U	0.25 U	0.5 U	0.5 U
Vinyl chloride	1 U	3.05	0.25 U	0.5 U	45.2	1 U	2 U	9.92	1 U	2 U	0.25 U	0.5 U	0.5 U

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Notes:

Shading indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

R - Unreliable Result

U - The material was analyzed for, but not detected

UG/L - Micrograms per liter

CTO-WE13
ABL, Site 1
Validated Pore Water Detected Analytical Results
2009-2012 LTM

Station ID	1PW06			1PW07	1PW08		
Sample ID	AS01-1PW06-R19	AS01-1PW06P-R20	AS01-1PW06-R20	AS01-1PW07-R20	AS01-1PW08P-R19	AS01-1PW08-R19	AS01-1PW08-R20
Sample Date	10/18/11	09/14/12	09/14/12	09/14/12	10/18/11	10/18/11	09/14/12
Chemical Name							
Volatile Organic Compounds (UG/L)							
1,1-Dichloroethane	0.5 U	0.25 U	0.25 U	0.53	0.5 U	0.5 U	0.25 U
1,1-Dichloroethene	0.5 U	1 U	1 U	1 U	0.5 U	0.5 U	1 U
2-Butanone	5 U	5 U	5 R	5 U	5 U	5 U	5 U
cis-1,2-Dichloroethene	0.5 U	1.22	0.979 J	50	0.5 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	0.5 U	0.5 U	0.5 U	0.54 J	0.5 U	0.5 U	0.5 U
Trichloroethene	0.5 U	0.659 J	0.511 J	0.5 U	0.5 U	0.5 U	0.5 U
Vinyl chloride	0.5 U	0.5 U	0.5 U	2.39	0.5 U	0.5 U	0.5 U

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Notes:

Shading indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

R - Unreliable Result

U - The material was analyzed for, but not detected

UG/L - Micrograms per liter

CTO-WE13
ABL, Site 1
Validated Sediment Raw Analytical Results
2008-2012 LTM

Station ID	1SD-0/1SW-0								1SD-0/1SW-0	
Sample ID	AS01-SD00-R14	AS01-SD00-R15	AS01-1SD00P-R16	AS01-1SD00-R16	AS01-SD00-R17	AS01-SD00P-R18	AS01-SD00-R18	AS01-SD00P-R19	AS01-SD00-R19	AS01-SD00-R20
Sample Date	08/13/08	10/14/08	07/21/09	07/21/09	04/20/10	07/08/11	07/08/11	10/05/11	10/05/11	08/30/12
Chemical Name										
Volatile Organic Compounds (UG/KG)										
1,1-Dichloroethene	8 U	8.7 U	8.1 U	7.7 U	7.25 U	0.556 U	0.59 U	3.29 U	3.02 U	2.5 U
1,2-Dichloroethene (total)	9 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone	45 U	8.7 U	8.1 U	7.7 U	7.25 U	2.78 U	2.95 U	6.58 U	6.05 U	6.26 U
Acetone	18 B	35 U	32 U	31 U	29 U	5.56 U	5.9 U	13.2 UJ	12.1 UJ	12.5 U
cis-1,2-Dichloroethene	9 U	8.7 U	8.1 U	7.7 U	7.25 U	0.556 U	0.59 U	3.29 U	3.02 U	1.25 U
Methylene chloride	39 U	8.7 U	8.1 U	7.7 U	7.25 U	1.11 U	1.18 U	6.58 U	6.05 U	2.5 U
Tetrachloroethene	9 U	8.7 U	8.1 U	7.7 U	7.25 U	0.556 U	0.59 U	3.29 U	3.02 U	1.25 U
Toluene	8 U	8.7 U	8.1 U	7.7 U	7.25 U	0.556 U	0.59 U	3.29 U	3.02 U	1.25 U
trans-1,2-Dichloroethene	11 U	8.7 U	8.1 U	7.7 U	7.25 U	0.556 U	0.59 U	3.29 U	3.02 U	1.25 U
Trichloroethene	9 U	8.7 U	8.1 U	7.7 U	7.25 U	0.556 U	0.59 U	3.29 U	3.02 U	1.25 U
Vinyl chloride	8 U	8.7 U	8.1 U	7.7 U	7.25 U	1.11 U	1.18 U	3.29 UJ	3.02 UJ	2.5 U
Semivolatile Organic Compounds (UG/KG)										
1,1-Biphenyl	520 U	44 J	530 U	510 U	241 U	108 U	118 UL	230 U	204 U	199 U
2,4-Dinitrotoluene	520 U	580 U	530 U	510 U	241 U	108 U	118 UL	230 U	204 U	199 U
2,6-Dinitrotoluene	520 U	580 U	530 U	510 U	241 U	108 U	118 UL	230 U	204 U	199 U
2-Chloronaphthalene	520 U	120 U	110 U	100 U	241 U	108 U	118 UL	230 U	204 U	199 U
2-Methylnaphthalene	520 U	120	21 J	22 J	241 U	108 U	118 UL	230 U	204 U	199 U
2-Methylphenol	960 U	580 U	530 U	510 U	241 U	108 U	118 U	230 U	204 U	199 U
2-Nitroaniline	1,300 U	3,000 U	2,700 U	2,600 U	1,210 U	541 U	591 UL	918 U	816 U	992 U
2-Nitrophenol	800 U	580 U	530 U	510 U	241 U	108 U	118 U	230 U	204 U	199 U
3,3'-Dichlorobenzidine	550 U	580 U	530 U	510 U	483 U	217 U	237 UL	230 U	204 U	398 U
3-Nitroaniline	1,300 U	3,000 U	2,700 U	2,600 U	1,210 U	541 U	591 UL	918 U	816 U	992 U
4,6-Dinitro-2-methylphenol	1,600 U	3,000 U	2,700 U	2,600 U	1,210 U	541 U	591 U	2,300 U	2,040 U	992 U
4-Bromophenyl-phenylether	520 U	580 U	530 U	510 U	241 U	108 U	118 UL	230 U	204 U	199 U
4-Chloro-3-methylphenol	780 U	580 U	530 U	510 U	241 U	108 U	118 U	230 U	204 U	199 U
4-Chloroaniline	560 U	580 U	530 U	510 U	241 U	108 U	118 UL	230 U	204 U	199 U
4-Methylphenol	NA	120 J	530 U	23 J	NA	NA	NA	230 U	204 U	NA
Acenaphthylene	520 U	120 U	110 U	100 U	241 U	108 U	118 UL	230 U	204 U	199 U
Acetophenone	840 U	580 U	530 U	510 U	241 U	108 U	118 UL	230 U	204 U	199 U
Anthracene	520 U	120 U	110 U	100 U	241 U	108 U	118 UL	230 U	204 U	199 U
Benzaldehyde	580 UL	580 U	630	510 U	241 U	108 R	118 R	230 U	204 U	199 U
Benzo(a)anthracene	520 U	120 U	39 J	34 J	241 U	108 U	118 UL	230 U	204 U	199 U
Benzo(a)pyrene	520 U	120 U	36 J	30 J	241 U	108 U	118 UL	230 U	204 U	199 U
Benzo(b)fluoranthene	640 U	30 J	49 J	42 J	241 U	108 U	118 UL	230 U	204 U	199 U
Benzo(g,h,i)perylene	520 U	120 U	30 J	25 J	241 U	108 U	118 UL	230 U	204 U	199 U
Benzo(k)fluoranthene	520 U	27 J	110 U	100 U	241 U	108 U	118 UL	230 U	204 U	199 U
bis(2-Chloroethyl)ether	520 U	120 U	110 U	100 U	241 U	108 U	118 UL	230 U	204 U	199 U
bis(2-Ethylhexyl)phthalate	520 U	140 J	530 U	510 U	241 U	108 U	118 UL	230 U	204 U	199 U
Butylbenzylphthalate	520 U	580 U	72 J	510 U	241 U	108 U	118 UL	230 U	204 U	199 U
Caprolactam	690 U	3,000 U	270 J	270 J	241 U	108 U	118 UL	230 U	204 U	199 UJ
Carbazole	530 U	120 U	110 U	100 U	241 U	108 U	118 UL	230 U	204 U	199 U
Chrysene	520 U	120 U	57 J	43 J	241 U	108 U	118 UL	230 U	204 U	199 U
Dibenz(a,h)anthracene	610 U	120 U	110 U	100 U	241 U	108 U	118 UL	230 U	204 U	199 U
SVOA (PG/G)										
Dibenzofuran	520,000 U	580,000 U	NA	NA	NA	NA	NA	NA	NA	NA
SVOA (UG/KG)										
Dibenzofuran	NA	NA	530 U	510 U	241 U	108 U	118 UL	230 U	204 U	199 U
Diethylphthalate	520 U	580 U	530 U	65 J	241 U	108 U	118 UL	230 U	204 U	199 U
Di-n-octylphthalate	1,000 U	580 U	530 U	510 U	241 U	108 U	118 UL	230 U	204 U	199 U
Fluoranthene	520 U	140	67 J	58 J	241 U	108 U	118 UL	230 U	204 U	199 U
Fluorene	520 U	120 U	110 U	100 U	241 U	108 U	118 UL	230 U	204 U	199 U
Indeno(1,2,3-cd)pyrene	580 U	120 U	28 J	21 J	241 U	108 U	118 UL	230 U	204 U	199 U
Isophorone	520 U	580 U	530 U	510 U	241 U	108 U	118 UL	230 U	204 U	199 U
Naphthalene	520 U	59 J	110 U	15 J	241 U	108 U	118 UL	230 U	204 U	199 U
n-Nitroso-di-n-propylamine	520 U	120 U	110 U	100 U	241 U	108 U	118 UL	230 U	204 U	199 U
Phenanthrene	520 U	220	53 J	53 J	241 U	108 U	118 UL	230 U	204 U	199 U
Pyrene	520 U	90 J	63 J	58 J	241 U	108 U	118 UL	230 U	204 U	199 U

Station ID	1SD-0/1SW-0								1SD-0/1SW-0	
Sample ID	AS01-SD00-R14	AS01-SD00-R15	AS01-1SD00P-R16	AS01-1SD00-R16	AS01-SD00-R17	AS01-SD00P-R18	AS01-SD00-R18	AS01-SD00P-R19	AS01-SD00-R19	AS01-SD00-R20
Sample Date	08/13/08	10/14/08	07/21/09	07/21/09	04/20/10	07/08/11	07/08/11	10/05/11	10/05/11	08/30/12
Chemical Name										
Total Metals (MG/KG)										
Aluminum	6,070	7,350	6,050	5,650	4,350	4,020	4,370	2,900	2,840	4,180
Antimony	0.29 U	0.29 L	0.73 B	0.71 B	1.06 U	0.414 UL	0.426 UL	2.82 R	2.4 R	8.88 UL
Arsenic	8.4	14.3	10.2	9.2	6.57	6	5.9	1.28 J	1.8 U	9.46 L
Barium	79.8	153	87.2	87.4	45.3 L	54	74.9	39.6	51.4	46.4 L
Beryllium	1.3	2.2	1.6	1.6	1.01	0.648	0.66	0.706 R	0.601 R	0.969 L
Cadmium	0.62 J	0.84 J	0.81 U	0.75 U	0.118 J	0.207 UL	0.213 UL	0.706 U	0.601 U	0.444 U
Calcium	1,600	73,800	4,820	4,900	22,100	86,600	77,700	347,000 J	207,000 J	6,140
Chromium	12.4	44.3	14.6	13.3	9.6	6.38	8.82	3.26 J	3.34	6.82 L
Cobalt	35.7	34.4	37.1	35.8	25.4	16.1	15.9	5.27 L	6.87 L	22.5 L
Copper	20	48.1	24	22.8	20.6	12.8	11.3	5.43	4.68	14.1 L
Cyanide	0.75 U	0.87 U	0.25 J	0.16 J	0.68 U	0.326 J	0.287 U	0.331 R	0.257 L	0.596 U
Iron	25,900	24,200	37,300	32,400	28,200	21,600	21,100	8,330	5,840	34,900 J
Lead	23.4	24	26.2	24.4	24.1	12.9 L	12.5 L	2.24 J	3.38 J	14.9 L
Magnesium	769	2,050	1,040	962	1,470 L	2,250	2,220	23,100 K	4,520 K	766 L
Manganese	686	917	759	706	807	791	852	409	355	842
Mercury	0.06	1.9	0.072	0.039 J	0.0362 J	0.0212 J	0.0296 J	0.0252 J	0.0275 J	0.0171 J
Nickel	63.2	60.5	66.2	62.4	43.1	25.9	26	8.39 L	9.55 L	41.6 L
Potassium	948	524 L	849	769	314	384	364	443 K	457 K	376 L
Selenium	0.38 U	0.93 J	1.6 U	1.5 U	0.861 J	2.07 U	2.13 U	1.76 U	1.5 U	4.44 UL
Silver	0.09 U	0.46 J	0.26 J	0.25 J	0.529 U	0.207 U	0.213 U	0.706 U	0.601 U	1.78 U
Sodium	70.6 J	1,070	33.4 J	48.8 J	35	48.9	45	1,060 U	901 U	57 B
Thallium	0.2 U	2.6 U	0.53 J	0.56 J	1.37 J	10.4 R	10.7 R	1.41 UL	1.2 UL	22.2 R
Vanadium	15.3	14.5	20.4	19.5	13	8.56	9.03	4.65	3.9	13.5 L
Zinc	167	224 L	186	171	122	82.9	91.9	57.3	57.5	113 L
Acid Volatile Sulfide/Simultaneously Extractable Metals (UMOL/G)										
Zinc, SEM	1.16 J	2.4 J	1.4	1.1 B	0.414	0.794	0.779	0.512 J	0.256 J	0.424
AVSSEM (UMOL/G)										
Acid volatile sulfide, SEM	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0335 L
AVSSEM (UMOL/G)										
Cadmium, SEM	0.0032 J	0.0076 J	0.0027	0.002	8.48E-04 B	0.00182 J	0.00168 J	0.00567 U	7.16E-04 J	4.51E-04 J
Copper, SEM	0.113 J	0.45 J	0.19	0.14	0.0409	0.0567	0.051	0.189 J	0.018 J	0.0415
Lead, SEM	0.0472 J	0.062 J	0.075	0.063	0.0247	0.0326	0.0383	0.0267 J	0.0101 J	0.0167
Mercury, SEM	0 B	5.00E-04 K	1.00E-04 U	9.60E-05 U	1.30E-05 UL	3.04E-05 UL	1.99E-05 L	3.22E-05 U	2.96E-05 U	3.51E-05 B
Nickel, SEM	0.332 J	0.63 J	0.44 B	0.32 B	0.11	0.174	0.184	0.716 J	0.0307 J	0.193
Silver, SEM	1.00E-04 UL	0.0027	0.0012 J	6.80E-04 J	0.0012 U	0.00703 U	0.00685 U	0.0155 U	0.00166 U	0.00115 J
Wet Chemistry										
% Solids (pct)	64	57.3	NA	NA	72.6	NA	NA	NA	NA	NA
Carbon (ug/g)	33,000 K	NA	NA	NA	NA	NA	NA	NA	NA	NA
pH (ph)	7.3	7.9	7.4	7.3	7.12	8.91 J	8.64 J	9.06 J	8.93 J	7.11
Total organic carbon (TOC) (mg/kg)	NA	144,000	56,600 B	50,000 B	29,400 J	19,700 L	631 UL	10,600 J	3,970 J	4,060 K
Grain Size (PCT)										
Coarse Gravel (%)	NA	NA	NA	NA	0	NA	NA	NA	NA	0 U
Coarse Sand (%)	2.3	0	0	0	9.3	18.4	19.1	NA	NA	16.1
Fine gravel (%)	NA	NA	NA	NA	5.7	NA	NA	NA	NA	46.7
Fine Sand (%)	77.3	20.7	88.1	88.3	60.8	14.9	17.8	NA	NA	5.6
Fines (%)	12.8	78.5	9.3	9.4	6.7	1.7	1.7	NA	NA	2
Gravel (%)	6.3	0	0	0	NA	40.7	37.8	NA	NA	NA
GS03 Sieve 3" (75 mm)	100	100	100	100	NA	100	100	NA	NA	NA
GS05 Sieve 2" (50 mm)	100	100	100	100	NA	100	100	NA	NA	NA
GS06 Sieve 1.5" (37.5 mm)	100	100	100	100	NA	100	100	NA	NA	NA
GS07 Sieve 1" (25.0 mm)	100	100	100	100	NA	100	100	NA	NA	NA
GRAINSIZE (PCT/P)										
GS07 Sieve 1" (25.0 mm)	NA	NA	NA	NA	NA	NA	NA	NA	100	NA
GRAINSIZE (PCT)										
GS08 Sieve 0.75" (19.0 mm)	100	100	100	100	NA	100	100	NA	NA	NA
GRAINSIZE (PCT/P)										
GS08 Sieve 0.75" (19.0 mm)	NA	NA	NA	NA	NA	NA	NA	NA	94	NA

Station ID	1SD-0/1SW-0								1SD-0/1SW-0	
Sample ID	AS01-SD00-R14	AS01-SD00-R15	AS01-1SD00P-R16	AS01-1SD00-R16	AS01-SD00-R17	AS01-SD00P-R18	AS01-SD00-R18	AS01-SD00P-R19	AS01-SD00-R19	AS01-SD00-R20
Sample Date	08/13/08	10/14/08	07/21/09	07/21/09	04/20/10	07/08/11	07/08/11	10/05/11	10/05/11	08/30/12
Chemical Name										
GS09 Sieve 0.5" (12.5 mm)	NA	NA	NA	NA	NA	NA	NA	NA	78	NA
GRAINSIZE (PCT)										
GS10 Sieve 0.375" (9.5 mm)	97.4	100	100	100	NA	85.4	90.2	NA	NA	NA
Medium Sand (%)	1.2	0.8	2.6	2.3	17.5	24.2	23.6	NA	NA	29.6
Sand (%)	NA	NA	NA	NA	NA	57.5	60.5	NA	NA	NA
Sieve No. 004 (4.75 mm)	93.7	100	100	100	NA	59.3	62.2	NA	NA	NA
GRAINSIZE (PCT/P)										
Sieve No. 004 (4.75 mm)	NA	NA	NA	NA	NA	NA	NA	NA	35	NA
GRAINSIZE (PCT)										
Sieve No. 010 (2.00 mm)	91.4	100	100	100	NA	40.9	43.1	NA	NA	NA
GRAINSIZE (PCT/P)										
Sieve No. 010 (2.00 mm)	NA	NA	NA	NA	NA	NA	NA	NA	16	NA
GRAINSIZE (PCT)										
Sieve No. 020 (850 um)	90.9	99.8	99.7	99.7	NA	25.5	28.1	NA	NA	NA
Sieve No. 040 (425 um)	90.1	99.2	97.4	97.7	NA	16.7	19.5	NA	NA	NA
GRAINSIZE (PCT/P)										
Sieve No. 040 (425 um)	NA	NA	NA	NA	NA	NA	NA	NA	8	NA
GRAINSIZE (PCT)										
Sieve No. 060 (250 um)	76.7	97.5	85.9	86.4	NA	7.6	8.7	NA	NA	NA
Sieve No. 100 (150 um)	38.2	93.5	39.2	40.5	NA	NA	NA	NA	NA	NA
GRAINSIZE (PCT/P)										
Sieve No. 100 (150 um)	NA	NA	NA	NA	NA	NA	NA	NA	3	NA
GRAINSIZE (PCT)										
Sieve No. 140 (106 um)	50.5	95.2	60.3	61.3	NA	NA	NA	NA	NA	NA
Sieve No. 200 (75 um)	12.8	78.5	9.3	9.4	NA	1.8	1.7	NA	NA	NA
GRAINSIZE (PCT/P)										
Sieve No. 200 (75 um)	NA	NA	NA	NA	NA	NA	NA	NA	2	NA

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Notes:

Shading indicates detections
NA - Not analyzed
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
R - Unreliable Result
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
MG/KG - Milligrams per kilogram
PCT - Percent
PH - pH units
UG/G - Micrograms per gram
UG/KG - Micrograms per kilogram
UMOL/G - Micromoles per gram

CTO-WE13
ABL, Site 1
Validated Sediment Raw Analytical Results
2008-2012 LTM

Station ID	1SD-0A/1SW-0A					1SD-1/1SW-1							
Sample ID	AS01-SD00A-R15	AS01-1SD00A-R16	AS01-SD00A-R18	AS01-SD00A-R19	AS01-SD00A-R20	AS01-SD01P-R14	AS01-SD01-R14	AS01-SD01-R15	AS01-1SD01-R16	AS01-SD01P-R17	AS01-SD01-R17	AS01-SD01-R18	AS01-SD01-R19
Sample Date	10/14/08	07/21/09	07/08/11	10/05/11	08/30/12	08/14/08	08/14/08	10/10/08	07/20/09	04/20/10	04/20/10	07/08/11	10/05/11
Chemical Name													
Volatile Organic Compounds (UG/KG)													
1,1-Dichloroethene	6.4 U	6.2 U	0.614 U	3.41 U	2.6 U	7 U	9 U	5.8 U	6.3 U	5.93 U	6.14 U	0.607 U	2.1 U
1,2-Dichloroethene (total)	NA	NA	NA	NA	NA	8 U	10 U	NA	NA	NA	NA	NA	NA
2-Butanone	6.4 U	6.2 U	3.07 U	6.82 U	6.5 U	40 U	19 J	5.8 U	6.3 U	5.93 U	6.14 U	3.04 U	4.19 U
Acetone	25 U	25 U	6.14 U	13.6 UJ	13 U	18 B	76	23 U	25 U	23.7 U	24.6 U	6.07 U	8.39 UJ
cis-1,2-Dichloroethene	6.4 U	6.2 U	0.614 U	3.41 U	1.3 U	8 U	10 U	5.8 U	6.3 U	5.93 U	6.14 U	0.607 U	2.1 U
Methylene chloride	1.9 J	6.2 U	1.23 U	6.82 U	2.6 U	34 U	43 U	1.7 B	6.3 U	5.93 U	6.14 U	1.21 U	4.19 U
Tetrachloroethene	6.4 U	6.2 U	0.614 U	3.41 U	1.3 U	8 U	10 U	5.8 U	6.3 U	5.93 U	6.14 U	0.607 U	2.1 U
Toluene	6.4 U	6.2 U	0.614 U	3.41 U	1.02 B	7 U	9 U	5.8 U	6.3 U	5.93 U	6.14 U	0.607 U	2.1 U
trans-1,2-Dichloroethene	6.4 U	6.2 U	0.614 U	3.41 U	1.3 U	10 U	12 U	5.8 U	6.3 U	5.93 U	6.14 U	0.607 U	2.1 U
Trichloroethene	6.4 U	6.2 U	0.614 U	3.41 U	1.3 U	8 U	10 U	5.8 U	6.3 U	5.93 U	6.14 U	0.607 U	2.1 U
Vinyl chloride	6.4 U	6.2 U	1.23 U	3.41 UJ	2.6 U	7 U	9 U	5.8 U	6.3 U	5.93 U	6.14 U	1.21 U	2.1 UJ
Semivolatile Organic Compounds (UG/KG)													
1,1-Biphenyl	51 J	31 J	113 UL	231 U	216 U	480 U	580 U	22 J	410 U	198 U	224 U	112 U	173 U
2,4-Dinitrotoluene	420 U	410 U	113 UL	231 U	216 U	480 U	580 U	380 U	410 U	198 U	224 U	112 U	173 U
2,6-Dinitrotoluene	420 U	410 U	113 UL	231 U	216 U	480 U	580 U	380 U	410 U	198 U	224 U	112 U	173 U
2-Chloronaphthalene	85 U	83 U	113 UL	231 U	216 U	480 U	580 U	76 U	83 U	198 U	224 U	112 U	173 U
2-Methylnaphthalene	74 J	44 J	113 UL	231 U	216 U	480 U	580 U	21 J	16 J	198 U	224 U	112 U	173 U
2-Methylphenol	420 U	410 U	113 U	231 U	216 U	880 U	1,100 U	380 U	410 U	198 U	224 U	112 U	173 U
2-Nitroaniline	2,100 U	2,100 U	563 UL	923 U	1,070 U	1,200 U	1,400 U	1,900 U	2,100 U	991 U	1,120 U	562 U	689 U
2-Nitrophenol	420 U	410 U	113 U	231 U	216 U	740 U	890 U	380 U	410 U	198 U	224 U	112 U	173 U
3,3'-Dichlorobenzidine	420 U	410 U	226 UL	231 U	430 UJ	510 U	610 U	380 U	410 U	396 U	449 U	225 U	173 U
3-Nitroaniline	2,100 U	2,100 U	563 UL	923 U	1,070 U	1,200 U	1,400 U	1,900 U	2,100 U	991 U	1,120 U	562 U	689 U
4,6-Dinitro-2-methylphenol	2,100 U	2,100 U	563 U	2,310 U	1,070 U	1,500 U	1,800 U	1,900 U	2,100 U	991 U	1,120 U	562 U	1,730 U
4-Bromophenyl-phenylether	420 U	410 U	113 UL	231 U	216 U	480 U	580 U	380 U	410 U	198 U	224 U	112 U	173 U
4-Chloro-3-methylphenol	420 U	410 U	113 U	231 U	216 U	720 U	870 U	380 U	410 U	198 U	224 U	112 U	173 U
4-Chloroaniline	420 U	410 U	113 UL	231 U	216 U	520 U	630 U	380 U	410 U	198 U	224 U	112 U	173 U
4-Methylphenol	420 U	410 U	NA	231 U	NA	NA	NA	380 U	410 U	NA	NA	NA	173 U
Acenaphthylene	85 U	83 U	113 UL	231 U	216 U	480 U	580 U	76 U	83 U	198 U	224 U	112 U	173 U
Acetophenone	420 U	410 U	113 UL	231 U	216 U	780 U	940 U	380 U	410 U	198 U	224 U	112 U	173 U
Anthracene	85 U	83 U	113 UL	231 U	216 U	480 U	580 U	76 U	83 U	198 U	224 U	112 U	173 U
Benzaldehyde	420 U	410 U	113 R	231 U	216 U	540 UL	640 UL	380 U	480	198 U	224 U	112 R	173 U
Benzo(a)anthracene	85 U	16 J	113 UL	231 U	216 U	480 U	580 U	76 U	83 U	198 U	224 U	112 U	173 U
Benzo(a)pyrene	85 U	83 U	113 UL	231 U	216 U	480 U	580 U	76 U	83 U	198 U	224 U	112 U	173 U
Benzo(b)fluoranthene	18 J	83 U	113 UL	231 U	216 U	590 U	720 U	76 U	83 U	198 U	224 U	112 U	173 U
Benzo(g,h,i)perylene	85 U	9.3 J	113 UL	231 U	216 U	480 U	580 U	76 U	83 U	198 U	224 U	112 U	173 U
Benzo(k)fluoranthene	85 U	83 U	113 UL	231 U	216 U	480 U	580 U	76 U	83 U	198 U	224 U	112 U	173 U
bis(2-Chloroethyl)ether	85 U	83 U	113 UL	231 U	216 U	480 U	580 U	76 U	83 U	198 U	224 U	112 U	173 U
bis(2-Ethylhexyl)phthalate	420 U	410 U	113 UL	231 U	216 U	480 U	580 U	380 U	410 U	198 U	224 U	112 U	173 U
Butylbenzylphthalate	420 U	410 U	113 UL	231 U	216 U	480 U	580 U	380 U	410 U	198 U	224 U	112 U	173 U
Caprolactam	2,100 U	230 J	113 UL	231 U	216 UJ	640 U	770 U	1,900 U	210 J	198 U	224 U	112 U	173 U
Carbazole	85 U	83 U	113 UL	231 U	216 U	490 U	590 U	76 U	83 U	198 U	224 U	112 U	173 U
Chrysene	28 J	17 J	113 UL	231 U	216 U	480 U	580 U	76 U	83 U	198 U	224 U	112 U	173 U
Dibenz(a,h)anthracene	85 U	83 U	113 UL	231 U	216 U	560 U	680 U	76 U	83 U	198 U	224 U	112 U	173 U
SVOA (PG/G)													
Dibenzofuran	420,000 U	NA	NA	NA	NA	480,000 U	580,000 U	380,000 U	NA	NA	NA	NA	NA
SVOA (UG/KG)													
Dibenzofuran	NA	410 U	113 UL	231 U	216 U	NA	NA	NA	410 U	198 U	224 U	112 U	173 U
Diethylphthalate	420 U	410 U	113 UL	231 U	216 U	480 U	580 U	380 U	410 U	198 U	224 U	112 U	173 U
Di-n-octylphthalate	420 U	410 U	113 UL	231 U	216 U	930 U	1,100 U	380 U	410 U	198 U	224 U	112 U	173 U
Fluoranthene	85 U	20 J	113 UL	231 U	216 U	480 U	580 U	76 U	83 U	198 U	224 U	112 U	173 U
Fluorene	85 U	83 U	113 UL	231 U	216 U	480 U	580 U	76 U	83 U	198 U	224 U	112 U	173 U
Indeno(1,2,3-cd)pyrene	85 U	6.7 J	113 UL	231 U	216 U	540 U	640 U	76 U	83 U	198 U	224 U	112 U	173 U
Isophorone	420 U	410 U	113 UL	231 U	216 U	480 U	580 U	380 U	410 U	198 U	224 U	112 U	173 U
Naphthalene	25 J	16 J	113 UL	231 U	216 U	480 U	580 U	76 U	83 U	198 U	224 U	112 U	173 U
n-Nitroso-di-n-propylamine	85 U	83 U	113 UL	231 U	216 U	480 U	580 U	76 U	83 U	198 U	224 U	112 U	173 U
Phenanthrene	70 J	42 J	113 UL	231 U	216 U	480 U	580 U	27 J	25 J	198 U	224 U	112 U	173 U
Pyrene	85 U	83 U	113 UL	231 U	216 U	480 U	580 U	76 U	83 U	198 U	224 U	112 U	173 U

Station ID	1SD-0A/1SW-0A					1SD-1/1SW-1							
Sample ID	AS01-SD00A-R15	AS01-1SD00A-R16	AS01-SD00A-R18	AS01-SD00A-R19	AS01-SD00A-R20	AS01-SD01P-R14	AS01-SD01-R14	AS01-SD01-R15	AS01-1SD01-R16	AS01-SD01P-R17	AS01-SD01-R17	AS01-SD01-R18	AS01-SD01-R19
Sample Date	10/14/08	07/21/09	07/08/11	10/05/11	08/30/12	08/14/08	08/14/08	10/10/08	07/20/09	04/20/10	04/20/10	07/08/11	10/05/11
Chemical Name													
Total Metals (MG/KG)													
Aluminum	4,150	4,650	3,660	7,760	3,050	6,170	7,650	3,010	5,730	1,990	2,010	2,580	2,860
Antimony	0.31 L	0.4 B	0.423 UL	2.75 R	8 UL	0.18 U	0.66 J	0.14 L	0.52 B	0.735 U	0.916 U	0.423 UL	2.1 R
Arsenic	7.4	7.4	7.57	7.34	6.08 L	8.6	10.3	6.1	7.3	3.18 J	4.39 J	6.18	2.38 J
Barium	68.9	65.4	48.8	127	53.5 L	72.7	127	52.8	75.3	18.9 L	36.1 L	34.6	36.2
Beryllium	1.2	1.2	0.536	0.959 L	0.774 L	1.3	1.6	0.98	1.3	0.609	0.499	0.823	0.651 L
Cadmium	0.19 J	0.62 U	0.212 UL	0.686 U	0.4 U	0.49 J	0.85 J	0.2 J	1.3 U	0.367 U	0.458 U	0.212 UL	0.524 U
Calcium	1,130	2,280	66,500	149,000	1,720	1,400	1,960	1,660	10,600	486 J	1,180 J	1,470	1,390
Chromium	12.3	13	6.19	11.8	3.98 L	12.7	12.3	9	12.5	6.17 J	4.29 J	6.66	4.25
Cobalt	28.8	20.8	14.1	22 L	19.2 L	22.4	31.6	18.5	24.9	13.7	14.1	19.2	10.5 L
Copper	14.7	15	8.52	15	12.7 L	33.9	40.7	8.9	15.3	8.73	9.26	11.7	5.75
Cyanide	0.83 L	0.34 J	0.283 U	0.0141 R	0.582 U	0.7 U	0.85 U	0.48 J	0.16 J	0.536 U	0.621 U	0.284 U	0.285 R
Iron	26,600	31,700	17,300	28,700	27,100 J	23,800	22,700	23,400	42,700	16,900	13,900	24,700	8,620
Lead	12.8	16.3	9.48 L	12.7	10.4 L	34.6	50.2	12.7	13	6.88	7.71	20 L	4.99
Magnesium	505 J	632	2,000	4,200 K	373 L	734	844	383 J	797	225 L	350 L	452	537 K
Manganese	2,090	756	690	1,330	1,060	482	570	628	878	423	405	546	408
Mercury	0.026 B	0.016 J	0.0109 U	0.103	0.0188 J	0.13	0.13	0.086	0.018 J	0.0195 J	0.304 U	0.0115 U	0.021 J
Nickel	50.1	39.8	22.7	32.9 L	32.5 L	40.5	53.2	33.3	44.2	24.6	24.3	34.4	16.9 L
Potassium	417 L	527 J	329	1,070 K	268 L	768	941	343 L	602 J	124 J	190 J	175	282 K
Selenium	1.2 U	1.2 U	2.12 U	1.72 U	4 UL	0.24 U	0.28 J	0.61 J	1.3 U	0.586 J	0.619 J	2.12 U	1.31 U
Silver	0.54 J	0.3 J	0.212 U	0.686 U	1.6 U	0.15 J	0.2 J	0.18 B	0.3 J	0.367 U	0.349 J	0.22 J	0.524 U
Sodium	107 J	42 J	46.7	1,030 U	103	82.3 J	119	90.6 J	108 J	23.3 J	93 J	35.7	786 U
Thallium	1.7 U	0.64 J	10.6 R	2.41 L	20 R	0.12 U	0.11 U	1.7 U	0.58 J	18.4 U	22.9 U	10.6 R	1.05 UL
Vanadium	20.8	15.5	6.98	14.1	12.7 L	14.1	13.7	11.8	17.7	7.58	8.1	8.79	7.91
Zinc	121 L	110	142	122	84.6 L	135	184	99.2 L	120	67.9	67	93.3	43.7
Acid Volatile Sulfide/Simultaneously Extractable Metals (UMOL/G)													
Zinc, SEM	1.3 J	NA	NA	NA	NA	0.272 J	0.428 J	0.98 J	0.61 B	0.182	0.167	0.539	0.347
AVSSEM (UMOL/G)													
Acid volatile sulfide, SEM	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
AVSSEM (UMOL/G)													
Cadmium, SEM	0.0038 J	NA	NA	NA	NA	6.00E-04 J	0.0011 J	0.0027 J	6.70E-04 J	2.55E-04 B	1.92E-04 B	9.74E-04 J	0.00505 U
Copper, SEM	0.14 J	NA	NA	NA	NA	0.0294 J	0.066 J	0.093 J	0.078	0.0182	0.0169	0.0522	0.0406 J
Lead, SEM	0.057 J	NA	NA	NA	NA	0.0175 J	0.0342 J	0.031 J	0.034	0.00812	0.0071	0.0273	0.017
Mercury, SEM	0 K	NA	NA	NA	NA	0 UL	0 UL	0 K	7.80E-05 U	1.10E-05 UL	1.30E-05 UL	2.95E-05 UL	2.87E-05 U
Nickel, SEM	0.64 J	NA	NA	NA	NA	0.0719 J	0.0973 J	0.42 J	0.25 B	0.0562	0.0556	0.192	0.156 J
Silver, SEM	0.0029	NA	NA	NA	NA	1.00E-04 UL	2.00E-04 UL	0.0011	9.30E-04 J	0.0011 U	0.0012 U	0.00137 U	0.0138 U
Wet Chemistry													
% Solids (pct)	78.5	NA	NA	NA	NA	69	57	86.8	NA	92.3	79.9	NA	NA
Carbon (ug/g)	NA	NA	NA	NA	NA	41,000	120,000	NA	NA	NA	NA	NA	NA
pH (ph)	7	7.5	9.12 J	8.15 J	7.24	7.3	7.2	7.1	7.2	6.82	6.89	6.53 J	7.48 J
Total organic carbon (TOC) (mg/kg)	3,930	14,900 B	582 UL	13,600	34,100 K	NA	NA	4,960	7,690 B	3,000 J	6,360 J	17,000 L	7,160
Grain Size (PCT)													
Coarse Gravel (%)	NA	NA	NA	NA	0 U	NA	NA	NA	NA	NA	0 U	NA	NA
Coarse Sand (%)	10.2	12.1	14.1	NA	16.4	1.5	0.6	12.1	15.3	NA	10.9	18.2	NA
Fine gravel (%)	NA	NA	NA	NA	6.8	NA	NA	NA	NA	NA	1.7	NA	NA
Fine Sand (%)	1.3	6.3	0.5	NA	8.4	56.9	65	1.9	5.4	NA	0.5	3.6	NA
Fines (%)	7.7	1.1	0.8	NA	0.9	33	27.6	2.9	6.3	NA	0.3	0.2	NA
Gravel (%)	9.8	2.1	81	NA	NA	0.8	0.7	75.1	47.6	NA	NA	65.8	NA
GS03 Sieve 3" (75 mm)	100	100	100	NA	NA	100	100	100	100	NA	NA	100	NA
GS05 Sieve 2" (50 mm)	100	100	100	NA	NA	100	100	100	100	NA	NA	100	NA
GS06 Sieve 1.5" (37.5 mm)	100	100	100	NA	NA	100	100	100	100	NA	NA	100	NA
GS07 Sieve 1" (25.0 mm)	100	100	100	NA	NA	100	100	90	100	NA	NA	100	NA
GRAINSIZE (PCT/P)													
GS07 Sieve 1" (25.0 mm)	NA	NA	NA	96	NA	NA	NA	NA	NA	NA	NA	NA	80
GRAINSIZE (PCT)													
GS08 Sieve 0.75" (19.0 mm)	100	100	100	NA	NA	100	100	90	93.8	NA	NA	100	NA
GRAINSIZE (PCT/P)													
GS08 Sieve 0.75" (19.0 mm)	NA	NA	NA	89	NA	NA	NA	NA	NA	NA	NA	NA	65

Station ID	1SD-0A/1SW-0A					1SD-1/1SW-1							
Sample ID	AS01-SD00A-R15	AS01-1SD00A-R16	AS01-SD00A-R18	AS01-SD00A-R19	AS01-SD00A-R20	AS01-SD01P-R14	AS01-SD01-R14	AS01-SD01-R15	AS01-1SD01-R16	AS01-SD01P-R17	AS01-SD01-R17	AS01-SD01-R18	AS01-SD01-R19
Sample Date	10/14/08	07/21/09	07/08/11	10/05/11	08/30/12	08/14/08	08/14/08	10/10/08	07/20/09	04/20/10	04/20/10	07/08/11	10/05/11
Chemical Name													
GS09 Sieve 0.5" (12.5 mm)	NA	NA	NA	82	NA	NA	NA	NA	NA	NA	NA	NA	51
GRAINSIZE (PCT)													
GS10 Sieve 0.375" (9.5 mm)	95.6	100	42.3	NA	NA	100	100	49.1	67.2	NA	NA	52.4	NA
Medium Sand (%)	71.1	78.3	3.6	NA	67.5	7.7	6.1	8.1	25.4	NA	86.6	12.2	NA
Sand (%)	NA	NA	18.2	NA	NA	NA	NA	NA	NA	NA	NA	34	NA
Sieve No. 004 (4.75 mm)	90.2	97.9	19	NA	NA	99.2	99.3	24.9	52.4	NA	NA	34.2	NA
GRAINSIZE (PCT/P)													
Sieve No. 004 (4.75 mm)	NA	NA	NA	56	NA	NA	NA	NA	NA	NA	NA	NA	26
GRAINSIZE (PCT)													
Sieve No. 010 (2.00 mm)	80.1	85.7	4.9	NA	NA	97.7	98.7	12.9	37.1	NA	NA	16	NA
GRAINSIZE (PCT/P)													
Sieve No. 010 (2.00 mm)	NA	NA	NA	27	NA	NA	NA	NA	NA	NA	NA	NA	13
GRAINSIZE (PCT)													
Sieve No. 020 (850 um)	31.6	34.3	1.6	NA	NA	95.9	97.4	7.2	18.5	NA	NA	6.9	NA
Sieve No. 040 (425 um)	9	7.4	1.3	NA	NA	90	92.6	4.8	11.7	NA	NA	3.8	NA
GRAINSIZE (PCT/P)													
Sieve No. 040 (425 um)	NA	NA	NA	8	NA	NA	NA	NA	NA	NA	NA	NA	2
GRAINSIZE (PCT)													
Sieve No. 060 (250 um)	7.8	2.3	1	NA	NA	69.4	70.6	3.5	7.8	NA	NA	1.2	NA
Sieve No. 100 (150 um)	7.8	1.3	NA	NA	NA	47.4	44.4	3	6.6	NA	NA	NA	NA
GRAINSIZE (PCT/P)													
Sieve No. 100 (150 um)	NA	NA	NA	2	NA	NA	NA	NA	NA	NA	NA	NA	0
GRAINSIZE (PCT)													
Sieve No. 140 (106 um)	7.8	1.6	NA	NA	NA	53.7	51.9	3.1	6.9	NA	NA	NA	NA
Sieve No. 200 (75 um)	7.7	1.1	0.8	NA	NA	33	27.6	2.9	6.3	NA	NA	0.2	NA
GRAINSIZE (PCT/P)													
Sieve No. 200 (75 um)	NA	NA	NA	1	NA	NA	NA	NA	NA	NA	NA	NA	0

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Notes:

Shading indicates detections
NA - Not analyzed
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
R - Unreliable Result
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
MG/KG - Milligrams per kilogram
PCT - Percent
PH - pH units
UG/G - Micrograms per gram
UG/KG - Micrograms per kilogram
UMOL/G - Micromoles per gram

Station ID	1SD-1/1SW-1	1SD-1A/1SW-1A						1SD-2/1SW-2				
Sample ID	AS01-SD01-R20	AS01-SD01A-R15	AS01-1SD01A-R16	AS01-SD01A-R17	AS01-SD01A-R18	AS01-SD01A-R19	AS01-SD01A-R20	AS01-SD02P-R14	AS01-SD02-R14	AS01-SD02-R15	AS01-1SD02-R16	AS01-SD02P-R17
Sample Date	08/30/12	10/10/08	07/20/09	04/20/10	07/08/11	10/05/11	08/30/12	08/14/08	08/14/08	10/10/08	07/20/09	04/20/10
Chemical Name												
Volatile Organic Compounds (UG/KG)												
1,1-Dichloroethene	2.44 U	6.3 U	6.8 U	6.71 U	0.564 U	2.93 U	2.4 U	7 U	6 U	7 U	6.8 U	7.27 U
1,2-Dichloroethene (total)	NA	NA	NA	NA	NA	NA	NA	5 J	6 J	NA	NA	NA
2-Butanone	6.1 U	6.3 U	6.8 U	6.71 U	2.82 U	5.86 U	6 U	40 U	38 U	7 U	6.8 U	7.27 U
Acetone	12.2 U	25 U	27 U	26.9 U	5.64 U	11.7 UJ	12 U	45 U	43 U	28 U	27 U	29.1 U
cis-1,2-Dichloroethene	1.22 U	6.3 U	6.8 U	6.71 U	0.564 U	2.93 U	1.2 U	5 J	6 J	7 U	6.8 U	7.27 U
Methylene chloride	2.44 U	6.3 U	6.8 U	1.62 J	1.13 U	5.86 U	2.4 U	34 U	33 U	7 U	6.8 U	7.27 U
Tetrachloroethene	1.22 U	6.3 U	6.8 U	6.71 U	0.564 U	2.93 U	1.2 U	8 U	8 U	7 U	6.8 U	7.27 U
Toluene	1.22 U	6.3 U	6.8 U	6.71 U	0.564 U	2.93 U	1.2 U	7 U	6 U	7 U	6.8 U	7.27 U
trans-1,2-Dichloroethene	1.22 U	6.3 U	6.8 U	6.71 U	0.564 U	2.93 U	1.2 U	10 U	9 U	7 U	6.8 U	7.27 U
Trichloroethene	1.22 U	6.3 U	6.8 U	6.71 U	0.564 U	2.93 U	1.2 U	11	7 J	7 U	6.8 U	1.45 J
Vinyl chloride	2.44 U	6.3 U	6.8 U	6.71 U	1.13 U	2.93 UJ	2.4 U	7 U	6 U	7 U	6.8 U	7.27 U
Semivolatile Organic Compounds (UG/KG)												
1,1-Biphenyl	218 U	410 U	23 J	224 U	107 U	209 U	198 U	450 U	460 U	460 U	450 U	258 U
2,4-Dinitrotoluene	218 U	410 U	450 U	224 U	107 U	209 U	198 U	450 U	460 U	460 U	450 U	258 U
2,6-Dinitrotoluene	218 U	410 U	450 U	224 U	107 U	209 U	198 U	450 U	460 U	460 U	450 U	258 U
2-Chloronaphthalene	218 U	84 U	91 U	224 U	107 U	209 U	198 U	450 U	460 U	93 U	91 U	258 U
2-Methylnaphthalene	218 U	26 J	36 J	224 U	107 U	209 U	198 U	450 U	460 U	93 U	28 J	258 U
2-Methylphenol	218 U	410 U	450 U	224 U	107 U	209 U	198 U	840 U	840 U	460 U	450 U	258 U
2-Nitroaniline	1,080 U	2,100 U	2,300 U	1,120 U	535 U	837 U	990 U	1,100 U	1,100 U	2,400 U	2,300 U	1,290 U
2-Nitrophenol	218 U	410 U	450 U	224 U	107 U	209 U	198 U	700 U	700 U	460 U	450 U	258 U
3,3'-Dichlorobenzidine	434 U	410 U	450 U	448 U	214 U	209 U	396 U	480 U	480 U	460 U	450 U	515 U
3-Nitroaniline	1,080 U	2,100 U	2,300 U	1,120 U	535 U	837 U	990 U	1,100 U	1,100 U	2,400 U	2,300 U	1,290 U
4,6-Dinitro-2-methylphenol	1,080 U	2,100 U	2,300 U	1,120 U	535 U	2,090 U	990 U	1,400 U	1,400 U	2,400 U	2,300 U	1,290 U
4-Bromophenyl-phenylether	218 U	410 U	450 U	224 U	107 U	209 U	198 U	450 U	460 U	460 U	450 U	258 U
4-Chloro-3-methylphenol	218 U	410 U	450 U	224 U	107 U	209 U	198 U	690 U	690 U	460 U	450 U	258 U
4-Chloroaniline	218 U	410 U	450 U	224 U	107 U	209 U	198 U	490 U	500 U	460 U	450 U	258 U
4-Methylphenol	NA	410 U	450 U	NA	NA	209 U	NA	NA	NA	460 U	450 U	NA
Acenaphthylene	218 U	84 U	91 U	224 U	107 U	209 U	198 U	450 U	460 U	93 U	91 U	258 U
Acetophenone	218 U	410 U	450 U	224 U	107 U	209 U	198 U	740 U	740 U	460 U	450 U	258 U
Anthracene	218 U	84 U	91 U	224 U	107 U	209 U	198 U	450 U	460 U	93 U	91 U	258 U
Benzaldehyde	218 U	410 U	450 U	224 U	107 R	209 U	198 U	510 UL	510 UL	460 U	530	258 U
Benzo(a)anthracene	218 U	84 U	91 U	224 U	107 U	209 U	198 U	160 J	460 U	33 J	74 J	258 U
Benzo(a)pyrene	218 U	84 U	91 U	224 U	107 U	209 U	198 U	140 J	460 U	24 J	78 J	258 U
Benzo(b)fluoranthene	218 U	84 U	91 U	224 U	107 U	209 U	198 U	560 U	560 U	40 J	110	258 U
Benzo(g,h,i)perylene	218 U	84 U	91 U	224 U	107 U	209 U	198 U	450 U	460 U	210	53 J	258 U
Benzo(k)fluoranthene	218 U	84 U	91 U	224 U	107 U	209 U	198 U	160 J	460 U	93 U	23 J	258 U
bis(2-Chloroethyl)ether	218 U	84 U	91 U	224 U	107 U	209 U	198 U	450 U	460 U	93 U	91 U	258 U
bis(2-Ethylhexyl)phthalate	218 U	410 U	450 U	224 U	107 U	209 U	198 U	450 U	460 U	460 U	450 U	258 U
Butylbenzylphthalate	218 U	410 U	450 U	224 U	107 U	209 U	198 U	450 U	460 U	460 U	450 U	258 U
Caprolactam	218 UJ	2,100 U	230 J	224 U	107 U	209 U	198 UJ	600 U	610 U	2,400 U	230 J	258 U
Carbazole	218 U	84 U	91 U	224 U	107 U	209 U	198 U	470 U	470 U	93 U	14 J	258 U
Chrysene	218 U	84 U	16 J	224 U	107 U	209 U	198 U	170 J	460 U	33 J	96	258 U
Dibenz(a,h)anthracene	218 U	84 U	91 U	224 U	107 U	209 U	198 U	540 U	540 U	93 U	30 J	258 U
SVOA (PG/G)												
Dibenzofuran	NA	410,000 U	NA	NA	NA	NA	NA	450,000 U	460,000 U	460,000 U	NA	NA
SVOA (UG/KG)												
Dibenzofuran	218 U	NA	450 U	224 U	107 U	209 U	198 U	NA	NA	NA	450 U	258 U
Diethylphthalate	218 U	410 U	68 J	224 U	107 U	209 U	198 U	450 U	460 U	42 J	51 J	258 U
Di-n-octylphthalate	218 U	410 U	450 U	224 U	107 U	209 U	198 U	880 U	880 U	460 U	450 U	258 U
Fluoranthene	218 U	84 U	91 U	224 U	107 U	209 U	198 U	320 J	460 U	58 J	93	258 U
Fluorene	218 U	84 U	91 U	224 U	107 U	209 U	198 U	450 U	460 U	93 U	91 U	258 U
Indeno(1,2,3-cd)pyrene	218 U	84 U	91 U	224 U	107 U	209 U	198 U	510 U	510 U	240	46 J	258 U
Isophorone	218 U	410 U	450 U	224 U	107 U	209 U	198 U	450 U	460 U	460 U	450 U	258 U
Naphthalene	218 U	84 U	17 J	224 U	107 U	209 U	198 U	450 U	460 U	93 U	21 J	258 U
n-Nitroso-di-n-propylamine	218 U	84 U	91 U	224 U	107 U	209 U	198 U	450 U	460 U	93 U	91 U	258 U
Phenanthrene	218 U	24 J	29 J	224 U	107 U	209 U	198 U	240 J	460 U	42 J	90 J	258 U
Pyrene	218 U	84 U	91 U	224 U	107 U	209 U	198 U	300 J	460 U	37 J	81 J	258 U

CTO-WE13
ABL, Site 1
Validated Sediment Raw Analytical Results
2008-2012 LTM

Station ID	1SD-1/1SW-1	1SD-1A/1SW-1A						1SD-2/1SW-2				
Sample ID	AS01-SD01-R20	AS01-SD01A-R15	AS01-1SD01A-R16	AS01-SD01A-R17	AS01-SD01A-R18	AS01-SD01A-R19	AS01-SD01A-R20	AS01-SD02P-R14	AS01-SD02-R14	AS01-SD02-R15	AS01-1SD02-R16	AS01-SD02P-R17
Sample Date	08/30/12	10/10/08	07/20/09	04/20/10	07/08/11	10/05/11	08/30/12	08/14/08	08/14/08	10/10/08	07/20/09	04/20/10
Chemical Name												
Total Metals (MG/KG)												
Aluminum	3,920	6,320	5,660	2,670	1,820	3,690	2,000	4,820	5,470	3,340	3,920	2,790
Antimony	9.56 UL	0.42 L	0.78 J	0.934 U	0.42 UL	2.55 R	8.9 UL	0.27 U	0.23 U	0.2 L	0.65 B	1.06 U
Arsenic	8.26 L	8.4	18	5.12	3.24 J	2.3 J	5.44 L	8.2	9.2	4.4	7.8	5.69
Barium	40.1 L	85.2	70.4	45.1 L	21.6	61.1	60.9 L	43	68.5	30.2	46.2	25.6 L
Beryllium	1.22 L	1.3	1.6	0.785	0.453	0.613 L	0.662 L	1	1.2	1.4	1.4	0.922
Cadmium	0.478 U	0.22 J	1.4 U	0.467 U	0.21 UL	0.637 U	0.444 U	0.42 J	0.68 J	0.26 J	0.69 U	0.0563 J
Calcium	993	4,100	2,260	986	971	1,040 J	1,000	2,380	2,410	1,170	1,480	949
Chromium	7.18 L	15.9	17.8	6.51	4.41	4.54	2.9 L	12.5	14.3	8.4	11.1	8.45
Cobalt	30.7 L	25.8	32.4	20.9	12.5	11.5 L	16 L	25.4	29.8	17.2	23.9	20.9
Copper	17.4 L	14.9	21.9	12.6	5.07	5.83	11.3 L	22.2	27.1	17.7	21.6	16
Cyanide	0.658 U	1.6 L	0.51 J	0.88	0.486 J	0.301 R	0.556 U	0.7 U	0.7 U	4.8 L	0.33 J	0.691 U
Iron	31,400 J	33,000	55,300	18,500	12,400	12,300	25,100 J	26,200	27,400	18,800	29,200	26,200
Lead	21 L	36.4	18.6	10.8	6.37 L	2.74	8.01 L	19.2	23.4	11.7	25.4	17.3
Magnesium	541 L	1,130	990	428 L	242	955 U	287 L	648	703	471 J	503 J	435 L
Manganese	589	1,200	1,310	644	380	618	591	350	347	221	525	570
Mercury	0.0264 J	0.034 B	0.028 J	0.0241 J	0.0179 J	0.018 J	0.0178 J	0.08	0.2	0.048	0.091	0.0368 J
Nickel	57.1 L	45.4	61	35.3	21.5	19.6 L	26.8 L	48.2	55.9	30.9	41.7	38.2
Potassium	329 L	479 L	705	215	109	449 K	266 L	755	765	322 L	445 J	179 J
Selenium	4.78 UL	0.72 J	1.4 U	0.788 J	2.1 U	1.59 U	4.44 UL	0.36 U	0.41 J	0.68 J	1.4 U	0.751 J
Silver	1.91 U	0.35 B	0.4 J	0.467 U	0.21 U	0.637 U	1.78 U	1.2 J	2.9	0.09 B	0.23 J	0.531 U
Sodium	52.8 B	198 J	29.8 J	35.7	21.2	955 U	39.5 B	62.3 J	65.9 J	74.6 J	694 U	25.2 J
Thallium	23.8 R	1.9 U	1.3 J	1.03 J	10.5 R	1.21 L	22.2 R	0.19 U	0.18 J	2.1 U	0.5 J	1.07 J
Vanadium	15.1 L	16.7	25.9	10.1	5.79	8.94	9.59 L	14.8	16.6	9.8	16.1	12.3
Zinc	153 L	126 L	182	90.4	52.9	40.3	77.6 L	159	183	121 L	145	113
Acid Volatile Sulfide/Simultaneously Extractable Metals (UMOL/G)												
Zinc, SEM	0.711	1.3 J	NA	NA	NA	NA	NA	0.718 J	0.525 J	1.2 J	0.73 B	0.815 J
AVSSEM (UMOL/G)												
Acid volatile sulfide, SEM	0.112 L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
AVSSEM (UMOL/G)												
Cadmium, SEM	8.31E-04 J	0.0039 J	NA	NA	NA	NA	NA	0.0023 J	0.0014 J	0.0027 J	0.0012 J	0.00158 B
Copper, SEM	0.0741	0.14 J	NA	NA	NA	NA	NA	0.0958 J	0.103 J	0.18 J	0.13	0.0968 J
Lead, SEM	0.0374	0.073 J	NA	NA	NA	NA	NA	0.028 J	0.0273 J	0.083 J	0.079	0.0444 J
Mercury, SEM	3.32E-05 B	0 K	NA	NA	NA	NA	NA	0 B	0 B	1.00E-04	1.70E-05 J	1.40E-05 UL
Nickel, SEM	0.212	0.62 J	NA	NA	NA	NA	NA	0.101 J	0.0764 J	0.4 J	0.19 B	0.215 J
Silver, SEM	0.00122 J	0.0027	NA	NA	NA	NA	NA	0.0034 J	0.004 J	7.00E-04	4.40E-04 J	0.0031 U
Wet Chemistry												
% Solids (pct)	NA	79.6	NA	77.9	NA	NA	NA	73	72	71.3	NA	71.9
Carbon (ug/g)	NA	NA	NA	NA	NA	NA	NA	22,000	18,000	NA	NA	NA
pH (ph)	7.18	7.1	7.2	6.57	6.59 J	8.41 J	6.9	7.4	7.5	7	7.2	7.04
Total organic carbon (TOC) (mg/kg)	11,100 K	6,250	2,370 U	4,910 J	29,400 L	2,180	9,990 K	NA	NA	25,000	4,350 B	8,880 J
Grain Size (PCT)												
Coarse Gravel (%)	0 U	NA	NA	NA	NA	NA	0 U	NA	NA	NA	NA	NA
Coarse Sand (%)	1.6	14.4	3	NA	15.6	NA	17	0.5	0.6	1.3	0.9	NA
Fine gravel (%)	0.2	NA	NA	NA	NA	NA	46.1	NA	NA	NA	NA	NA
Fine Sand (%)	64	9.7	15.8	NA	1.4	NA	3.5	79.1	80.1	73.4	76.8	NA
Fines (%)	4	5	0.2	NA	0.1	NA	0.5	3.5	1.2	7.7	6	NA
Gravel (%)	NA	8.4	0.1	NA	73	NA	NA	0.7	0.9	0.9	1.4	NA
GS03 Sieve 3" (75 mm)	NA	100	100	NA	100	NA	NA	100	100	100	100	NA
GS05 Sieve 2" (50 mm)	NA	100	100	NA	100	NA	NA	100	100	100	100	NA
GS06 Sieve 1.5" (37.5 mm)	NA	100	100	NA	100	NA	NA	100	100	100	100	NA
GS07 Sieve 1" (25.0 mm)	NA	100	100	NA	100	NA	NA	100	100	100	100	NA
GRAINSIZE (PCT/P)												
GS07 Sieve 1" (25.0 mm)	NA	NA	NA	NA	NA	91	NA	NA	NA	NA	NA	NA
GRAINSIZE (PCT)												
GS08 Sieve 0.75" (19.0 mm)	NA	100	100	NA	100	NA	NA	100	100	100	100	NA
GRAINSIZE (PCT/P)												
GS08 Sieve 0.75" (19.0 mm)	NA	NA	NA	NA	NA	79	NA	NA	NA	NA	NA	NA

Station ID	1SD-1/1SW-1	1SD-1A/1SW-1A						1SD-2/1SW-2				
Sample ID	AS01-SD01-R20	AS01-SD01A-R15	AS01-1SD01A-R16	AS01-SD01A-R17	AS01-SD01A-R18	AS01-SD01A-R19	AS01-SD01A-R20	AS01-SD02P-R14	AS01-SD02-R14	AS01-SD02-R15	AS01-1SD02-R16	AS01-SD02P-R17
Sample Date	08/30/12	10/10/08	07/20/09	04/20/10	07/08/11	10/05/11	08/30/12	08/14/08	08/14/08	10/10/08	07/20/09	04/20/10
Chemical Name												
GS09 Sieve 0.5" (12.5 mm)	NA	NA	NA	NA	NA	68	NA	NA	NA	NA	NA	NA
GRAINSIZE (PCT)												
GS10 Sieve 0.375" (9.5 mm)	NA	98.6	100	NA	59.3	NA	NA	99.6	100	100	100	NA
Medium Sand (%)	30.2	62.5	80.9	NA	9.9	NA	32.9	16.3	17.1	16.7	14.8	NA
Sand (%)	NA	NA	NA	NA	26.9	NA	NA	NA	NA	NA	NA	NA
Sieve No. 004 (4.75 mm)	NA	91.6	99.9	NA	27	NA	NA	99.3	99.1	99.1	98.6	NA
GRAINSIZE (PCT/P)												
Sieve No. 004 (4.75 mm)	NA	NA	NA	NA	NA	39	NA	NA	NA	NA	NA	NA
GRAINSIZE (PCT)												
Sieve No. 010 (2.00 mm)	NA	77.2	96.9	NA	11.4	NA	NA	98.8	98.5	97.8	97.6	NA
GRAINSIZE (PCT/P)												
Sieve No. 010 (2.00 mm)	NA	NA	NA	NA	NA	21	NA	NA	NA	NA	NA	NA
GRAINSIZE (PCT)												
Sieve No. 020 (850 um)	NA	41.7	65.6	NA	3.7	NA	NA	97.5	96.5	95.1	94.4	NA
Sieve No. 040 (425 um)	NA	14.7	16	NA	1.5	NA	NA	82.6	81.4	81.1	82.8	NA
GRAINSIZE (PCT/P)												
Sieve No. 040 (425 um)	NA	NA	NA	NA	NA	2	NA	NA	NA	NA	NA	NA
GRAINSIZE (PCT)												
Sieve No. 060 (250 um)	NA	6.5	1.3	NA	0.4	NA	NA	24.8	26.8	44.5	32.2	NA
Sieve No. 100 (150 um)	NA	5.1	0.3	NA	NA	NA	NA	6.3	5.7	20.2	9.6	NA
GRAINSIZE (PCT/P)												
Sieve No. 100 (150 um)	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	NA	NA
GRAINSIZE (PCT)												
Sieve No. 140 (106 um)	NA	5.3	0.5	NA	NA	NA	NA	9.4	9.6	26.8	13.8	NA
Sieve No. 200 (75 um)	NA	5	0.2	NA	0.1	NA	NA	3.5	1.2	7.7	6	NA
GRAINSIZE (PCT/P)												
Sieve No. 200 (75 um)	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	NA	NA

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Notes:

Shading indicates detections
NA - Not analyzed
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
R - Unreliable Result
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
MG/KG - Milligrams per kilogram
PCT - Percent
PH - pH units
UG/G - Micrograms per gram
UG/KG - Micrograms per kilogram
UMOL/G - Micromoles per gram

Station ID	1SD-2/1SW-2					1SD-2A/1SW-2A					1SD-3/1SW-3	
Sample ID	AS01-SD02-R17	AS01-SD02A-R18	AS01-SD02-R18	AS01-SD02-R19	AS01-SD02-R20	AS01-SD02A-R15	AS01-1SD02A-R16	AS01-SD02A-R17	AS01-SD02A-R19	AS01-SD02A-R20	AS01-SD03-R14	AS01-SD03P-R15
Sample Date	04/20/10	07/07/11	07/07/11	10/05/11	08/29/12	10/10/08	07/20/09	04/20/10	10/05/11	08/29/12	08/14/08	10/09/08
Chemical Name												
Volatile Organic Compounds (UG/KG)												
1,1-Dichloroethene	6.83 U	0.604 U	0.634 U	3.49 U	2.6 U	6.6 U	6.4 U	6.32 U	3.18 U	2.62 U	7 J	7 U
1,2-Dichloroethene (total)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4,000	NA
2-Butanone	6.83 U	3.02 U	3.17 U	6.97 U	6.48 U	6.6 U	6.4 U	6.32 U	6.37 U	6.52 U	43 UJ	7 U
Acetone	27.3 U	6.04 U	6.34 U	13.9 UJ	13 U	26 U	26 U	25.3 U	12.7 UJ	13.1 U	30 B	28 U
cis-1,2-Dichloroethene	6.83 U	0.604 U	0.634 U	3.49 U	1.3 U	6.6 U	6.4 U	6.32 U	3.18 U	1.31 U	4,000	7 U
Methylene chloride	6.83 U	1.21 U	1.27 U	6.97 U	2.6 U	1.4 B	6.4 U	6.32 U	6.37 U	2.62 U	37 UJ	7 U
Tetrachloroethene	6.83 U	0.604 U	0.634 U	3.49 U	1.3 U	6.6 U	6.4 U	6.32 U	3.18 U	1.31 U	9 UJ	7 U
Toluene	6.83 U	0.604 U	0.634 U	3.49 U	1.3 U	6.6 U	6.4 U	6.32 U	3.18 U	1.31 U	7 UJ	7 U
trans-1,2-Dichloroethene	6.83 U	0.604 U	0.634 U	3.49 U	1.3 U	6.6 U	6.4 U	6.32 U	3.18 U	1.31 U	52 J	7 U
Trichloroethene	6.83 U	0.604 U	0.634 U	3.49 U	1.3 U	6.6 U	6.4 U	6.32 U	3.18 U	1.31 U	620	7 U
Vinyl chloride	6.83 U	1.21 U	1.27 U	3.49 UJ	2.6 U	6.6 U	6.4 U	6.32 U	3.18 UJ	2.62 U	200 J	7 U
Semivolatile Organic Compounds (UG/KG)												
1,1-Biphenyl	241 U	103 U	111 U	242 U	214 U	42 J	37 J	222 U	218 U	208 U	480 U	460 U
2,4-Dinitrotoluene	241 U	103 U	111 U	242 U	214 U	440 U	420 U	222 U	218 U	208 U	480 U	460 U
2,6-Dinitrotoluene	241 U	103 U	111 U	242 U	214 U	440 U	420 U	222 U	218 U	208 U	480 U	460 U
2-Chloronaphthalene	241 U	103 U	111 U	242 U	214 U	88 U	86 U	222 U	218 U	208 U	480 U	92 U
2-Methylnaphthalene	241 U	103 U	111 U	242 U	214 U	53 J	61 J	222 U	218 U	208 U	480 U	92 U
2-Methylphenol	241 U	103 UL	111 UL	242 U	214 U	440 U	420 U	222 U	218 U	208 U	900 U	460 U
2-Nitroaniline	1,200 U	516 U	555 U	968 U	1,060 U	2,200 U	2,200 U	1,110 U	873 U	1,040 U	1,200 U	2,300 U
2-Nitrophenol	241 U	103 UL	111 U	242 U	214 U	440 U	420 U	222 U	218 U	208 U	750 U	460 U
3,3'-Dichlorobenzidine	482 U	207 U	222 R	242 U	426 U	440 U	420 U	443 U	218 U	416 U	510 U	460 U
3-Nitroaniline	1,200 U	516 U	555 U	968 U	1,060 U	2,200 U	2,200 U	1,110 U	873 U	1,040 U	1,200 U	2,300 U
4,6-Dinitro-2-methylphenol	1,200 U	516 UL	555 U	2,420 U	1,060 U	2,200 U	2,200 U	1,110 U	2,180 U	1,040 U	1,500 U	2,300 U
4-Bromophenyl-phenylether	241 U	103 U	111 U	242 U	214 U	440 U	420 U	222 U	218 U	208 U	480 U	460 U
4-Chloro-3-methylphenol	241 U	103 UL	111 U	242 U	214 U	440 U	420 U	222 U	218 U	1,270	740 U	460 U
4-Chloroaniline	241 U	103 U	111 U	242 U	214 U	440 U	420 U	222 U	218 U	208 U	530 U	460 U
4-Methylphenol	NA	NA	NA	242 U	NA	440 U	420 U	NA	218 U	NA	NA	460 U
Acenaphthylene	241 U	103 U	111 U	242 U	214 U	88 U	86 U	222 U	218 U	208 U	480 U	92 U
Acetophenone	241 U	103 U	111 U	242 U	214 U	440 U	420 U	222 U	218 U	208 U	790 U	460 U
Anthracene	241 U	103 U	111 U	242 U	214 U	88 U	86 U	222 U	218 U	208 U	480 U	30 J
Benzaldehyde	241 U	103 R	111 R	242 U	214 U	440 U	420 U	222 U	218 U	208 U	540 UL	460 U
Benzo(a)anthracene	241 U	103 U	111 U	242 U	214 U	190	86 U	222 U	218 U	208 U	480 U	140
Benzo(a)pyrene	241 U	103 U	111 U	242 U	214 U	120	86 U	222 U	218 U	208 U	480 U	88 J
Benzo(b)fluoranthene	241 U	103 U	111 U	242 U	214 U	250	86 U	222 U	218 U	208 U	600 U	150
Benzo(g,h,i)perylene	241 U	103 U	111 U	242 U	214 U	250	86 U	222 U	218 U	208 U	480 U	230
Benzo(k)fluoranthene	241 U	103 U	111 U	242 U	214 U	88 U	86 U	222 U	218 U	208 U	480 U	92 U
bis(2-Chloroethyl)ether	241 U	103 U	111 U	242 U	214 U	88 U	86 U	222 U	218 U	208 U	480 U	92 U
bis(2-Ethylhexyl)phthalate	241 U	103 U	111 U	242 U	214 U	440 U	420 U	222 U	218 U	208 U	480 U	460 U
Butylbenzylphthalate	241 U	103 U	111 U	242 U	214 U	440 U	420 U	222 U	218 U	208 U	480 U	460 U
Caprolactam	241 U	103 U	111 U	242 U	214 UJ	2,200 U	220 J	222 U	218 U	208 UJ	650 U	2,300 U
Carbazole	241 U	103 U	111 U	242 U	214 U	44 J	86 U	222 U	218 U	208 U	500 U	35 J
Chrysene	241 U	103 U	111 U	242 U	214 U	200	15 J	222 U	218 U	208 U	480 U	130
Dibenz(a,h)anthracene	241 U	103 U	111 U	242 U	214 U	250	86 U	222 U	218 U	208 U	570 U	240
SVOA (PG/G)												
Dibenzofuran	NA	NA	NA	NA	NA	440,000 U	NA	NA	NA	NA	480,000 U	460,000 U
SVOA (UG/KG)												
Dibenzofuran	241 U	103 U	111 U	242 U	214 U	NA	420 U	222 U	218 U	208 U	NA	NA
Diethylphthalate	241 U	103 U	111 U	242 U	214 U	440 U	420 U	222 U	218 U	208 U	480 U	460 U
Di-n-octylphthalate	241 U	103 U	111 U	242 U	214 U	440 U	420 U	222 U	218 U	208 U	940 U	460 U
Fluoranthene	241 U	103 U	111 U	242 U	214 U	600	7.4 J	222 U	218 U	208 U	480 U	350
Fluorene	241 U	103 U	111 U	242 U	214 U	88 U	86 U	222 U	218 U	208 U	480 U	92 U
Indeno(1,2,3-cd)pyrene	241 U	103 U	111 U	242 U	214 U	270	86 U	222 U	218 U	208 U	540 U	260
Isophorone	241 U	103 U	111 U	242 U	214 U	440 U	420 U	222 U	218 U	208 U	480 U	460 U
Naphthalene	241 U	103 U	111 U	242 U	214 U	88 U	26 J	222 U	218 U	208 U	480 U	92 U
n-Nitroso-di-n-propylamine	241 U	103 U	111 U	242 U	214 U	88 U	86 U	222 U	218 U	208 U	480 U	92 U
Phenanthrene	241 U	103 U	111 U	138 J	120 J	170	46 J	222 U	218 U	208 U	480 U	170
Pyrene	241 U	103 U	111 U	242 U	214 U	320	86 U	222 U	218 U	208 U	480 U	200

CTO-WE13
ABL, Site 1
Validated Sediment Raw Analytical Results
2008-2012 LTM

Station ID	1SD-2/1SW-2					1SD-2A/1SW-2A					1SD-3/1SW-3	
Sample ID	AS01-SD02-R17	AS01-SD02A-R18	AS01-SD02-R18	AS01-SD02-R19	AS01-SD02-R20	AS01-SD02A-R15	AS01-1SD02A-R16	AS01-SD02A-R17	AS01-SD02A-R19	AS01-SD02A-R20	AS01-SD03-R14	AS01-SD03P-R15
Sample Date	04/20/10	07/07/11	07/07/11	10/05/11	08/29/12	10/10/08	07/20/09	04/20/10	10/05/11	08/29/12	08/14/08	10/09/08
Chemical Name												
Total Metals (MG/KG)												
Aluminum	3,330	3,100	3,260	4,690	3,660	4,570	5,580	3,010	4,270	2,780	6,960	4,140
Antimony	1.04 U	0.461 L	1.07 L	2.85 R	9.28 UL	0.23 L	0.62 B	1.01 U	2.69 R	8.64 UL	0.15 U	0.23 L
Arsenic	6.92	7.99	8.28	6.49	8.48 L	8.3	10.3	6.13	7.7	4.51 L	8.8	6.3
Barium	31.2 L	29.7	33.2	53.6	29.1 L	51.2	58	34.1 L	42.1	33.8 L	93.9	80.1
Beryllium	1.03	1.03	1.13	1.31 L	1.16 K	1.5	1.5	1.14	1.4 L	0.825 K	1.4	1.4
Cadmium	0.518 U	0.206 UL	0.221 UL	0.713 U	0.464 U	0.23 J	1.3 U	0.503 U	0.672 U	0.432 U	0.78 J	0.54 J
Calcium	1,030	1,010	1,020	1,300 J	1,240	1,490	2,710	1,230	1,110 J	2,650	1,990	1,390
Chromium	9.75	12.7	9.84	10.8	7.19 L	11.6	14.7	8.44	12.2	1.9 L	11.6	9
Cobalt	26.3	23.3	27.6	29.7 L	33.6 L	32.7	30.6	27.7	30.9 L	20.7 L	44.3	31.4
Copper	17.6	13.2	16.8	17.8	16.6 L	17.5	18.9	20.3	34.5	12.1 L	21.5	17.7
Cyanide	0.687 U	0.325 U	0.311 U	0.197 L	0.668 U	1.9 L	0.18 J	0.655 U	0.329 R	0.6 U	0.7 U	0.7 UL
Iron	30,400	33,800	33,900	31,500	29,200 J	32,200	47,900	26,000	42,200	21,100 J	20,800	21,500
Lead	19.8	15.1 L	24.6 L	19.7	16.9 L	19.1	17.8	19.1	17.8	10.4 L	20.4	17.9
Magnesium	511 L	410	514	728 K	560 L	713	753	474 L	643 K	437 L	921	591 J
Manganese	641	795	826	904	367	1,110	1,140	760	962	876	1,730	794
Mercury	0.0242 J	0.0184 J	0.0318 J	0.057	0.0409 J	0.05	0.023 J	0.0231 J	0.0265 J	0.0204 J	0.16	0.075
Nickel	45.3	42.4	51.6	59.1 L	57.9 L	62.9	55.9	49.5	60.4 L	35.1 L	75.4	55.9
Potassium	250 J	206	233	562 K	298 L	532 L	735	223	532 K	224 L	924	425 L
Selenium	0.708 J	2.06 U	2.21 U	1.78 U	4.64 UL	0.66 J	1.3 U	1.08 J	1.68 U	4.32 UL	0.2 U	0.59 J
Silver	0.518 U	0.307 J	0.293 J	0.713 U	1.86 U	0.26 B	0.39 J	0.503 U	0.672 U	1.73 U	0.39 J	0.22 B
Sodium	29	25.6	26.9	1,070 U	42.6 B	156 J	78.1 J	30	1,010 U	64.1 B	93.8 J	67 J
Thallium	1.28 J	10.3 R	11.1 R	1.16 L	23.2 R	1.8 U	0.83 J	1.28 J	1.7 L	21.6 R	0.11 U	2 U
Vanadium	14.1	14.1	14.1	15.3	14.7 L	16	25.2	12.6	17.2	9.83 L	11.9	11.5
Zinc	130	124	141	153	145 L	164 L	152	132	163	94.1 L	195	156 L
Acid Volatile Sulfide/Simultaneously Extractable Metals (UMOL/G)												
Zinc, SEM	0.275 J	NA	1.24	1.13	0.989	1.6 J	NA	NA	NA	NA	0.46 J	1.7 L
AVSSEM (UMOL/G)												
Acid volatile sulfide, SEM	NA	NA	NA	NA	0.276 L	NA	NA	NA	NA	NA	NA	NA
AVSSEM (UMOL/G)												
Cadmium, SEM	8.76E-04 B	NA	0.00211	0.00243	8.76E-04 J	0.0035 J	NA	NA	NA	NA	0.0013 J	0.003 L
Copper, SEM	0.0318 J	NA	0.132	0.136	0.128	0.15 J	NA	NA	NA	NA	0.0536 J	0.19 L
Lead, SEM	0.0151 J	NA	0.106	0.0738	0.0488	0.061 J	NA	NA	NA	NA	0.0113 J	0.072 L
Mercury, SEM	1.40E-05 UL	NA	2.95E-05 L	4.65E-05	1.56E-05 B	0	NA	NA	NA	NA	0 B	1.00E-04
Nickel, SEM	0.0742 J	NA	0.392	0.412	0.383	0.82 J	NA	NA	NA	NA	0.133 J	0.69 L
Silver, SEM	0.0013 U	NA	0.00695 U	0.00848 U	6.07E-04 J	0.0026	NA	NA	NA	NA	2.00E-04 J	0.002 L
Wet Chemistry												
% Solids (pct)	72.4	NA	NA	NA	NA	75.8	NA	75.7	NA	NA	68	71.8
Carbon (ug/g)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	55,000	NA
pH (ph)	7.02	7.04 J	6.94 J	8.01 J	6.97	6.7	7	6.81	8.05 J	7.25	7.3	6.9
Total organic carbon (TOC) (mg/kg)	5,150 J	4,930 L	11,100 L	72,100	24,000 K	69,600	4,580 B	14,900 J	13,300	5,750 K	NA	14,500
Grain Size (PCT)												
Coarse Gravel (%)	0 U	NA	NA	NA	0 U	NA	NA	0 U	NA	0 U	NA	NA
Coarse Sand (%)	0 U	6	0.1	NA	0.5	5.3	5.2	3.9	NA	13.5	1.7	0.1
Fine gravel (%)	0 U	NA	NA	NA	0.2	NA	NA	4.4	NA	2.9	NA	NA
Fine Sand (%)	84.1	18.8	70.1	NA	67	26.5	11.1	4.2	NA	10.1	61.8	92.5
Fines (%)	11.5	1	1.2	NA	3.9	1.4	1.1	0.4	NA	1.2	12.5	5
Gravel (%)	NA	0.7	0	NA	NA	0.8	1.4	NA	NA	NA	14.1	0
GS03 Sieve 3" (75 mm)	NA	100	100	NA	NA	100	100	NA	NA	NA	100	100
GS05 Sieve 2" (50 mm)	NA	100	100	NA	NA	100	100	NA	NA	NA	100	100
GS06 Sieve 1.5" (37.5 mm)	NA	100	100	NA	NA	100	100	NA	NA	NA	100	100
GS07 Sieve 1" (25.0 mm)	NA	100	100	NA	NA	100	100	NA	NA	NA	100	100
GRAINSIZE (PCT/P)												
GS07 Sieve 1" (25.0 mm)	NA	NA	NA	100	NA	NA	NA	NA	100	NA	NA	NA
GRAINSIZE (PCT)												
GS08 Sieve 0.75" (19.0 mm)	NA	100	100	NA	NA	100	100	NA	NA	NA	100	100
GRAINSIZE (PCT/P)												
GS08 Sieve 0.75" (19.0 mm)	NA	NA	NA	100	NA	NA	NA	NA	98	NA	NA	NA

Station ID	1SD-2/1SW-2					1SD-2A/1SW-2A					1SD-3/1SW-3	
Sample ID	AS01-SD02-R17	AS01-SD02A-R18	AS01-SD02-R18	AS01-SD02-R19	AS01-SD02-R20	AS01-SD02A-R15	AS01-1SD02A-R16	AS01-SD02A-R17	AS01-SD02A-R19	AS01-SD02A-R20	AS01-SD03-R14	AS01-SD03P-R15
Sample Date	04/20/10	07/07/11	07/07/11	10/05/11	08/29/12	10/10/08	07/20/09	04/20/10	10/05/11	08/29/12	08/14/08	10/09/08
Chemical Name												
GS09 Sieve 0.5" (12.5 mm)	NA	NA	NA	100	NA	NA	NA	NA	98	NA	NA	NA
GRAINSIZE (PCT)												
GS10 Sieve 0.375" (9.5 mm)	NA	100	100	NA	NA	100	100	NA	NA	NA	87	100
Medium Sand (%)	4.4	73.5	28.6	NA	28.4	66.1	81.1	87.1	NA	72.3	9.9	2.4
Sand (%)	NA	98.3	98.8	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sieve No. 004 (4.75 mm)	NA	99.3	100	NA	NA	99.2	98.6	NA	NA	NA	85.9	100
GRAINSIZE (PCT/P)												
Sieve No. 004 (4.75 mm)	NA	NA	NA	100	NA	NA	NA	NA	98	NA	NA	NA
GRAINSIZE (PCT)												
Sieve No. 010 (2.00 mm)	NA	93.3	99.9	NA	NA	93.9	93.4	NA	NA	NA	84.2	99.9
GRAINSIZE (PCT/P)												
Sieve No. 010 (2.00 mm)	NA	NA	NA	100	NA	NA	NA	NA	97	NA	NA	NA
GRAINSIZE (PCT)												
Sieve No. 020 (850 um)	NA	43.8	99.2	NA	NA	67	49.4	NA	NA	NA	81.5	99.6
Sieve No. 040 (425 um)	NA	19.8	71.3	NA	NA	27.8	12.3	NA	NA	NA	74.3	97.5
GRAINSIZE (PCT/P)												
Sieve No. 040 (425 um)	NA	NA	NA	63	NA	NA	NA	NA	27	NA	NA	NA
GRAINSIZE (PCT)												
Sieve No. 060 (250 um)	NA	4	11.3	NA	NA	4.4	3.5	NA	NA	NA	47	66.9
Sieve No. 100 (150 um)	NA	NA	NA	NA	NA	1.7	1.6	NA	NA	NA	22.9	20.1
GRAINSIZE (PCT/P)												
Sieve No. 100 (150 um)	NA	NA	NA	13	NA	NA	NA	NA	3	NA	NA	NA
GRAINSIZE (PCT)												
Sieve No. 140 (106 um)	NA	NA	NA	NA	NA	2.1	2	NA	NA	NA	28.9	33
Sieve No. 200 (75 um)	NA	1	1.2	NA	NA	1.4	1.1	NA	NA	NA	12.5	5
GRAINSIZE (PCT/P)												
Sieve No. 200 (75 um)	NA	NA	NA	7	NA	NA	NA	NA	2	NA	NA	NA

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Notes:

Shading indicates detections
NA - Not analyzed
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
R - Unreliable Result
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
MG/KG - Milligrams per kilogram
PCT - Percent
PH - pH units
UG/G - Micrograms per gram
UG/KG - Micrograms per kilogram
UMOL/G - Micromoles per gram

CTO-WE13
ABL, Site 1
Validated Sediment Raw Analytical Results
2008-2012 LTM

Station ID	1SD-3/1SW-3								1SD-3A/1SW-3A			
Sample ID	AS01-SD03-R15	AS01-1SD03-R16	AS01-SD03-R17	AS01-SD03P-R18	AS01-SD03-R18	AS01-SD03-R19	AS01-SD03P-R20	AS01-SD03-R20	AS01-SD03AP-R15	AS01-SD03A-R15	AS01-1SD03A-R16	AS01-SD03A-R17
Sample Date	10/09/08	07/17/09	04/20/10	07/07/11	07/07/11	10/05/11	08/29/12	08/29/12	10/09/08	10/09/08	07/17/09	04/20/10
Chemical Name												
Volatile Organic Compounds (UG/KG)												
1,1-Dichloroethene	6.9 U	7.1 U	7.28 U	0.622 U	75.6 U	4.17 U	2.84 U	2.76 U	7 U	7 U	6 U	6.18 U
1,2-Dichloroethene (total)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone	6.9 U	7.1 U	7.28 U	3.11 U	378 U	12.6 J	7.08 U	6.9 U	7 U	7 U	6 U	6.18 U
Acetone	28 U	28 U	29.1 U	6.22 U	756 U	63.5 J	14.2 U	13.8 U	28 U	28 U	24 U	24.7 U
cis-1,2-Dichloroethene	6.9 U	3.5 J	7.28 U	12.8 L	6,190 L	20.2	6.01 J	2.97 J	7 U	7 U	6 U	0.788 J
Methylene chloride	1.6 B	7.1 U	7.28 U	1.24 U	151 U	8.33 U	2.84 U	2.76 U	7 U	1.8 B	6 U	6.18 U
Tetrachloroethene	6.9 U	7.1 U	7.28 U	0.622 U	75.6 U	4.17 U	1.42 U	1.38 U	7 U	7 U	6 U	6.18 U
Toluene	6.9 U	7.1 U	7.28 U	0.622 U	75.6 U	4.17 U	1.42 U	1.38 U	7 U	7 U	6 U	6.18 U
trans-1,2-Dichloroethene	6.9 U	7.1 U	7.28 U	0.622 UL	200 L	4.17 U	1.42 U	1.38 U	7 U	7 U	6 U	6.18 U
Trichloroethene	6.9 U	7.1 U	7.28 U	20.3 L	396 L	4.17 U	1.13 J	1.38 U	7 U	7 U	6 U	1.52 J
Vinyl chloride	6.9 U	7.1 U	7.28 U	1.24 U	151 U	4.11 J	2.84 U	2.76 U	7 U	7 U	6 U	6.18 U
Semivolatile Organic Compounds (UG/KG)												
1,1-Biphenyl	460 U	470 U	271 U	115 U	123 U	290 U	214 U	244 UL	40 J	42 J	37 J	221 U
2,4-Dinitrotoluene	460 U	470 U	271 U	115 U	123 U	290 U	214 U	244 UL	460 U	460 U	400 U	221 U
2,6-Dinitrotoluene	460 U	470 U	271 U	115 U	123 U	290 U	214 U	244 UL	460 U	460 U	400 U	221 U
2-Chloronaphthalene	93 U	95 U	271 U	115 U	123 U	290 U	214 U	244 UL	94 U	93 U	81 U	221 U
2-Methylnaphthalene	93 U	95 U	271 U	115 U	123 U	290 U	372 J	129 L	55 J	57 J	59 J	221 U
2-Methylphenol	460 U	470 U	271 U	115 U	123 U	290 U	214 U	244 UL	460 U	460 U	400 U	221 U
2-Nitroaniline	2,300 U	2,400 U	1,360 U	573 U	615 U	1,160 U	1,070 U	1,220 UL	2,400 U	2,400 U	2,100 U	1,110 U
2-Nitrophenol	460 U	470 U	271 U	115 U	123 U	290 U	214 U	244 UL	460 U	460 U	400 U	221 U
3,3'-Dichlorobenzidine	460 U	470 U	543 UL	230 U	246 U	290 U	430 U	488 UL	460 U	460 U	400 U	442 U
3-Nitroaniline	2,300 U	2,400 U	1,360 U	573 U	615 U	1,160 U	1,070 U	1,220 UL	2,400 U	2,400 U	2,100 U	1,110 U
4,6-Dinitro-2-methylphenol	2,300 U	2,400 U	1,360 U	573 U	615 U	2,900 R	1,070 U	1,220 UL	2,400 U	2,400 U	2,100 U	1,110 U
4-Bromophenyl-phenylether	460 U	470 U	271 U	115 U	123 U	290 U	214 U	244 UL	460 U	460 U	400 U	221 U
4-Chloro-3-methylphenol	460 U	470 U	271 U	115 U	123 U	290 U	214 U	244 UL	460 U	460 U	400 U	221 U
4-Chloroaniline	460 U	470 U	271 U	115 U	123 U	290 U	214 U	244 UL	460 U	460 U	400 U	221 U
4-Methylphenol	460 U	470 U	NA	NA	NA	290 U	NA	NA	460 U	460 U	400 U	NA
Acenaphthylene	93 U	95 U	271 U	115 U	123 U	290 U	214 U	244 UL	94 U	93 U	81 U	221 U
Acetophenone	460 U	470 U	271 U	115 U	123 U	290 U	214 U	244 UL	460 U	460 U	400 U	221 U
Anthracene	93 U	95 U	271 U	115 U	123 U	290 U	214 U	244 UL	94 U	45 J	81 U	221 U
Benzaldehyde	460 U	470 U	201	115 R	123 R	290 U	214 U	244 UL	460 U	460 U	400 U	221 U
Benzo(a)anthracene	34 J	36 J	271 U	115 U	123 U	290 U	115 J	211 L	25 J	120	81 U	221 U
Benzo(a)pyrene	28 J	95 U	271 U	115 U	123 U	290 U	110 J	195 L	17 J	110	81 U	221 U
Benzo(b)fluoranthene	47 J	25 J	271 U	115 U	123 U	290 U	154 J	180 L	23 J	170	81 U	221 U
Benzo(g,h,i)perylene	210	15 J	271 U	115 U	123 U	290 U	214 U	244 UL	94 U	250	81 U	221 U
Benzo(k)fluoranthene	93 U	95 U	271 U	115 U	123 U	290 U	214 U	160 L	94 U	93 U	81 U	221 U
bis(2-Chloroethyl)ether	93 U	95 U	271 U	115 U	123 U	290 U	214 U	244 UL	94 U	93 U	81 U	221 U
bis(2-Ethylhexyl)phthalate	460 U	470 U	271 U	115 U	123 U	290 U	214 U	244 UL	460 U	460 U	400 U	221 U
Butylbenzylphthalate	460 U	470 U	271 U	115 U	123 U	290 U	214 U	244 UL	460 U	460 U	400 U	221 U
Caprolactam	2,300 U	240 J	271 U	115 U	123 U	290 U	214 UJ	244 UL	2,400 U	2,400 U	190 J	221 U
Carbazole	93 U	95 U	271 U	115 U	123 U	290 U	214 U	244 UL	94 U	28 J	81 U	221 U
Chrysene	29 J	23 J	271 U	115 U	123 U	290 U	470 J	338 L	31 J	130	81 U	221 U
Dibenz(a,h)anthracene	93 U	95 U	271 U	115 U	123 U	290 U	214 U	244 UL	94 U	250	81 U	221 U
SVOA (PG/G)												
Dibenzofuran	460,000 U	NA	NA	NA	NA	NA	NA	NA	460,000 U	460,000 U	NA	NA
SVOA (UG/KG)												
Dibenzofuran	NA	470 U	271 U	115 U	123 U	290 U	214 U	244 UL	NA	NA	400 U	221 U
Diethylphthalate	460 U	470 U	271 U	115 U	123 U	290 U	214 U	244 UL	460 U	460 U	400 U	221 U
Di-n-octylphthalate	460 U	470 U	271 U	115 U	123 U	290 U	214 U	244 UL	460 U	460 U	400 U	221 U
Fluoranthene	55 J	38 J	271 U	115 U	123 U	290 U	245 J	487 L	59 J	370	7 J	221 U
Fluorene	93 U	95 U	271 U	115 U	123 U	290 U	214 U	244 UL	94 U	93 U	81 U	221 U
Indeno(1,2,3-cd)pyrene	240	15 J	271 U	115 U	123 U	290 U	214 U	244 UL	230	280	81 U	221 U
Isophorone	460 U	470 U	271 U	115 U	123 U	290 U	214 U	244 UL	460 U	460 U	400 U	221 U
Naphthalene	93 U	95 U	271 U	115 U	123 U	290 U	179 J	244 UL	25 J	32 J	23 J	221 U
n-Nitroso-di-n-propylamine	93 U	95 U	271 U	115 U	123 U	290 U	214 U	244 UL	94 U	93 U	81 U	221 U
Phenanthrene	43 J	31 J	271 U	115 U	123 U	290 U	1,140 J	511 L	75 J	350	46 J	221 U
Pyrene	34 J	42 J	271 U	115 U	123 U	290 U	190 J	371 L	41 J	220	81 U	221 U

Station ID	1SD-3/1SW-3								1SD-3A/1SW-3A			
Sample ID	AS01-SD03-R15	AS01-1SD03-R16	AS01-SD03-R17	AS01-SD03P-R18	AS01-SD03-R18	AS01-SD03-R19	AS01-SD03P-R20	AS01-SD03-R20	AS01-SD03AP-R15	AS01-SD03A-R15	AS01-1SD03A-R16	AS01-SD03A-R17
Sample Date	10/09/08	07/17/09	04/20/10	07/07/11	07/07/11	10/05/11	08/29/12	08/29/12	10/09/08	10/09/08	07/17/09	04/20/10
Chemical Name												
Total Metals (MG/KG)												
Aluminum	4,110	4,200	4,670	3,620	2,720	11,600	3,080	3,790	4,370	4,390	5,210	3,190
Antimony	0.23 L	0.49 B	1.03 U	0.622 L	0.62 L	0.694 R	10.3 UL	9 UL	0.18 L	0.26 L	0.68 B	0.925 U
Arsenic	7.1	7.9	6.67	8	6.02	14.7	6.75 L	6.97 L	8.4	9.5	9.5	7.9
Barium	52.3	61.8	74.9 L	34.2 J	18 J	125	66.5 L	44.6 L	61.2	67.5	121	38.9 L
Beryllium	1.4	1.2	1.39	1.21	1.08	6.71 L	0.779 L	0.846 L	1.5	1.6	1.3	1.19
Cadmium	0.37 J	0.72 U	0.332 J	0.217 UL	0.245 UL	1.73	0.516 U	0.45 U	0.29 J	0.28 J	1.3 U	0.463 U
Calcium	1,160	1,270	2,190	1,090 J	452 J	4,840	1,470	1,780	1,170	1,220	4,340	952
Chromium	9.6	10.1	9.02	10.4	8.71	10.8	4.42 L	6.09 L	11.3	11.2	12.1	9.15
Cobalt	32.6	26.8	36.2	26.1 J	14.3 J	62.3 L	14.9 L	21.1 L	36.6	36.3	26.6	31.1
Copper	17.9	18.1	22.4	17.8	14.4	127	19.6 L	19.1 L	18.9	26.4	18.7	18.2
Cyanide	4.1 L	0.71 U	0.693 U	0.311 U	0.326 U	0.449 R	0.676 U	0.662 U	2.6 L	1.7 L	0.6 U	0.626 U
Iron	22,800	30,100	24,300	43,800 J	27,700 J	27,600	19,200 J	22,600 J	28,800	29,900	40,500	31,200
Lead	18.9	37.5	22.3	28.2 L	12.1 L	33	24.5 L	22.6 L	17.8	19.6	16.8	18.7
Magnesium	582 J	637 J	748 L	499 J	316 J	797 K	382 L	500 L	657	600 J	1,380	520 L
Manganese	879	533	1,190	761 J	191 J	514	632	477	1,330	1,300	987	804
Mercury	0.05	0.06	0.0671 J	0.0226 J	0.0239 J	0.185	0.0487 J	0.0476 J	0.057	0.042 B	0.031 J	0.0317 J
Nickel	56.9	49.1	66.8	59 J	28.5 J	125 L	22.7 L	30.1 L	72	70.5	46.6	56
Potassium	442 L	580 J	300	233	173	504 K	220 L	281 L	528 L	534 L	690	252
Selenium	0.47 J	1.4 U	1.4 J	2.17 U	2.45 U	0.581 J	5.16 UL	4.5 UL	0.75 J	0.64 J	0.54 J	1.12 J
Silver	0.34 J	0.29 J	0.401 J	0.307 J	0.245 U	0.174 U	2.06 U	1.8 U	0.36 J	0.37 J	0.33 J	0.463 U
Sodium	71.6 J	717 U	44.1	29.3 J	20.1 J	109 J	68.4 B	60.9 B	111 J	103 J	96.4 J	28.2
Thallium	1.9 U	2.1 U	1.95 J	10.9 R	12.2 R	0.622 L	25.8 R	22.6 R	1.9 U	2 U	0.75 J	1.54 J
Vanadium	12.1	14.5	23.7	15.1	11.1	11.4	11.2 L	11.8 L	14.4	13.9	24.1	14.4
Zinc	159 L	142	168	164 J	94.5 J	586	89.8 L	124 L	168 L	172 L	139	151
Acid Volatile Sulfide/Simultaneously Extractable Metals (UMOL/G)												
Zinc, SEM	1.5 L	1.8	1.63	NA	1.05	1.33	0.607	0.607	1.5 L	1.4 L	NA	NA
AVSSEM (UMOL/G)												
Acid volatile sulfide, SEM	NA	NA	NA	NA	NA	NA	0.392 L	1.46 L	NA	NA	NA	NA
AVSSEM (UMOL/G)												
Cadmium, SEM	0.0025 L	0.0042	0.00398	NA	0.0025	0.00363	0.00101 J	7.59E-04 J	0.0016 L	0.0015 L	NA	NA
Copper, SEM	0.16 L	0.27	0.206	NA	0.145	0.211	0.173	0.114	0.13 L	0.14 L	NA	NA
Lead, SEM	0.073 L	0.08	0.0724	NA	0.0747	0.0862	0.0773	0.0578	0.12 L	0.063 L	NA	NA
Mercury, SEM	1.00E-04	8.80E-05 U	1.60E-05 UL	NA	3.76E-05 UL	4.49E-05 U	2.48E-05 U	2.44E-05 U	1.00E-04	0	NA	NA
Nickel, SEM	0.65 L	0.36 B	0.532	NA	0.268	0.414	0.177	0.156	0.84 L	0.76 L	NA	NA
Silver, SEM	0.0015 L	8.40E-04 J	0.0037 U	NA	0.00174 U	0.0108 U	0.00101 J	8.85E-04 J	0.0027 L	0.0024 L	NA	NA
Wet Chemistry												
% Solids (pct)	72.4	NA	69.8	NA	NA	NA	NA	NA	71.2	71.9	NA	77.9
Carbon (ug/g)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
pH (ph)	6.9	7	7.48	6.66 J	6.38 J	7.09 J	6.98	7	6.7	6.8	7.1	6.9
Total organic carbon (TOC) (mg/kg)	11,700	29,800	28,100 J	5,820 L	22,100 L	258,000	27,000 K	31,800 K	6,560	5,290	1,340 J	5,790 J
Grain Size (PCT)												
Coarse Gravel (%)	NA	NA	0 U	NA	NA	NA	NA	0 U	NA	NA	NA	0
Coarse Sand (%)	0	0	0.4	0.6	3.6	NA	NA	1	1.1	1.1	13.7	0.7
Fine gravel (%)	NA	NA	0 U	NA	NA	NA	NA	0.6	NA	NA	NA	0.6
Fine Sand (%)	93	82.1	76	43.8	25.2	NA	NA	73.7	48.2	48.4	10.7	46.8
Fines (%)	4.5	15.3	19.3	0.6	4.7	NA	NA	16.9	0.7	3	0.7	2.1
Gravel (%)	0	0	NA	0.1	12.9	NA	NA	NA	0	0.4	1.9	NA
GS03 Sieve 3" (75 mm)	100	100	NA	100	100	NA	NA	NA	100	100	100	NA
GS05 Sieve 2" (50 mm)	100	100	NA	100	100	NA	NA	NA	100	100	100	NA
GS06 Sieve 1.5" (37.5 mm)	100	100	NA	100	90.5	NA	NA	NA	100	100	100	NA
GS07 Sieve 1" (25.0 mm)	100	100	NA	NA	100	NA	NA	NA	100	100	100	NA
GRAINSIZE (PCT/P)												
GS07 Sieve 1" (25.0 mm)	NA	NA	NA	NA	NA	100	NA	NA	NA	NA	NA	NA
GRAINSIZE (PCT)												
GS08 Sieve 0.75" (19.0 mm)	100	100	NA	NA	100	NA	NA	NA	100	100	100	NA
GRAINSIZE (PCT/P)												
GS08 Sieve 0.75" (19.0 mm)	NA	NA	NA	NA	NA	100	NA	NA	NA	NA	NA	NA

Station ID	1SD-3/1SW-3								1SD-3A/1SW-3A			
Sample ID	AS01-SD03-R15	AS01-1SD03-R16	AS01-SD03-R17	AS01-SD03P-R18	AS01-SD03-R18	AS01-SD03-R19	AS01-SD03P-R20	AS01-SD03-R20	AS01-SD03AP-R15	AS01-SD03A-R15	AS01-1SD03A-R16	AS01-SD03A-R17
Sample Date	10/09/08	07/17/09	04/20/10	07/07/11	07/07/11	10/05/11	08/29/12	08/29/12	10/09/08	10/09/08	07/17/09	04/20/10
Chemical Name												
GS09 Sieve 0.5" (12.5 mm)	NA	NA	NA	NA	NA	100	NA	NA	NA	NA	NA	NA
GRAINSIZE (PCT)												
GS10 Sieve 0.375" (9.5 mm)	100	100	NA	100	90.5	NA	NA	NA	100	100	100	NA
Medium Sand (%)	2.4	2.6	4.3	54.9	53.4	NA	NA	7.8	50	47.2	73	49.8
Sand (%)	NA	NA	NA	99.3	82.2	NA	NA	NA	NA	NA	NA	NA
Sieve No. 004 (4.75 mm)	100	100	NA	99.9	87.1	NA	NA	NA	100	99.6	98.1	NA
GRAINSIZE (PCT/P)												
Sieve No. 004 (4.75 mm)	NA	NA	NA	NA	NA	100	NA	NA	NA	NA	NA	NA
GRAINSIZE (PCT)												
Sieve No. 010 (2.00 mm)	100	100	NA	99.3	83.5	NA	NA	NA	98.9	98.5	84.4	NA
GRAINSIZE (PCT/P)												
Sieve No. 010 (2.00 mm)	NA	NA	NA	NA	NA	100	NA	NA	NA	NA	NA	NA
GRAINSIZE (PCT)												
Sieve No. 020 (850 um)	99.8	99.3	NA	92.5	58.8	NA	NA	NA	91.3	91.6	34.8	NA
Sieve No. 040 (425 um)	97.6	97.4	NA	44.4	30.1	NA	NA	NA	48.9	51.3	11.4	NA
GRAINSIZE (PCT/P)												
Sieve No. 040 (425 um)	NA	NA	NA	NA	NA	92	NA	NA	NA	NA	NA	NA
GRAINSIZE (PCT)												
Sieve No. 060 (250 um)	68.3	75.4	NA	8	7.3	NA	NA	NA	6.2	8.5	3.7	NA
Sieve No. 100 (150 um)	20.7	32.4	NA	NA	NA	NA	NA	NA	1	3.3	1.2	NA
GRAINSIZE (PCT/P)												
Sieve No. 100 (150 um)	NA	NA	NA	NA	NA	38	NA	NA	NA	NA	NA	NA
GRAINSIZE (PCT)												
Sieve No. 140 (106 um)	34.1	46.5	NA	NA	NA	NA	NA	NA	1.4	3.6	1.9	NA
Sieve No. 200 (75 um)	4.5	15.3	NA	0.6	4.9	NA	NA	NA	0.7	3	0.7	NA
GRAINSIZE (PCT/P)												
Sieve No. 200 (75 um)	NA	NA	NA	NA	NA	27	NA	NA	NA	NA	NA	NA

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Notes:

Shading indicates detections
NA - Not analyzed
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
R - Unreliable Result
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
MG/KG - Milligrams per kilogram
PCT - Percent
PH - pH units
UG/G - Micrograms per gram
UG/KG - Micrograms per kilogram
UMOL/G - Micromoles per gram

Station ID	1SD-4/1SW-4										
Sample ID	AS01-SD03A-R18	AS01-SD03A-R19	AS01-SD03AP-R20	AS01-SD03A-R20	AS01-SD04-R14	AS01-SD04-R15	AS01-SD04-R16	AS01-SD04-R17	AS01-SD04-R18	AS01-SD04-R19	AS01-SD04-R20
Sample Date	07/07/11	10/05/11	08/29/12	08/29/12	08/13/08	10/08/08	07/16/09	04/19/10	07/07/11	10/04/11	08/29/12
Chemical Name											
Volatile Organic Compounds (UG/KG)											
1,1-Dichloroethene	0.61 U	3.13 U	2.68 U	2.34 U	8 U	17 U	11 U	8.68 U	0.698 U	4.06 U	2.7 U
1,2-Dichloroethene (total)	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA	NA
2-Butanone	3.05 U	6.27 U	6.7 U	5.86 U	47 U	17 U	11 U	8.68 U	3.49 U	8.13 U	6.74 U
Acetone	6.1 U	12.5 UJ	13.4 U	11.7 U	23 B	53 J	43 U	42.5 B	6.98 U	29.2 B	13.5 U
cis-1,2-Dichloroethene	28.5	3.13 U	1.34 U	1.17 U	10 U	17 U	6.1 J	3.56 J	17.4	4.97 J	7.7
Methylene chloride	1.22 U	6.27 U	2.68 U	2.34 U	40 U	11 B	11 U	8.68 U	2.98 J	8.13 U	2.7 U
Tetrachloroethene	0.61 U	3.13 U	1.34 U	1.17 U	10 U	17 U	11 U	1.72 J	0.698 U	4.06 U	1.35 U
Toluene	0.61 U	3.13 U	1.34 U	1.17 U	8 U	17 U	11 U	8.68 U	0.698 U	4.06 U	1.7 J
trans-1,2-Dichloroethene	0.61 U	3.13 U	1.34 U	1.17 U	11 U	17 U	5.3 J	8.68 U	1.02 J	4.06 U	0.829 J
Trichloroethene	44.7	3.13 U	1.34 U	1.17 U	10 U	17 U	11 U	20.9	8.73	9.98	0.676 J
Vinyl chloride	1.22 U	3.13 UJ	2.68 U	2.34 U	8 U	17 U	10 J	8.68 U	1.4 U	4.06 UJ	2.7 U
Semivolatile Organic Compounds (UG/KG)											
1,1-Biphenyl	107 U	222 U	226 U	200 U	510 U	70 J	710 U	321 U	128 U	258 U	208 U
2,4-Dinitrotoluene	107 U	222 U	226 U	200 U	510 U	1,100 U	710 U	321 U	128 U	258 U	208 U
2,6-Dinitrotoluene	107 U	222 U	226 U	200 U	510 U	1,100 U	710 U	321 U	128 U	258 U	208 U
2-Chloronaphthalene	107 U	222 U	226 U	200 U	510 U	230 U	140 U	321 U	128 U	258 U	208 U
2-Methylnaphthalene	107 U	222 U	226 U	200 U	510 U	160 J	45 J	321 U	128 U	258 U	208 U
2-Methylphenol	107 U	222 U	226 U	200 U	940 U	1,100 U	710 U	321 U	128 U	258 U	208 U
2-Nitroaniline	532 U	885 U	1,130 U	1,000 U	1,300 U	5,800 U	3,600 U	1,610 U	641 U	1,030 U	1,030 U
2-Nitrophenol	107 U	222 U	226 U	200 U	780 U	1,100 U	710 U	321 U	128 U	258 U	208 U
3,3'-Dichlorobenzidine	213 U	222 U	454 U	402 U	540 U	1,100 U	710 U	643 U	257 U	258 U	414 U
3-Nitroaniline	532 U	885 U	1,130 U	1,000 U	1,300 U	5,800 U	3,600 U	1,610 U	641 U	1,030 U	1,030 U
4,6-Dinitro-2-methylphenol	532 U	2,220 U	1,130 U	1,000 U	1,600 U	5,800 U	3,600 U	1,610 U	641 U	2,580 U	1,030 U
4-Bromophenyl-phenylether	107 U	222 U	226 U	200 U	510 U	1,100 U	710 U	321 U	128 U	258 U	208 U
4-Chloro-3-methylphenol	107 U	222 U	226 U	200 U	770 U	1,100 U	710 U	321 U	128 U	258 U	208 U
4-Chloroaniline	107 U	222 U	226 U	200 U	550 U	1,100 U	710 U	321 U	128 U	258 U	208 U
4-Methylphenol	NA	222 U	NA	NA	NA	1,100 U	57 J	NA	NA	258 U	NA
Acenaphthylene	107 U	222 U	226 U	200 U	510 U	230 U	140 U	321 U	128 U	258 U	208 U
Acetophenone	107 U	222 U	226 U	200 U	830 U	76 J	710 U	321 U	128 U	258 U	208 U
Anthracene	107 U	222 U	226 U	200 U	510 U	230 U	140 U	321 U	128 U	258 U	208 U
Benzaldehyde	107 R	222 U	226 U	200 U	570 UL	1,100 U	860	278 J	128 R	258 U	208 U
Benzo(a)anthracene	107 U	222 U	226 U	200 U	510 U	130 J	76 J	321 U	128 U	258 U	208 U
Benzo(a)pyrene	107 U	222 U	226 U	200 U	510 U	110 J	66 J	321 U	128 U	258 U	208 U
Benzo(b)fluoranthene	107 U	222 U	226 U	200 U	630 U	180 J	92 J	321 U	128 U	258 U	208 U
Benzo(g,h,i)perylene	107 U	222 U	226 U	200 U	510 U	540	68 J	321 U	128 U	258 U	208 U
Benzo(k)fluoranthene	107 U	222 U	226 U	200 U	510 U	230 U	50 J	321 U	128 U	258 U	208 U
bis(2-Chloroethyl)ether	107 U	222 U	226 U	200 U	510 U	230 U	140 U	321 U	128 U	258 U	208 U
bis(2-Ethylhexyl)phthalate	107 U	222 U	226 U	200 U	510 U	1,100 U	100 J	321 U	171 J	258 U	208 U
Butylbenzylphthalate	107 U	222 U	226 U	200 U	510 U	1,100 U	710 U	321 U	136 J	258 U	208 U
Caprolactam	107 U	222 U	226 UJ	200 UJ	680 U	5,800 U	420 J	321 U	128 U	258 U	208 UJ
Carbazole	107 U	222 U	226 U	200 U	520 U	230 U	140 U	321 U	128 U	258 U	208 U
Chrysene	107 U	222 U	226 U	200 U	510 U	170 J	130 J	321 U	128 U	258 U	208 U
Dibenz(a,h)anthracene	107 U	222 U	226 U	200 U	600 U	230 U	140 U	321 U	128 U	258 U	208 U
SVOA (PG/G)											
Dibenzofuran	NA	NA	NA	NA	510,000 U	1,100,000 U	NA	NA	NA	NA	NA
SVOA (UG/KG)											
Dibenzofuran	107 U	222 U	226 U	200 U	NA	NA	710 U	321 U	128 U	258 U	208 U
Diethylphthalate	107 U	222 U	226 U	200 U	510 U	140 J	710 U	321 U	128 U	258 U	208 U
Di-n-octylphthalate	107 U	222 U	226 U	200 U	980 U	1,100 U	710 U	321 U	128 U	258 U	208 U
Fluoranthene	107 U	222 U	226 U	200 U	510 U	250	140	321 U	170 J	258 U	208 U
Fluorene	107 U	222 U	226 U	200 U	510 U	230 U	140 U	321 U	128 U	258 U	208 U
Indeno(1,2,3-cd)pyrene	107 U	222 U	226 U	200 U	570 U	600	46 J	321 U	128 U	258 U	208 U
Isophorone	107 U	222 U	226 U	200 U	510 U	1,100 U	710 U	321 U	128 U	258 U	208 U
Naphthalene	107 U	222 U	226 U	200 U	510 U	79 J	27 J	321 U	128 U	258 U	208 U
n-Nitroso-di-n-propylamine	107 U	222 U	226 U	200 U	510 U	230 U	140 U	321 U	128 U	258 U	208 U
Phenanthrene	107 U	222 U	226 U	200 U	510 U	240	120 J	321 U	151 J	258 U	208 U
Pyrene	107 U	222 U	226 U	200 U	510 U	150 J	120 J	321 U	131 J	258 U	208 U

Station ID	1SD-4/1SW-4										
Sample ID	AS01-SD03A-R18	AS01-SD03A-R19	AS01-SD03AP-R20	AS01-SD03A-R20	AS01-SD04-R14	AS01-SD04-R15	AS01-SD04-R16	AS01-SD04-R17	AS01-SD04-R18	AS01-SD04-R19	AS01-SD04-R20
Sample Date	07/07/11	10/05/11	08/29/12	08/29/12	08/13/08	10/08/08	07/16/09	04/19/10	07/07/11	10/04/11	08/29/12
Chemical Name											
Total Metals (MG/KG)											
Aluminum	3,470	5,540	3,910	4,450	5,790	11,800	8,720	6,590	4,100	4,840	3,450
Antimony	3.37 L	2.7 R	8.74 UL	9.02 UL	0.29 U	0.55 L	0.65 B	1.28 U	0.635 L	3.12 R	8.82 UL
Arsenic	11.1	7.77	9.92 L	11.1 L	11.3	11.2	13.5	9.16	7.48	6.36	6.18 L
Barium	32.2	61.3	50.2 L	54.6 L	78	168	109	88.9	47.9	81.9	30.9 L
Beryllium	1.41	1.82 L	1.16 K	1.24 L	1.4	3.6	2.4	1.87	1.07	1.23 L	0.97 L
Cadmium	0.224 UL	0.675 U	0.438 U	0.452 U	0.47 J	1.7	0.14 J	0.653	0.247 UL	0.779 U	0.442 U
Calcium	841	2,010	1,660	1,230	1,200	5,000	2,710	2,140	1,170	1,260 J	744
Chromium	14.2	13	5.86 L	4.72 L	13.7	17.2	17.5	12.1	9.55	11.8	6.74 L
Cobalt	28.2	34.3 L	27.5 L	31.8 L	41.4	102	55.7	57.7	27.7	38.4 L	28.7 L
Copper	21.7	24	16.2 L	18.5 L	19.4	41.2	34.4	28.2	17.8	20.3	14 L
Cyanide	0.332 U	0.331 R	0.622 U	0.634 U	0.75 U	7.4 L	1.1 U	0.965 U	0.356 U	0.397 R	0.622 U
Iron	61,800	47,700	37,600 J	43,600 J	32,200	32,900	32,800	29,400	29,500	30,000	25,400 J
Lead	129 L	22.4	16.2 L	21.1 L	23	29.7	27.5	23.9	22.7 L	25	15.3 L
Magnesium	478	844 K	610 L	626 L	747	1,650 J	1,090	843	596	765 K	394 L
Manganese	829	1,220	918	1,200	610	3,980	1,300	2,010	972	817	625
Mercury	0.034 J	0.0563	0.0335 J	0.0246 J	0.05	0.21	0.18	0.111 J	0.0613 J	0.0702	0.0385 J
Nickel	62.9	72.4 L	49.8 L	54.3 L	75.6	171	100	94.1	49.3	62.4 L	43.3 L
Potassium	206	730 K	368 L	466 L	832	947 L	826 J	445	317	609 K	171 L
Selenium	2.24 U	1.69 U	4.38 UL	4.52 UL	0.63 J	2.1 J	0.75 J	1.56 J	2.47 U	1.95 U	4.42 UL
Silver	1.18	0.675 U	1.75 U	1.81 U	0.1 U	1.2 J	0.52 J	0.496 J	0.329 J	0.779 U	1.77 U
Sodium	28.7	1,010 U	64.8 B	380	64.3 J	192 J	72 J	57.1	36	1,170 U	35.1 B
Thallium	11.2 R	1.83 L	21.8 R	22.6 R	0.4 J	5.2 U	0.81 J	3.38 J	12.4 R	1.34 L	22 R
Vanadium	18	19.6	17.2 L	19.1 L	16.7	20.6	22.1	34.3	13.4	15.9	11.5 L
Zinc	191	184	143 L	170 L	182	448 L	275	236	153	172	139 L
Acid Volatile Sulfide/Simultaneously Extractable Metals (UMOL/G)											
Zinc, SEM	NA	NA	NA	NA	0.37 J	5.2 L	2.2	0.989	1.24	1.68	0.639
AVSSEM (UMOL/G)											
Acid volatile sulfide, SEM	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.91 L
AVSSEM (UMOL/G)											
Cadmium, SEM	NA	NA	NA	NA	1.00E-03 J	0.012 L	0.0048	0.00491 K	0.00325 J	0.00443	8.22E-04 J
Copper, SEM	NA	NA	NA	NA	0.0343 J	0.48 L	0.35	0.123	0.19	0.217	0.0662
Lead, SEM	NA	NA	NA	NA	0.0128 J	0.12 L	0.14	0.0371	0.0709	0.0892	0.0321
Mercury, SEM	NA	NA	NA	NA	0 B	1.00E-04	1.30E-04 U	1.80E-05 U	3.18E-05 UL	4.00E-05 U	2.48E-05 U
Nickel, SEM	NA	NA	NA	NA	0.0786 J	2.3 L	0.62 B	0.291	0.408	0.622	0.189
Silver, SEM	NA	NA	NA	NA	1.00E-04 UL	0.0092 L	0.0012 J	0.0016 U	0.00738 U	0.00961 U	5.47E-04 J
Wet Chemistry											
% Solids (pct)	NA	NA	NA	NA	65	29.1	NA	56.1	NA	NA	NA
Carbon (ug/g)	NA	NA	NA	NA	58,000	NA	NA	NA	NA	NA	NA
pH (ph)	6.83 J	7.64 J	7.13	7.09	7.2	9.3	6.8	6.7	6.81 J	7.46 J	7.37
Total organic carbon (TOC) (mg/kg)	4,940 L	16,600	75,800 K	20,000 K	NA	82,500	51,900	43,900	16,700 L	31,000	14,800 K
Grain Size (PCT)											
Coarse Gravel (%)	NA	NA	NA	0 U	NA	NA	NA	0	NA	NA	0 U
Coarse Sand (%)	1.2	NA	NA	3.1	0.2	1.8	0.5	1.1	0.1	NA	3.8
Fine gravel (%)	NA	NA	NA	0.1	NA	NA	NA	6.3	NA	NA	7.2
Fine Sand (%)	47.1	NA	NA	4.7	88.4	31.9	70.3	58.2	88.3	NA	68.1
Fines (%)	0.2	NA	NA	1.1	5.9	64.2	25.1	29.3	7.2	NA	7.3
Gravel (%)	2.3	NA	NA	NA	0	0	0.3	NA	0.8	NA	NA
GS03 Sieve 3" (75 mm)	100	NA	NA	NA	100	100	100	NA	100	NA	NA
GS05 Sieve 2" (50 mm)	100	NA	NA	NA	100	100	100	NA	100	NA	NA
GS06 Sieve 1.5" (37.5 mm)	100	NA	NA	NA	100	100	100	NA	100	NA	NA
GS07 Sieve 1" (25.0 mm)	100	NA	NA	NA	100	100	100	NA	100	NA	NA
GRAINSIZE (PCT/P)											
GS07 Sieve 1" (25.0 mm)	NA	100	NA	NA	NA	NA	NA	NA	NA	100	NA
GRAINSIZE (PCT)											
GS08 Sieve 0.75" (19.0 mm)	100	NA	NA	NA	100	100	100	NA	100	NA	NA
GRAINSIZE (PCT/P)											
GS08 Sieve 0.75" (19.0 mm)	NA	100	NA	NA	NA	NA	NA	NA	NA	100	NA

Station ID	1SD-4/1SW-4										
Sample ID	AS01-SD03A-R18	AS01-SD03A-R19	AS01-SD03AP-R20	AS01-SD03A-R20	AS01-SD04-R14	AS01-SD04-R15	AS01-SD04-R16	AS01-SD04-R17	AS01-SD04-R18	AS01-SD04-R19	AS01-SD04-R20
Sample Date	07/07/11	10/05/11	08/29/12	08/29/12	08/13/08	10/08/08	07/16/09	04/19/10	07/07/11	10/04/11	08/29/12
Chemical Name											
GS09 Sieve 0.5" (12.5 mm)	NA	99	NA	NA	NA	NA	NA	NA	NA	100	NA
GRAINSIZE (PCT)											
GS10 Sieve 0.375" (9.5 mm)	100	NA	NA	NA	100	100	100	NA	100	NA	NA
Medium Sand (%)	49.2	NA	NA	91	5.4	2.1	3.8	5.1	3.2	NA	13.6
Sand (%)	97.5	NA	NA	NA	NA	NA	NA	NA	91.6	NA	NA
Sieve No. 004 (4.75 mm)	97.7	NA	NA	NA	100	100	99.7	NA	99.2	NA	NA
GRAINSIZE (PCT/P)											
Sieve No. 004 (4.75 mm)	NA	99	NA	NA	NA	NA	NA	NA	NA	100	NA
GRAINSIZE (PCT)											
Sieve No. 010 (2.00 mm)	96.5	NA	NA	NA	99.8	98.2	99.2	NA	99.1	NA	NA
GRAINSIZE (PCT/P)											
Sieve No. 010 (2.00 mm)	NA	97	NA	NA	NA	NA	NA	NA	NA	100	NA
GRAINSIZE (PCT)											
Sieve No. 020 (850 um)	88.6	NA	NA	NA	99	98	98.3	NA	98.7	NA	NA
Sieve No. 040 (425 um)	47.3	NA	NA	NA	94.4	96	95.4	NA	95.9	NA	NA
GRAINSIZE (PCT/P)											
Sieve No. 040 (425 um)	NA	22	NA	NA	NA	NA	NA	NA	NA	91	NA
GRAINSIZE (PCT)											
Sieve No. 060 (250 um)	10.3	NA	NA	NA	43.8	91	82	NA	62.9	NA	NA
Sieve No. 100 (150 um)	NA	NA	NA	NA	11.6	77.4	49.4	NA	NA	NA	NA
GRAINSIZE (PCT/P)											
Sieve No. 100 (150 um)	NA	3	NA	NA	NA	NA	NA	NA	NA	21	NA
GRAINSIZE (PCT)											
Sieve No. 140 (106 um)	NA	NA	NA	NA	17.5	81.8	62.4	NA	NA	NA	NA
Sieve No. 200 (75 um)	0.2	NA	NA	NA	5.9	64.2	25.1	NA	7.6	NA	NA
GRAINSIZE (PCT/P)											
Sieve No. 200 (75 um)	NA	2	NA	NA	NA	NA	NA	NA	NA	9	NA

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Notes:

Shading indicates detections
NA - Not analyzed
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
R - Unreliable Result
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
MG/KG - Milligrams per kilogram
PCT - Percent
PH - pH units
UG/G - Micrograms per gram
UG/KG - Micrograms per kilogram
UMOL/G - Micromoles per gram

Station ID	1SD-4A/1SW-4A						1SD-5/1SW-5						
Sample ID	AS01-SD04A-R15	AS01-SD04A-R16	AS01-SD04A-R17	AS01-SD04A-R18	AS01-SD04A-R19	AS01-SD04A-R20	AS01-SD05-R14	AS01-SD05A-R16	AS01-SD05-R16	AS01-SD05-R17	AS01-SD05-R18	AS01-SD05-R19	AS01-SD05-R20
Sample Date	10/08/08	07/16/09	04/19/10	07/07/11	10/04/11	08/29/12	08/12/08	07/15/09	07/15/09	04/19/10	07/06/11	10/04/11	08/28/12
Chemical Name													
Volatile Organic Compounds (UG/KG)													
1,1-Dichloroethene	6.7 U	6.3 U	6.61 U	0.661 U	3.13 U	2.48 U	7 U	6.7 U	6.4 U	5.8 U	0.611 U	3.16 U	2.7 U
1,2-Dichloroethene (total)	NA	NA	NA	NA	NA	NA	8 U	NA	NA	NA	NA	NA	NA
2-Butanone	6.7 U	6.3 U	6.61 U	3.3 U	6.25 U	6.22 U	41 U	6.7 U	6.4 U	5.8 U	3.05 U	6.32 U	6.76 U
Acetone	16 J	25 U	26.4 U	6.61 U	12.5 UJ	12.4 U	47 U	27 U	25 U	23.2 U	6.11 U	12.6 UJ	13.5 U
cis-1,2-Dichloroethene	6.7 U	6.3 U	6.61 U	0.661 U	3.13 U	1.24 U	8 U	6.7 U	6.4 U	5.8 U	0.611 U	3.16 U	1.35 U
Methylene chloride	6.4 B	170	6.61 U	1.32 U	3.26 B	2.48 U	22 B	6.7 U	6.4 U	5.8 U	1.22 U	6.32 U	2.7 U
Tetrachloroethene	6.7 U	6.3 U	6.61 U	0.661 U	3.13 U	1.24 U	8 U	6.7 U	6.4 U	5.8 U	0.611 U	3.16 U	1.35 U
Toluene	6.7 U	6.3 U	6.61 U	0.661 U	3.13 U	1.24 U	7 U	6.7 U	6.4 U	5.8 U	0.611 U	3.16 U	1.35 U
trans-1,2-Dichloroethene	6.7 U	6.3 U	6.61 U	0.661 U	3.13 U	1.24 U	10 U	6.7 U	6.4 U	5.8 U	0.611 U	3.16 U	1.35 U
Trichloroethene	6.7 U	6.3 U	6.61 U	0.661 U	3.13 U	1.24 U	8 U	6.7 U	6.4 U	5.8 U	0.611 U	3.16 U	1.35 U
Vinyl chloride	6.7 U	6.3 U	6.61 U	1.32 U	3.13 UJ	2.48 U	7 U	6.7 U	6.4 U	5.8 U	1.22 U	3.16 UJ	2.7 U
Semivolatile Organic Compounds (UG/KG)													
1,1-Biphenyl	44 J	23 J	237 U	106 U	216 U	204 UL	470 U	70 J	25 J	224 U	108 U	225 U	230 U
2,4-Dinitrotoluene	440 U	420 U	237 U	106 U	216 U	204 UL	470 U	49 J	420 U	224 U	108 U	225 U	230 U
2,6-Dinitrotoluene	440 U	420 U	237 U	106 U	216 U	204 UL	470 U	1,100	420 U	224 U	108 U	225 U	230 U
2-Chloronaphthalene	90 U	84 U	237 U	106 U	216 U	204 UL	470 U	1,400	85 U	224 U	108 U	225 U	230 U
2-Methylnaphthalene	58 J	31 J	237 U	106 U	216 U	204 UL	250 J	140	30 J	224 U	108 U	225 U	230 U
2-Methylphenol	440 U	420 U	237 U	106 U	216 U	204 UL	860 U	20 J	420 U	224 U	108 U	225 U	230 U
2-Nitroaniline	2,300 U	2,100 U	1,180 U	530 U	864 U	1,020 UL	1,200 U	39 J	2,200 U	1,120 U	539 U	898 U	1,150 U
2-Nitrophenol	440 U	420 U	237 U	106 U	216 U	204 UL	720 U	150 J	420 U	224 U	108 U	225 U	230 U
3,3'-Dichlorobenzidine	440 U	420 U	473 U	212 U	216 U	410 UL	500 U	220 J	420 U	447 U	216 U	225 U	460 U
3-Nitroaniline	2,300 U	2,100 U	1,180 U	530 U	864 U	1,020 UL	1,200 U	23 J	2,200 U	1,120 U	539 U	898 U	1,150 U
4,6-Dinitro-2-methylphenol	2,300 U	2,100 U	1,180 U	530 U	2,160 U	1,020 UL	1,400 U	780 J	2,200 U	1,120 U	539 U	2,250 U	1,150 U
4-Bromophenyl-phenylether	440 U	420 U	237 U	106 U	216 U	204 UL	470 U	200 J	420 U	224 U	108 U	225 U	230 U
4-Chloro-3-methylphenol	440 U	420 U	237 U	106 U	216 U	204 UL	710 U	220 J	420 U	224 U	108 U	225 U	230 U
4-Chloroaniline	440 U	420 U	237 U	106 U	216 U	204 UL	510 U	47 J	420 U	224 U	108 U	225 U	230 U
4-Methylphenol	440 U	420 U	NA	NA	216 U	NA	NA	440 U	420 U	NA	NA	225 U	NA
Acenaphthylene	90 U	84 U	237 U	106 U	216 U	204 UL	280 J	90 U	85 U	224 U	108 U	225 U	230 U
Acetophenone	440 U	420 U	237 U	106 U	216 U	204 UL	770 U	440 U	420 U	224 U	108 U	225 U	230 U
Anthracene	90 U	84 U	237 U	106 U	216 U	204 UL	210 J	90 U	85 U	224 U	108 U	225 U	230 U
Benzaldehyde	440 U	420 U	237 U	106 R	216 U	204 UL	520 UL	26 J	500	224 U	108 R	225 U	230 U
Benzo(a)anthracene	53 J	84 U	237 U	106 U	216 U	204 UL	1,100	49 J	64 J	224 U	108 U	225 U	230 U
Benzo(a)pyrene	42 J	84 U	237 U	106 U	216 U	204 UL	1,200	42 J	79 J	224 U	108 U	225 U	230 U
Benzo(b)fluoranthene	70 J	84 U	237 U	106 U	216 U	204 UL	1,400	61 J	93	224 U	108 U	225 U	230 U
Benzo(g,h,i)perylene	220	84 U	237 U	106 U	216 U	204 UL	510	11 J	64 J	224 U	108 U	225 U	230 U
Benzo(k)fluoranthene	90 U	84 U	237 U	106 U	216 U	204 UL	1,400	54 J	51 J	224 U	108 U	225 U	230 U
bis(2-Chloroethyl)ether	90 U	84 U	237 U	106 U	216 U	204 UL	470 U	13 J	85 U	224 U	108 U	225 U	230 U
bis(2-Ethylhexyl)phthalate	440 U	420 U	237 U	106 U	216 U	204 UL	470 U	440 U	420 U	224 U	108 U	225 U	230 U
Butylbenzylphthalate	440 U	420 U	237 U	106 U	216 U	204 UL	470 U	440 U	420 U	224 U	108 U	225 U	230 U
Caprolactam	2,300 U	220 J	237 U	106 U	216 U	204 UL	620 U	2,300 U	220 J	224 U	108 U	225 U	230 UJ
Carbazole	90 U	84 U	237 U	106 U	216 U	204 UL	530 J	90 U	16 J	224 U	108 U	225 U	230 U
Chrysene	59 J	84 U	237 U	106 U	216 U	204 UL	1,900	51 J	110	224 U	108 U	225 U	230 U
Dibenz(a,h)anthracene	240	84 U	237 U	106 U	216 U	204 UL	200 J	90 U	28 J	224 U	108 U	225 U	230 U
SVOA (PG/G)													
Dibenzofuran	440,000 U	NA	NA	NA	NA	NA	310,000 J	NA	NA	NA	NA	NA	NA
SVOA (UG/KG)													
Dibenzofuran	NA	420 U	237 U	106 U	216 U	204 UL	NA	20 J	420 U	224 U	108 U	225 U	230 U
Diethylphthalate	440 U	53 J	237 U	106 U	216 U	204 UL	470 U	440 U	24 J	224 U	108 U	225 U	230 U
Di-n-octylphthalate	440 U	420 U	237 U	106 U	216 U	204 UL	910 U	340 J	420 U	224 U	108 U	225 U	230 U
Fluoranthene	83 J	84 U	237 U	106 U	216 U	204 UL	4,000	63 J	170	224 U	108 U	225 U	230 U
Fluorene	90 U	84 U	237 U	106 U	216 U	204 UL	430 J	19 J	85 U	224 U	108 U	225 U	230 U
Indeno(1,2,3-cd)pyrene	240	84 U	237 U	106 U	216 U	204 UL	620	17 J	48 J	224 U	108 U	225 U	230 U
Isophorone	440 U	420 U	237 U	106 U	216 U	204 UL	470 U	96 J	420 U	224 U	108 U	225 U	230 U
Naphthalene	27 J	84 U	237 U	106 U	216 U	204 UL	260 J	140	14 J	224 U	108 U	225 U	230 U
n-Nitroso-di-n-propylamine	90 U	84 U	237 U	106 U	216 U	204 UL	470 U	1,200	85 U	224 U	108 U	225 U	230 U
Phenanthrene	96	32 J	237 U	106 U	216 U	204 UL	4,600	110	150	224 U	108 U	225 U	230 U
Pyrene	52 J	84 U	237 U	106 U	216 U	204 UL	3,500	56 J	160	224 U	108 U	225 U	230 U

Station ID	1SD-4A/1SW-4A						1SD-5/1SW-5						
Sample ID	AS01-SD04A-R15	AS01-SD04A-R16	AS01-SD04A-R17	AS01-SD04A-R18	AS01-SD04A-R19	AS01-SD04A-R20	AS01-SD05-R14	AS01-SD05A-R16	AS01-SD05-R16	AS01-SD05-R17	AS01-SD05-R18	AS01-SD05-R19	AS01-SD05-R20
Sample Date	10/08/08	07/16/09	04/19/10	07/07/11	10/04/11	08/29/12	08/12/08	07/15/09	07/15/09	04/19/10	07/06/11	10/04/11	08/28/12
Chemical Name													
Total Metals (MG/KG)													
Aluminum	4,790	4,770	3,160	4,000	5,010	4,460	5,660	4,780	5,630	3,190	3,180	5,100	5,350
Antimony	0.21 L	0.71 B	0.934 U	0.584 L	2.54 R	8.74 UL	0.32 U	0.62 B	0.66 B	0.878 U	0.836 L	2.77 R	9.82 UL
Arsenic	9.1	13.4	8.04	10.6	8.38	13.1 L	9	12.6	12.7	9.67	9.24	10.2	10.7 L
Barium	55.4	57.9	73.1	47.7	53.7	43.4 L	67	60.4	60.1	43.4	35.6	54.4	60.8 L
Beryllium	1.6	1.6	1.2	1.18	1.55 L	1.52 L	1.3	1.4	1.6	1.23	1.2	1.82 L	1.64 L
Cadmium	0.31 J	1.3 U	0.467 U	0.233 UL	0.635 U	0.438 U	0.4 J	0.66 U	1.2 U	0.439 U	0.225 UL	0.693 U	0.492 U
Calcium	2,530	1,220	1,280	1,350	1,310 J	1,320	981	1,400	2,180	951	845	1,270 J	1,420
Chromium	13.9	15.6	11.7	9.72	16.4	8.49 L	11.3	11.6	15.3	12.7	10.5	17.6	8.97 L
Cobalt	29.8	31.8	30.7	31	38.8 L	41.4 L	32.3	31.6	32.8	26.4	29.4	33.2 L	42.7 L
Copper	20.7	19.3	19.5	18.1	23.2	22.6 L	17.7	18.9	20.5	19.6	17.3	25.5	27.6 L
Cyanide	1.3 L	1.6	0.663 U	0.333 U	0.327 R	0.638 U	0.7 U	3.5	0.64 U	0.518 J	0.325 U	0.347 R	0.698 U
Iron	36,400	53,300	34,100	32,700	47,200	61,400 J	30,100	30,800	52,700	42,100	38,300	58,700	39,300 J
Lead	17.1	18.8	29.7	19.2 L	25.3	24.4 L	18	17.9	20.6	18.6	21 L	118	23.7 L
Magnesium	636	624 J	610	602	702 K	499 L	616	669	706	481	441	637 K	462 L
Manganese	999	884	787	944	1,120	1,530	790	868	1,080	696	863	1,180	436
Mercury	0.055	0.027 J	0.0448 J	0.0334 J	0.0267 J	0.019 J	0.03 J	0.11	0.076	0.0184 J	0.0228 J	0.0394 J	0.0543 J
Nickel	56.3	62	55.1	73.2	70.7 L	92.8 L	62.5	62.7	65.2	50.5	61.1	66.6 L	70.8 L
Potassium	500 L	625 J	248	318	583 K	264 L	924	772	724	241	194	655 K	217 L
Selenium	0.68 J	1.3 U	0.827 J	2.33 U	1.59 U	4.38 UL	0.42 U	0.58 J	1.2 U	0.7 J	2.25 U	1.73 U	4.92 UL
Silver	0.25 B	0.32 J	0.241 J	0.356 J	0.635 U	1.75 U	0.1 U	0.29 J	0.32 J	0.439 U	0.297 J	0.693 U	1.96 U
Sodium	139 J	636 U	40.5	39.1	953 U	43 B	72.4 J	660 U	17.8 J	48.7	26.2	1,040 U	50.4 B
Thallium	1.8 U	0.81 J	1.54 J	11.7 R	2.39 L	21.8 R	0.22 U	0.58 J	1.2 J	1.35 J	11.3 R	2.06 L	24.6 R
Vanadium	15.7	22.3	17.5	15.2	19.9	20.3 L	14	16.6	23.4	17.1	14.3	21.4	17.2 L
Zinc	154 L	171	152	184	205	222 L	168	173	207	145	166	192	222 L
Acid Volatile Sulfide/Simultaneously Extractable Metals (UMOL/G)													
Zinc, SEM	1.3 L	NA	NA	NA	NA	NA	0.798 J	NA	0.85 B	0.359	0.995	1.22	0.907
AVSSEM (UMOL/G)													
Acid volatile sulfide, SEM	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.568 L
AVSSEM (UMOL/G)													
Cadmium, SEM	0.0014 L	NA	NA	NA	NA	NA	0.0019 J	NA	1.00E-03 J	0.00112 B	0.00201	0.00159	7.10E-04 J
Copper, SEM	0.14 L	NA	NA	NA	NA	NA	0.0911 J	NA	0.1	0.0398	0.113	0.0955	0.131
Lead, SEM	0.059 L	NA	NA	NA	NA	NA	0.0334 J	NA	0.068	0.0166	0.0623	0.0458	0.0463
Mercury, SEM	1.00E-04	NA	NA	NA	NA	NA	0 B	NA	2.20E-05 J	6.25E-06 J	1.35E-05 L	3.11E-05 J	2.50E-05 U
Nickel, SEM	0.65 L	NA	NA	NA	NA	NA	0.205 J	NA	0.33 B	0.0927	0.295	0.331	0.295
Silver, SEM	0.0016 L	NA	NA	NA	NA	NA	1.00E-04 UL	NA	9.70E-04 J	0.0012 U	0.00141 U	0.00152 U	8.09E-04 J
Wet Chemistry													
% Solids (pct)	74.8	NA	77.9	NA	NA	NA	70	NA	NA	80	NA	NA	NA
Carbon (ug/g)	NA	NA	NA	NA	NA	NA	46,000 K	NA	NA	NA	NA	NA	NA
pH (ph)	8.4	7.2	6.75	6.82 J	7.48 J	7.48	7.2	7.2	7.2	6.65	6.94 J	7.73 J	7.61
Total organic carbon (TOC) (mg/kg)	10,400	2,440	18,900	14,300 L	6,450	7,010 K	NA	7,580 B	3,610 B	8,690	12,600 L	27,500	11,900 K
Grain Size (PCT)													
Coarse Gravel (%)	NA	NA	0	NA	NA	0 U	NA	NA	NA	0	NA	NA	0 U
Coarse Sand (%)	5.1	0.8	2.6	1	NA	3.5	0.2	6.8	5.2	2.5	4.1	NA	1.9
Fine gravel (%)	NA	NA	0.2	NA	NA	2.7	NA	NA	NA	7.8	NA	NA	7.2
Fine Sand (%)	13.3	39.4	24.6	42.2	NA	34.7	77	11.1	30.8	44.7	21.8	NA	54.3
Fines (%)	2.1	0.1	0.2	0.5	NA	3.3	1.9	1.2	5	0.3	0.3	NA	20.8
Gravel (%)	2.4	0.4	NA	0.4	NA	NA	0	0.7	19.8	NA	42.2	NA	NA
GS03 Sieve 3" (75 mm)	100	100	NA	100	NA	NA	100	100	100	NA	100	NA	NA
GS05 Sieve 2" (50 mm)	100	100	NA	100	NA	NA	100	100	100	NA	100	NA	NA
GS06 Sieve 1.5" (37.5 mm)	100	100	NA	100	NA	NA	100	100	100	NA	100	NA	NA
GS07 Sieve 1" (25.0 mm)	100	100	NA	100	NA	NA	100	100	100	NA	100	NA	NA
GRAINSIZE (PCT/P)													
GS07 Sieve 1" (25.0 mm)	NA	NA	NA	NA	100	NA	NA	NA	NA	NA	NA	97	NA
GRAINSIZE (PCT)													
GS08 Sieve 0.75" (19.0 mm)	100	100	NA	100	NA	NA	100	100	100	NA	100	NA	NA
GRAINSIZE (PCT/P)													
GS08 Sieve 0.75" (19.0 mm)	NA	NA	NA	NA	100	NA	NA	NA	NA	NA	NA	75	NA

Station ID	1SD-4A/1SW-4A						1SD-5/1SW-5						
Sample ID	AS01-SD04A-R15	AS01-SD04A-R16	AS01-SD04A-R17	AS01-SD04A-R18	AS01-SD04A-R19	AS01-SD04A-R20	AS01-SD05-R14	AS01-SD05A-R16	AS01-SD05-R16	AS01-SD05-R17	AS01-SD05-R18	AS01-SD05-R19	AS01-SD05-R20
Sample Date	10/08/08	07/16/09	04/19/10	07/07/11	10/04/11	08/29/12	08/12/08	07/15/09	07/15/09	04/19/10	07/06/11	10/04/11	08/28/12
Chemical Name													
GS09 Sieve 0.5" (12.5 mm)	NA	NA	NA	NA	100	NA	NA	NA	NA	NA	NA	69	NA
GRAINSIZE (PCT)													
GS10 Sieve 0.375" (9.5 mm)	100	100	NA	100	NA	NA	100	100	91.1	NA	65.6	NA	NA
Medium Sand (%)	77	59.3	72.4	55.9	NA	55.8	20.9	80.2	39.1	44.7	31.6	NA	15.8
Sand (%)	NA	NA	NA	99.1	NA	NA	NA	NA	NA	NA	57.5	NA	NA
Sieve No. 004 (4.75 mm)	97.6	99.6	NA	99.6	NA	NA	100	99.3	80.2	NA	57.8	NA	NA
GRAINSIZE (PCT/P)													
Sieve No. 004 (4.75 mm)	NA	NA	NA	NA	100	NA	NA	NA	NA	NA	NA	56	NA
GRAINSIZE (PCT)													
Sieve No. 010 (2.00 mm)	92.5	98.8	NA	98.6	NA	NA	99.8	92.6	75	NA	53.7	NA	NA
GRAINSIZE (PCT/P)													
Sieve No. 010 (2.00 mm)	NA	NA	NA	NA	99	NA	NA	NA	NA	NA	NA	49	NA
GRAINSIZE (PCT)													
Sieve No. 020 (850 um)	63.7	90.2	NA	90.9	NA	NA	97.2	72	65.3	NA	47.1	NA	NA
Sieve No. 040 (425 um)	15.5	39.5	NA	42.7	NA	NA	78.9	12.4	35.8	NA	22.1	NA	NA
GRAINSIZE (PCT/P)													
Sieve No. 040 (425 um)	NA	NA	NA	NA	13	NA	NA	NA	NA	NA	NA	11	NA
GRAINSIZE (PCT)													
Sieve No. 060 (250 um)	5.2	3.8	NA	1.3	NA	NA	16.8	1.7	10.8	NA	4.2	NA	NA
Sieve No. 100 (150 um)	3	0.7	NA	NA	NA	NA	3.6	1.4	5.9	NA	NA	NA	NA
GRAINSIZE (PCT/P)													
Sieve No. 100 (150 um)	NA	NA	NA	NA	2	NA	NA	NA	NA	NA	NA	3	NA
GRAINSIZE (PCT)													
Sieve No. 140 (106 um)	3.5	1.2	NA	NA	NA	NA	5.6	1.4	6.8	NA	NA	NA	NA
Sieve No. 200 (75 um)	2.1	0.1	NA	0.5	NA	NA	1.9	1.2	5	NA	0.3	NA	NA
GRAINSIZE (PCT/P)													
Sieve No. 200 (75 um)	NA	NA	NA	NA	2	NA	NA	NA	NA	NA	NA	3	NA

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Notes:

Shading indicates detections
NA - Not analyzed
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
R - Unreliable Result
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
MG/KG - Milligrams per kilogram
PCT - Percent
PH - pH units
UG/G - Micrograms per gram
UG/KG - Micrograms per kilogram
UMOL/G - Micromoles per gram

Station ID	1SD-5A/1SW-5A				1SD-5C/1SW-5C						
Sample ID	AS01-SD05A-R17	AS01-SD05A-R18	AS01-SD05A-R19	AS01-SD05A-R20	AS01-SD05C-R14	AS01-SD05C-R15	AS01-SD05C-R16	AS01-SD05C-R17	AS01-SD05C-R18	AS01-SD05C-R19	AS01-SD05C-R20
Sample Date	04/19/10	07/06/11	10/04/11	08/28/12	08/12/08	10/07/08	07/15/09	04/19/10	07/06/11	10/04/11	08/28/12
Chemical Name											
Volatile Organic Compounds (UG/KG)											
1,1-Dichloroethene	6.4 U	0.634 U	3.03 U	2.58 U	7 U	7.2 U	7.8 U	6.33 U	0.685 U	3.28 U	2.46 U
1,2-Dichloroethene (total)	NA	NA	NA	NA	8 U	NA	NA	NA	NA	NA	NA
2-Butanone	6.4 U	3.17 U	6.06 U	6.46 U	41 U	7.2 U	7.8 U	6.33 U	3.43 U	6.56 U	6.14 U
Acetone	25.6 U	6.34 U	12.1 UJ	12.9 U	46 U	29 U	31 U	25.3 U	6.85 U	7.6 B	12.3 U
cis-1,2-Dichloroethene	6.4 U	0.634 U	3.03 U	1.29 U	8 U	7.2 U	7.8 U	6.33 U	3.15 J	3.28 U	1.23 U
Methylene chloride	6.4 U	1.27 U	6.06 U	2.58 U	42	7.2 U	7.8 U	6.33 U	1.37 U	6.56 U	2.46 U
Tetrachloroethene	6.4 U	0.634 U	3.03 U	1.29 U	8 U	7.2 U	7.8 U	6.33 U	0.685 U	3.28 U	1.23 U
Toluene	6.4 U	0.634 U	3.03 U	1.29 U	7 U	7.2 U	7.8 U	6.33 U	0.685 U	3.28 U	0.651 J
trans-1,2-Dichloroethene	6.4 U	0.634 U	3.03 U	1.29 U	10 U	7.2 U	7.8 U	6.33 U	0.685 U	3.28 U	1.23 U
Trichloroethene	6.4 U	0.634 U	3.03 U	1.29 U	8 U	7.2 U	7.8 U	6.33 U	1.68 J	3.28 U	1.23 U
Vinyl chloride	6.4 U	1.27 U	3.03 UJ	2.58 U	7 U	7.2 U	7.8 U	6.33 U	1.37 U	3.28 UJ	2.46 U
Semivolatile Organic Compounds (UG/KG)											
1,1-Biphenyl	245 U	101 U	209 U	208 U	480 U	480 U	510 U	249 U	103 U	221 U	199 U
2,4-Dinitrotoluene	245 U	101 U	209 U	208 U	480 U	480 U	510 U	249 U	103 U	221 U	199 U
2,6-Dinitrotoluene	245 U	101 U	209 U	208 U	480 U	480 U	510 U	249 U	103 U	221 U	199 U
2-Chloronaphthalene	245 U	101 U	209 U	208 U	480 U	97 U	100 U	249 U	103 U	221 U	199 U
2-Methylnaphthalene	245 U	101 U	209 U	208 U	480 U	97 U	51 J	249 U	103 U	221 U	199 U
2-Methylphenol	245 U	101 U	209 U	208 U	880 U	480 U	510 U	249 U	103 U	221 U	199 U
2-Nitroaniline	1,230 U	505 U	833 U	1,040 U	1,200 U	2,500 U	2,700 U	1,240 U	517 U	884 U	994 U
2-Nitrophenol	245 U	101 U	209 U	208 U	740 U	480 U	510 U	249 U	103 U	221 U	199 U
3,3'-Dichlorobenzidine	491 U	202 U	209 U	418 U	510 U	480 U	510 U	498 U	207 U	221 U	398 U
3-Nitroaniline	1,230 U	505 U	833 U	1,040 U	1,200 U	2,500 U	2,700 U	1,240 U	517 U	884 U	994 U
4,6-Dinitro-2-methylphenol	1,230 U	505 U	2,090 U	1,040 U	1,500 U	2,500 U	2,700 U	1,240 U	517 U	2,210 U	994 U
4-Bromophenyl-phenylether	245 U	101 U	209 U	208 U	480 U	480 U	510 U	249 U	103 U	221 U	199 U
4-Chloro-3-methylphenol	245 U	101 U	209 U	208 U	720 U	480 U	510 U	249 U	103 U	221 U	199 U
4-Chloroaniline	245 U	101 U	209 U	208 U	520 U	480 U	510 U	249 U	103 U	221 U	199 U
4-Methylphenol	NA	NA	209 U	NA	NA	480 U	27 J	NA	NA	221 U	NA
Acenaphthylene	245 U	101 U	209 U	208 U	480 U	97 U	100 U	249 U	103 U	221 U	199 U
Acetophenone	245 U	101 U	209 U	208 U	780 U	480 U	510 U	249 U	103 U	221 U	199 U
Anthracene	245 U	101 U	209 U	208 U	480 U	97 U	24 J	249 U	103 U	221 U	199 U
Benzaldehyde	245 U	101 R	209 U	208 U	540 UL	480 U	610	249 U	103 R	221 U	199 U
Benzo(a)anthracene	245 U	101 U	209 U	208 U	240 J	76 J	63 J	249 U	103 U	221 U	199 U
Benzo(a)pyrene	245 U	101 U	209 U	208 U	480 U	43 J	53 J	249 U	103 U	221 U	199 U
Benzo(b)fluoranthene	245 U	101 U	209 U	208 U	590 U	200	59 J	249 U	103 U	221 U	199 U
Benzo(g,h,i)perylene	245 U	101 U	209 U	208 U	480 U	250	57 J	249 U	103 U	221 U	199 U
Benzo(k)fluoranthene	245 U	101 U	209 U	208 U	170 J	97 U	30 J	249 U	103 U	221 U	199 U
bis(2-Chloroethyl)ether	245 U	101 U	209 U	208 U	480 U	97 U	100 U	249 U	103 U	221 U	199 U
bis(2-Ethylhexyl)phthalate	245 U	101 U	209 U	208 U	480 U	98 J	510 U	249 U	103 U	221 U	199 U
Butylbenzylphthalate	245 U	101 U	209 U	208 U	480 U	480 U	510 U	249 U	103 U	221 U	199 U
Caprolactam	245 U	101 U	209 U	208 UJ	640 U	2,500 U	270 J	249 U	103 U	221 U	199 UJ
Carbazole	245 U	101 U	209 U	208 U	490 U	97 U	100 U	249 U	103 U	221 U	199 U
Chrysene	245 U	101 U	209 U	208 U	260 J	130	87 J	249 U	103 U	221 U	199 U
Dibenz(a,h)anthracene	245 U	101 U	209 U	208 U	560 U	97 U	100 U	249 U	103 U	221 U	199 U
SVOA (PG/G)											
Dibenzofuran	NA	NA	NA	NA	480,000 U	480,000 U	NA	NA	NA	NA	NA
SVOA (UG/KG)											
Dibenzofuran	245 U	101 U	209 U	208 U	NA	NA	510 U	249 U	103 U	221 U	199 U
Diethylphthalate	245 U	101 U	209 U	208 U	480 U	480 U	29 J	249 U	103 U	221 U	199 U
Di-n-octylphthalate	245 U	101 U	209 U	208 U	920 U	480 U	510 U	249 U	103 U	221 U	199 U
Fluoranthene	245 U	101 U	209 U	208 U	710	190	130	249 U	103 U	141 J	199 U
Fluorene	245 U	101 U	209 U	208 U	480 U	97 U	100 U	249 U	103 U	221 U	199 U
Indeno(1,2,3-cd)pyrene	245 U	101 U	209 U	208 U	540 U	270	37 J	249 U	103 U	221 U	199 U
Isophorone	245 U	101 U	209 U	208 U	480 U	480 U	510 U	249 U	103 U	221 U	199 U
Naphthalene	245 U	101 U	209 U	208 U	480 U	97 U	35 J	249 U	103 U	221 U	199 U
n-Nitroso-di-n-propylamine	245 U	101 U	209 U	208 U	480 U	97 U	100 U	249 U	103 U	221 U	199 U
Phenanthrene	245 U	101 U	209 U	208 U	480 U	58 J	150	249 U	103 U	221 U	199 U
Pyrene	245 U	101 U	209 U	208 U	710	91 J	110	249 U	103 U	149 J	199 U

CTO-WE13
ABL, Site 1
Validated Sediment Raw Analytical Results
2008-2012 LTM

Station ID	1SD-5A/1SW-5A				1SD-5C/1SW-5C						
Sample ID	AS01-SD05A-R17	AS01-SD05A-R18	AS01-SD05A-R19	AS01-SD05A-R20	AS01-SD05C-R14	AS01-SD05C-R15	AS01-SD05C-R16	AS01-SD05C-R17	AS01-SD05C-R18	AS01-SD05C-R19	AS01-SD05C-R20
Sample Date	04/19/10	07/06/11	10/04/11	08/28/12	08/12/08	10/07/08	07/15/09	04/19/10	07/06/11	10/04/11	08/28/12
Chemical Name											
Total Metals (MG/KG)											
Aluminum	3,160	3,600	4,010	3,320	6,130	4,500	5,050	2,680	3,450	4,200	4,250
Antimony	0.897 U	0.548 L	2.59 R	9.24 UL	0.33 U	0.43 L	0.58 B	0.94 U	0.579 L	2.69 R	9.34 UL
Arsenic	8.98	9.05	7.41	8.39 L	10.9	9.1	12	6.49	8.03	7.65	9.91 L
Barium	31.4	35.9	50.5	37.1 L	47.5	51	60.5	30.1	33.2	65.9	40.6 L
Beryllium	1.28	1.2	1.24 L	0.849 L	1.4	1.6	1.7	1.05	1.14	1.36 L	1.25 L
Cadmium	0.449 U	0.237 UL	0.647 U	0.462 U	0.42 J	0.45 J	0.77 U	0.0564 J	0.254 UL	0.672 U	0.468 U
Calcium	801	1,180	995 J	2,370	1,210	2,320	2,210	839	1,110	1,040 J	2,010
Chromium	12.1	8.95	10.6	7.02 L	14.2	11.2	12.8	8.89	8.93	11.5	7.69 L
Cobalt	30.5	29.4	29.5 L	20.6 L	35.4	34.5	37.1	25.6	25.4	28.1 L	38.6 L
Copper	19.8	17.4	16.8	18.9 L	18.2	20.2	23.3	17.3	16.3	17.2	20.5 L
Cyanide	0.681 U	0.327 U	0.322 R	0.632 U	0.7 U	1.2 L	0.78 U	0.631 U	0.31 U	0.341 R	0.62 U
Iron	42,500	33,300	32,800	26,800 J	33,100	31,600	36,700	28,700	33,400	37,700	42,500 J
Lead	19.8	18.9 L	17	14.7 L	20.7	24.2	24.3	16.5	17.8 L	17.8	23.1 L
Magnesium	447	583	592 K	319 L	652	564 J	652 J	446	470	602 K	644 L
Manganese	731	901	825	740	400	473	511	641	410	1,110	1,210
Mercury	0.0181 J	0.0293 J	0.0215 J	0.0131 J	0.04 J	0.062	0.091	0.0135 J	0.0238 J	0.0356 J	0.0296 J
Nickel	56.6	64.3	58.7 L	36.1 L	70.7	67.9	68.6	46.9	48.5	59.1 L	64 L
Potassium	223	258	556 K	425 L	963	441 L	672 J	204	245	535 K	273 L
Selenium	0.758 J	2.37 U	1.62 U	4.62 UL	0.43 U	1.1 J	0.45 J	0.696 J	2.54 U	1.68 U	4.68 UL
Silver	0.449 U	0.367 J	0.647 U	1.85 U	0.11 U	0.13 B	0.22 J	0.47 U	0.254 U	0.672 U	1.87 U
Sodium	26.2	32.9	970 U	97.5	125	133 J	48.9 J	30.4	37.2	1,010 U	69.6 B
Thallium	1.43 J	11.9 R	1.37 L	23.2 R	0.22 U	2.2 U	0.67 J	1.34 J	12.7 R	1.89 L	23.4 R
Vanadium	17.3	15.3	15.5	11.9 L	17.4	14	19.1	14.1	13.9	16.1	18 L
Zinc	159	160	154	86.1 L	173	195 L	180	140	145	149	196 L
Acid Volatile Sulfide/Simultaneously Extractable Metals (UMOL/G)											
Zinc, SEM	NA	NA	NA	NA	0.993 J	1.8 L	1.2	0.327	1.23	1.08	0.791
AVSSEM (UMOL/G)											
Acid volatile sulfide, SEM	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0681 L
AVSSEM (UMOL/G)											
Cadmium, SEM	NA	NA	NA	NA	0.0024 J	0.0027 L	0.0022	5.65E-04 B	0.0027	0.00201	9.36E-04 J
Copper, SEM	NA	NA	NA	NA	0.105 J	0.17 L	0.16	0.0391	0.188	2.72	0.0743
Lead, SEM	NA	NA	NA	NA	0.0476 J	0.14 L	0.068	0.0202	0.0645	0.0614	0.0342
Mercury, SEM	NA	NA	NA	NA	0 B	0	1.90E-05 J	1.30E-05 U	3.19E-05 UL	2.40E-05 J	1.58E-05 B
Nickel, SEM	NA	NA	NA	NA	0.274 J	0.74 L	0.42 B	0.0836	0.398	5.25	0.305
Silver, SEM	NA	NA	NA	NA	2.00E-04 J	0.0012 L	8.70E-04 J	0.0012 U	0.00148 U	0.00834 U	9.71E-04 J
Wet Chemistry											
% Solids (pct)	76.2	NA	NA	NA	69	69	NA	76.3	NA	NA	NA
Carbon (ug/g)	NA	NA	NA	NA	23,000	NA	NA	NA	NA	NA	NA
pH (ph)	6.76	6.82 J	7.04 J	7.9	7.1	7.4	7.2	6.84	7.2 J	7.4 J	8.41
Total organic carbon (TOC) (mg/kg)	4,230	8,780 L	8,440	39,400 K	NA	29,200	7,740 B	22,900	21,400 L	6,160	7,890 K
Grain Size (PCT)											
Coarse Gravel (%)	0	NA	NA	0 U	NA	NA	NA	0	NA	NA	0 U
Coarse Sand (%)	0.6	0.1	NA	19.2	1.3	3	0.5	0	1	NA	1.6
Fine gravel (%)	3.1	NA	NA	6.2	NA	NA	NA	0	NA	NA	2.1
Fine Sand (%)	52.9	32.7	NA	7.1	84.7	55.5	67	74.8	73	NA	22.9
Fines (%)	0.3	0.5	NA	1.7	2.3	3.6	17.4	0.5	2.8	NA	1.8
Gravel (%)	NA	0.1	NA	NA	1.3	27.9	3.4	NA	1.7	NA	NA
GS03 Sieve 3" (75 mm)	NA	100	NA	NA	100	100	100	NA	100	NA	NA
GS05 Sieve 2" (50 mm)	NA	100	NA	NA	100	100	100	NA	100	NA	NA
GS06 Sieve 1.5" (37.5 mm)	NA	100	NA	NA	100	100	100	NA	100	NA	NA
GS07 Sieve 1" (25.0 mm)	NA	100	NA	NA	100	100	100	NA	100	NA	NA
GRAINSIZE (PCT/P)											
GS07 Sieve 1" (25.0 mm)	NA	NA	100	NA	NA	NA	NA	NA	NA	100	NA
GRAINSIZE (PCT)											
GS08 Sieve 0.75" (19.0 mm)	NA	100	NA	NA	100	100	100	NA	100	NA	NA
GRAINSIZE (PCT/P)											
GS08 Sieve 0.75" (19.0 mm)	NA	NA	100	NA	NA	NA	NA	NA	NA	100	NA

Station ID	1SD-5A/1SW-5A				1SD-5C/1SW-5C						
Sample ID	AS01-SD05A-R17	AS01-SD05A-R18	AS01-SD05A-R19	AS01-SD05A-R20	AS01-SD05C-R14	AS01-SD05C-R15	AS01-SD05C-R16	AS01-SD05C-R17	AS01-SD05C-R18	AS01-SD05C-R19	AS01-SD05C-R20
Sample Date	04/19/10	07/06/11	10/04/11	08/28/12	08/12/08	10/07/08	07/15/09	04/19/10	07/06/11	10/04/11	08/28/12
Chemical Name											
GS09 Sieve 0.5" (12.5 mm)	NA	NA	100	NA	NA	NA	NA	NA	NA	100	NA
GRAINSIZE (PCT)											
GS10 Sieve 0.375" (9.5 mm)	NA	100	NA	NA	99.4	76.1	97	NA	99	NA	NA
Medium Sand (%)	43.1	66.6	NA	65.8	10.3	9.9	11.7	24.7	21.4	NA	71.6
Sand (%)	NA	99.4	NA	NA	NA	NA	NA	NA	95.4	NA	NA
Sieve No. 004 (4.75 mm)	NA	99.9	NA	NA	98.7	72.1	96.6	NA	98.3	NA	NA
GRAINSIZE (PCT/P)											
Sieve No. 004 (4.75 mm)	NA	NA	100	NA	NA	NA	NA	NA	NA	100	NA
GRAINSIZE (PCT)											
Sieve No. 010 (2.00 mm)	NA	99.8	NA	NA	97.4	69	96.1	NA	97.3	NA	NA
GRAINSIZE (PCT/P)											
Sieve No. 010 (2.00 mm)	NA	NA	100	NA	NA	NA	NA	NA	NA	100	NA
GRAINSIZE (PCT)											
Sieve No. 020 (850 um)	NA	95.6	NA	NA	95.8	67.2	93.4	NA	94.8	NA	NA
Sieve No. 040 (425 um)	NA	33.2	NA	NA	87	59.1	84.4	NA	75.9	NA	NA
GRAINSIZE (PCT/P)											
Sieve No. 040 (425 um)	NA	NA	20	NA	NA	NA	NA	NA	NA	60	NA
GRAINSIZE (PCT)											
Sieve No. 060 (250 um)	NA	3.2	NA	NA	27.4	22.3	35.9	NA	21.3	NA	NA
Sieve No. 100 (150 um)	NA	NA	NA	NA	4.9	7.2	19.7	NA	NA	NA	NA
GRAINSIZE (PCT/P)											
Sieve No. 100 (150 um)	NA	NA	2	NA	NA	NA	NA	NA	NA	2	NA
GRAINSIZE (PCT)											
Sieve No. 140 (106 um)	NA	NA	NA	NA	8.3	9.6	22.6	NA	NA	NA	NA
Sieve No. 200 (75 um)	NA	0.5	NA	NA	2.3	3.6	17.4	NA	2.9	NA	NA
GRAINSIZE (PCT/P)											
Sieve No. 200 (75 um)	NA	NA	2	NA	NA	NA	NA	NA	NA	1	NA

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Notes:

Shading indicates detections
NA - Not analyzed
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
R - Unreliable Result
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
MG/KG - Milligrams per kilogram
PCT - Percent
PH - pH units
UG/G - Micrograms per gram
UG/KG - Micrograms per kilogram
UMOL/G - Micromoles per gram

CTO-WE13
ABL, Site 1
Validated Sediment Raw Analytical Results
2008-2012 LTM

Station ID	1SD-7/1SW-7								1SD-7A				
Sample ID	AS01-SD07-R14	AS01-SD07-R15	AS01-1SD07-R16	AS01-SD07-R17	AS01-SD07-R18	AS01-SD07-R19	AS01-SD07P-R19	AS01-SD07-R20	AS01-SD07A-R15	AS01-1SD07A-R16	AS01-SD07A-R17	AS01-SD07A-R18	AS01-SD07A-R20
Sample Date	08/14/08	10/09/08	07/17/09	04/20/10	07/07/11	10/05/11	10/05/11	08/29/12	10/09/08	07/17/09	04/20/10	07/07/11	08/29/12
Chemical Name													
Volatile Organic Compounds (UG/KG)													
1,1-Dichloroethene	7 U	7.1 U	7.9 U	6.95 U	6.21 J	207 U	183 U	2.76 U	6.6 U	6.3 U	6.13 U	0.654 U	2.44 U
1,2-Dichloroethene (total)	8 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone	38 U	7.1 U	7.9 U	6.95 U	17 U	413 U	365 U	6.9 U	6.6 U	6.3 U	6.13 U	3.27 U	6.12 U
Acetone	44 U	17 B	32 U	27.8 U	33.9 U	826 UJ	730 UJ	13.8 U	26 U	25 U	24.5 U	6.54 U	12.2 U
cis-1,2-Dichloroethene	8 U	7.1 U	7.9 U	6.95 U	5,900	15,500	10,800	40.8	6.6 U	6.3 U	6.13 U	0.654 U	1.22 U
Methylene chloride	33 U	7.1 U	7.9 U	6.95 U	6.79 U	413 U	365 U	2.76 U	6.6 U	6.3 U	6.13 U	1.31 U	2.44 U
Tetrachloroethene	8 U	7.1 U	7.9 U	6.95 U	3.39 U	207 U	183 U	1.38 U	6.6 U	6.3 U	6.13 U	0.654 U	1.22 U
Toluene	7 U	7.1 U	7.9 U	6.95 U	3.39 U	207 U	183 U	1.38 U	6.6 U	6.3 U	6.13 U	0.654 U	1.22 U
trans-1,2-Dichloroethene	9 U	7.1 U	7.9 U	6.95 U	128	569	487	1.53 J	6.6 U	6.3 U	6.13 U	0.654 U	1.22 U
Trichloroethene	8 U	7.1 U	7.9 U	6.95 U	103	10,100	5,480	0.739 J	6.6 U	6.3 U	6.13 U	0.654 U	1.22 U
Vinyl chloride	7 U	7.1 U	7.9 U	6.95 U	287	207 UJ	183 UJ	13.8	6.6 U	6.3 U	6.13 U	1.31 U	2.44 U
Semivolatile Organic Compounds (UG/KG)													
1,1-Biphenyl	440 U	470 U	24 J	271 U	118 UL	277 R	252 U	260 U	67 J	28 J	245 U	110 U	192 U
2,4-Dinitrotoluene	440 U	470 U	520 U	271 U	118 UL	277 R	252 U	260 U	430 U	410 U	245 U	110 U	192 U
2,6-Dinitrotoluene	440 U	470 U	520 U	271 U	118 UL	277 R	252 U	260 U	430 U	410 U	245 U	110 U	192 U
2-Chloronaphthalene	440 U	96 U	110 U	271 U	118 UL	277 R	252 U	260 U	88 U	84 U	245 U	110 U	192 U
2-Methylnaphthalene	440 U	96 U	51 J	271 U	118 UL	277 R	252 U	170 J	92	42 J	245 U	110 U	192 U
2-Methylphenol	810 U	470 U	520 U	271 U	118 U	277 R	252 U	260 U	430 U	410 U	245 U	110 UL	192 U
2-Nitroaniline	1,100 U	2,400 U	2,700 U	1,360 U	588 UL	1,100 R	1,010 U	1,300 U	2,200 U	2,100 U	1,220 U	551 U	960 U
2-Nitrophenol	680 U	470 U	520 U	271 U	118 U	277 R	252 U	260 U	430 U	410 U	245 U	110 UL	192 U
3,3'-Dichlorobenzidine	470 U	470 U	520 U	543 U	235 UL	277 R	252 R	520 U	430 U	410 U	490 U	221 U	384 U
3-Nitroaniline	1,100 U	2,400 U	2,700 U	1,360 U	588 UL	1,100 R	1,010 U	1,300 U	2,200 U	2,100 U	1,220 U	551 U	960 U
4,6-Dinitro-2-methylphenol	1,400 U	2,400 U	2,700 U	1,360 U	588 U	2,770 R	2,520 U	1,300 U	2,200 U	2,100 U	1,220 U	551 UL	960 U
4-Bromophenyl-phenylether	440 U	470 U	520 U	271 U	118 UL	277 R	252 U	260 U	430 U	410 U	245 U	110 U	192 U
4-Chloro-3-methylphenol	660 U	470 U	520 U	271 U	118 U	277 R	252 U	260 U	430 U	410 U	245 U	110 UL	192 U
4-Chloroaniline	480 U	470 U	520 U	271 U	118 UL	277 R	252 U	260 U	430 U	410 U	245 U	110 U	192 U
4-Methylphenol	NA	470 U	29 J	NA	NA	277 R	252 U	NA	430 U	410 U	NA	NA	NA
Acenaphthylene	440 U	96 U	110 U	271 U	118 UL	277 R	252 U	260 U	38 J	84 U	245 U	110 U	192 U
Acetophenone	720 U	470 U	520 U	271 U	118 UL	277 R	252 U	260 U	430 U	410 U	245 U	110 U	192 U
Anthracene	440 U	120	55 J	271 U	118 UL	277 R	252 U	260 U	88 U	84 U	245 U	110 U	192 U
Benzaldehyde	490 UL	470 U	620	271 U	118 R	277 R	252 U	260 U	430 U	410 U	245 U	110 R	192 U
Benzo(a)anthracene	440 U	430	100 J	271 U	118 UL	277 R	252 U	260 U	140	84 U	245 U	110 U	192 U
Benzo(a)pyrene	440 U	240	81 J	271 U	118 UL	277 R	252 U	260 U	160	84 U	245 U	110 U	192 U
Benzo(b)fluoranthene	550 U	490	100 J	271 U	118 UL	277 R	252 U	260 U	240	84 U	245 U	110 U	192 U
Benzo(g,h,i)perylene	440 U	300	68 J	271 U	118 UL	277 R	252 U	260 U	280	84 U	245 U	110 U	192 U
Benzo(k)fluoranthene	440 U	96 U	53 J	271 U	118 UL	277 R	252 U	260 U	88 U	84 U	245 U	110 U	192 U
bis(2-Chloroethyl)ether	440 U	96 U	110 U	271 U	118 UL	277 R	252 U	260 U	88 U	84 U	245 U	110 U	192 U
bis(2-Ethylhexyl)phthalate	440 U	69 B	69 J	271 U	118 UL	277 R	252 U	260 U	430 U	410 U	245 U	110 U	192 U
Butylbenzylphthalate	440 U	470 U	520 U	271 U	118 UL	277 R	252 U	260 U	430 U	410 U	245 U	110 U	192 U
Caprolactam	580 U	2,400 U	270 J	271 U	118 UL	277 R	252 U	260 UJ	2,200 U	210 J	245 U	110 U	192 UJ
Carbazole	450 U	160	38 J	271 U	118 UL	277 R	252 U	260 U	42 J	84 U	245 U	110 U	192 U
Chrysene	440 U	430	140	271 U	118 UL	277 R	252 U	260 U	210	84 U	245 U	110 U	192 U
Dibenz(a,h)anthracene	520 U	270	110 U	271 U	118 UL	277 R	252 U	260 U	240	84 U	245 U	110 U	192 U
SVOA (PG/G)													
Dibenzofuran	440,000 U	470,000 U	NA	NA	NA	NA	NA	NA	46,000 J	NA	NA	NA	NA
SVOA (UG/KG)													
Dibenzofuran	NA	NA	43 J	271 U	118 UL	277 R	252 U	260 U	NA	410 U	245 U	110 U	192 U
Diethylphthalate	440 U	470 U	520 U	271 U	118 UL	277 R	252 U	260 U	430 U	410 U	245 U	110 U	192 U
Di-n-octylphthalate	850 U	470 U	520 U	271 U	118 UL	277 R	252 U	260 U	430 U	410 U	245 U	110 U	192 U
Fluoranthene	440 U	1,300	250	271 U	118 UL	277 R	252 U	260 U	710	84 U	245 U	110 U	192 U
Fluorene	440 U	96 U	29 J	271 U	118 UL	277 R	252 U	260 U	88 U	84 U	245 U	110 U	192 U
Indeno(1,2,3-cd)pyrene	490 U	330	51 J	271 U	118 UL	277 R	252 U	260 U	310	84 U	245 U	110 U	192 U
Isophorone	440 U	470 U	520 U	271 U	118 UL	277 R	252 U	260 U	430 U	410 U	245 U	110 U	192 U
Naphthalene	440 U	96 U	78 J	271 U	118 UL	277 R	252 U	260 U	65 J	18 J	245 U	110 U	192 U
n-Nitroso-di-n-propylamine	440 U	96 U	110 U	271 U	118 UL	277 R	252 U	260 U	88 U	84 U	245 U	110 U	192 U
Phenanthrene	440 U	700	300	271 U	118 UL	277 R	252 U	216 J	650	33 J	245 U	110 U	192 U
Pyrene	440 U	700	220	271 U	118 UL	277 R	252 U	260 U	370	84 U	245 U	110 U	192 U

CTO-WE13
ABL, Site 1
Validated Sediment Raw Analytical Results
2008-2012 LTM

Station ID	1SD-7/1SW-7								1SD-7A				
Sample ID	AS01-SD07-R14	AS01-SD07-R15	AS01-1SD07-R16	AS01-SD07-R17	AS01-SD07-R18	AS01-SD07-R19	AS01-SD07P-R19	AS01-SD07-R20	AS01-SD07A-R15	AS01-1SD07A-R16	AS01-SD07A-R17	AS01-SD07A-R18	AS01-SD07A-R20
Sample Date	08/14/08	10/09/08	07/17/09	04/20/10	07/07/11	10/05/11	10/05/11	08/29/12	10/09/08	07/17/09	04/20/10	07/07/11	08/29/12
Chemical Name													
Total Metals (MG/KG)													
Aluminum	5,100	4,720	5,970	3,410	4,600	9,270 J	3,950 J	4,040	5,270	5,230	3,380	3,160	2,780
Antimony	0.26 U	0.36 L	0.85 J	1.04 U	0.493 UL	3.23 R	2.99 R	10.2 UL	0.2 L	0.48 B	0.956 U	0.762 L	8.8 UL
Arsenic	8.6	8.7	10.3	6.49	5.05	11.9 J	6.1 J	9.48 L	8.4	11.4	8.33	7.16	6.86 L
Barium	58.1	71.2	92.2	40.3 L	36.7	173 J	55.5 J	43.1 L	73.2	65	40.8 L	29.9	35 L
Beryllium	1.2	1.6	1.8	1.03	1.71	3.06 L	1.36 L	1.41 K	1.5	1.4	1.12	1.06	1.13 K
Cadmium	0.38 J	0.36 J	0.8 U	0.136 J	0.246 UL	0.945 J	0.748 U	0.508 U	0.25 J	1.3 U	0.478 U	0.222 UL	0.44 U
Calcium	893	1,450	2,430	1,250	1,270	5,450 J	1,300 J	1,090	2,040	1,830	1,370	1,770	1,140
Chromium	12.3	10.7	13.9	9.24	7.46	13.3 J	9.16 J	9.45 L	11.8	17.8	8.73	7.18	5.58 L
Cobalt	27.4	34.1	43.8	25.9	18.7	33.9 L	14.1 L	31 L	33.5	31.8	29.9	26.8	26.4 L
Copper	23.6	22.5	28.5	18.9	33.8	62.8 J	22.6 J	19.1 L	17.9	19.7	18.7	16.1	13.8 L
Cyanide	0.65 U	0.81 L	0.79 U	0.702 U	0.334 U	0.41 R	0.389 R	0.668 U	0.59 L	0.63 U	0.645 U	0.322 U	0.608 U
Iron	30,000	27,100	38,000	26,400	18,000	28,200	28,500	40,200 J	32,900	43,200	28,200	28,200	31,200 J
Lead	20	21.5	41.1	19	17.4 L	62.2 J	21.4 J	32 L	24	17.4	17	34.5 L	19.4 L
Magnesium	635	652 J	902	555 L	467	1,200 K	522 K	526 L	743	708	636 L	482	452 L
Manganese	306	280	1,160	733	377	390 J	219 J	620	1,290	952	796	827	1,130
Mercury	0.08	0.07	0.083	0.0395 J	0.045 J	0.185	0.255	0.046 J	0.057	0.019 J	0.0282 J	0.0171 J	0.0152 J
Nickel	54.8	64.6	77.4	47	45	107 L	36.7 L	61.7 L	61.4	52.1	56.7	63.8	45.9 L
Potassium	775	501 L	762 J	234	241	644 K	415 K	342 L	634 L	622 J	231	191	162 L
Selenium	0.34 U	0.84 J	0.52 J	0.996 J	2.46 U	2.02 U	1.87 U	5.08 UL	0.77 J	1.3 U	1.17 J	2.22 U	4.4 UL
Silver	0.08 U	0.25 B	0.58 J	0.519 U	0.246 U	0.808 U	0.748 U	2.04 U	0.36 J	0.29 J	0.478 U	0.277 J	1.76 U
Sodium	55.3 J	96 J	805 U	26.9	36.2	1,210 U	1,120 U	51.8 B	135 J	74.4 J	39.6	34.4	37.4 B
Thallium	0.18 U	2.1 U	0.76 J	1.29 J	12.3 R	1.62 UL	1.5 UL	25.4 R	1.9 U	0.82 J	1.46 J	11.1 R	22 R
Vanadium	15.5	14.2	20.9	13.7	10.1	15	11	18.6 L	16.9	24.6	13.9	12.3	12.7 L
Zinc	147	178 L	388	131	208	327 J	139 J	165 L	160 L	137	143	163	131 L
Acid Volatile Sulfide/Simultaneously Extractable Metals (UMOL/G)													
Zinc, SEM	0.621 J	1.5 L	1.6	1.2	3.6	0.987 J	0.604 J	1.11	1.4 J	NA	NA	NA	NA
AVSSEM (UMOL/G)													
Acid volatile sulfide, SEM	NA	NA	NA	NA	NA	NA	NA	1.59 L	NA	NA	NA	NA	NA
AVSSEM (UMOL/G)													
Cadmium, SEM	0.0018 J	0.0024 L	0.0022	0.00438	0.00844	0.00409	0.00361	0.00124 J	0.0033 J	NA	NA	NA	NA
Copper, SEM	0.111 J	0.16 L	1.3	0.184	0.919	0.329	0.378	0.1	0.14 J	NA	NA	NA	NA
Lead, SEM	0.0413 J	0.066 L	0.15	0.0823	0.125	0.091	0.0943	0.0548	0.059 J	NA	NA	NA	NA
Mercury, SEM	0 B	0	9.80E-05 U	1.50E-05 UL	4.16E-05 UL	5.32E-05	2.11E-05 J	2.40E-05 U	0 K	NA	NA	NA	NA
Nickel, SEM	0.152 J	0.58 L	0.45 B	0.369	0.591	0.253 J	0.635 J	0.395	0.69 J	NA	NA	NA	NA
Silver, SEM	1.00E-03 J	0.0012 L	0.0023	0.0034 U	0.00193 U	0.00194 U	0.00204 U	0.00107 J	0.0027	NA	NA	NA	NA
Wet Chemistry													
% Solids (pct)	75	70.1	NA	70.9	NA	NA	NA	NA	76.2	NA	76	NA	NA
Carbon (ug/g)	23,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
pH (ph)	7.2	7	7.3	6.82	6.75 J	7.02 J	7 J	7.01	7	7.5	6.89	6.82 J	7.08
Total organic carbon (TOC) (mg/kg)	NA	19,200	59,900	12,000 J	18,800 L	47,300 J	26,600 J	31,200 K	11,600	20,100	10,000 J	5,420 L	9,270 K
Grain Size (PCT)													
Coarse Gravel (%)	NA	NA	NA	0 U	NA	NA	NA	0 U	NA	NA	0 U	NA	0 U
Coarse Sand (%)	0	0.1	0.7	0.2	3.6	NA	NA	3.7	7.6	4.6	2.2	1	11.7
Fine gravel (%)	NA	NA	NA	0.3	NA	NA	NA	10.8	NA	NA	0.4	NA	19
Fine Sand (%)	91.2	89.8	75.1	88.7	66.7	NA	NA	54	19.4	9.4	31.3	10.7	10.3
Fines (%)	4.9	4.2	18.3	9.4	5.4	NA	NA	3	0.4	1.8	1.4	0.5	0.8
Gravel (%)	0	3.5	0.3	NA	9.9	NA	NA	NA	1.5	0.2	NA	0.1	NA
GS03 Sieve 3" (75 mm)	100	100	100	NA	100	NA	NA	NA	100	100	NA	100	NA
GS05 Sieve 2" (50 mm)	100	100	100	NA	100	NA	NA	NA	100	100	NA	100	NA
GS06 Sieve 1.5" (37.5 mm)	100	100	100	NA	100	NA	NA	NA	100	100	NA	100	NA
GS07 Sieve 1" (25.0 mm)	100	100	100	NA	100	NA	NA	NA	100	100	NA	100	NA
GRAINSIZE (PCT/P)													
GS07 Sieve 1" (25.0 mm)	NA	NA	NA	NA	NA	100	NA	NA	NA	NA	NA	NA	NA
GRAINSIZE (PCT)													
GS08 Sieve 0.75" (19.0 mm)	100	100	100	NA	100	NA	NA	NA	100	100	NA	100	NA
GRAINSIZE (PCT/P)													
GS08 Sieve 0.75" (19.0 mm)	NA	NA	NA	NA	NA	100	NA	NA	NA	NA	NA	NA	NA

Station ID	1SD-7/1SW-7								1SD-7A				
Sample ID	AS01-SD07-R14	AS01-SD07-R15	AS01-1SD07-R16	AS01-SD07-R17	AS01-SD07-R18	AS01-SD07-R19	AS01-SD07P-R19	AS01-SD07-R20	AS01-SD07A-R15	AS01-1SD07A-R16	AS01-SD07A-R17	AS01-SD07A-R18	AS01-SD07A-R20
Sample Date	08/14/08	10/09/08	07/17/09	04/20/10	07/07/11	10/05/11	10/05/11	08/29/12	10/09/08	07/17/09	04/20/10	07/07/11	08/29/12
Chemical Name													
GS09 Sieve 0.5" (12.5 mm)	NA	NA	NA	NA	NA	100	NA	NA	NA	NA	NA	NA	NA
GRAINSIZE (PCT)													
GS10 Sieve 0.375" (9.5 mm)	100	96.6	100	NA	97	NA	NA	NA	100	100	NA	100	NA
Medium Sand (%)	3.8	2.4	5.7	1.4	14.1	NA	NA	28.5	71.2	84	64.7	87.7	58.2
Sand (%)	NA	NA	NA	NA	84.4	NA	NA	NA	NA	NA	NA	99.4	NA
Sieve No. 004 (4.75 mm)	100	96.5	99.7	NA	90.1	NA	NA	NA	98.5	99.8	NA	99.9	NA
GRAINSIZE (PCT/P)													
Sieve No. 004 (4.75 mm)	NA	NA	NA	NA	NA	99	NA	NA	NA	NA	NA	NA	NA
GRAINSIZE (PCT)													
Sieve No. 010 (2.00 mm)	100	96.4	99	NA	86.5	NA	NA	NA	90.9	95.2	NA	98.9	NA
GRAINSIZE (PCT/P)													
Sieve No. 010 (2.00 mm)	NA	NA	NA	NA	NA	98	NA	NA	NA	NA	NA	NA	NA
GRAINSIZE (PCT)													
Sieve No. 020 (850 um)	99.8	96	97.5	NA	82.4	NA	NA	NA	62.7	52.9	NA	74.8	NA
Sieve No. 040 (425 um)	96.2	94	93.3	NA	72.4	NA	NA	NA	19.8	11.2	NA	11.2	NA
GRAINSIZE (PCT/P)													
Sieve No. 040 (425 um)	NA	NA	NA	NA	NA	86	NA	NA	NA	NA	NA	NA	NA
GRAINSIZE (PCT)													
Sieve No. 060 (250 um)	52.8	61.9	63.3	NA	35	NA	NA	NA	3.2	4.1	NA	2.1	NA
Sieve No. 100 (150 um)	16.4	18.4	29.8	NA	NA	NA	NA	NA	0.9	2.3	NA	NA	NA
GRAINSIZE (PCT/P)													
Sieve No. 100 (150 um)	NA	NA	NA	NA	NA	27	NA	NA	NA	NA	NA	NA	NA
GRAINSIZE (PCT)													
Sieve No. 140 (106 um)	24.4	29.9	39.4	NA	NA	NA	NA	NA	1.3	2.8	NA	NA	NA
Sieve No. 200 (75 um)	4.9	4.2	18.3	NA	5.7	NA	NA	NA	0.4	1.8	NA	0.5	NA
GRAINSIZE (PCT/P)													
Sieve No. 200 (75 um)	NA	NA	NA	NA	NA	18	NA	NA	NA	NA	NA	NA	NA

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Notes:

Shading indicates detections
NA - Not analyzed
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
R - Unreliable Result
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
MG/KG - Milligrams per kilogram
PCT - Percent
PH - pH units
UG/G - Micrograms per gram
UG/KG - Micrograms per kilogram
UMOL/G - Micromoles per gram

Station ID	1SD-9/1SW-9								1SD-9A			
Sample ID	AS01-SD09-R14	AS01-SD09-R15	AS01-SD09P-R16	AS01-SD09-R16	AS01-SD09-R17	AS01-SD09-R18	AS01-SD09-R19	AS01-SD09-R20	AS01-SD09A-R15	AS01-SD09A-R16	AS01-SD09A-R17	AS01-SD09A-R18
Sample Date	08/13/08	10/08/08	07/16/09	07/16/09	04/19/10	07/07/11	10/04/11	08/28/12	10/08/08	07/16/09	04/19/10	07/07/11
Chemical Name												
Volatile Organic Compounds (UG/KG)												
1,1-Dichloroethene	7 U	17 U	9.8 U	9.1 U	6.27 U	0.679 U	4.59 U	2.84 UJ	6.8 U	6.7 U	6.14 U	0.654 U
1,2-Dichloroethene (total)	9 UL	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone	42 UL	17 U	9.8 U	9.1 U	6.27 U	3.4 U	9.19 U	7.08 UJ	6.8 U	6.7 U	6.14 U	3.27 U
Acetone	47 U	35 J	39 U	29 J	25.1 U	6.79 U	23.9 B	14.2 UJ	27 U	27 U	24.5 U	6.54 U
cis-1,2-Dichloroethene	9 UL	17 U	9.8 U	9.1 U	2.98 J	2.52 J	7.17 J	1.42 UJ	6.8 U	2.4 J	6.14 U	1.03 J
Methylene chloride	36 U	8.5 B	9.8 U	10	6.27 U	1.36 U	9.19 U	2.84 UJ	6.8 U	6.7 U	6.14 U	1.31 U
Tetrachloroethene	9 UL	17 U	9.8 U	9.1 U	6.27 U	0.679 U	4.59 U	1.42 UJ	6.8 U	6.7 U	6.14 U	0.654 U
Toluene	7 UL	17 U	9.8 U	9.1 U	6.27 U	0.679 U	4.59 U	1.42 UJ	6.8 U	6.7 U	6.14 U	0.654 U
trans-1,2-Dichloroethene	10 UL	17 U	9.8 U	9.1 U	6.27 U	0.679 U	4.59 U	1.42 UJ	6.8 U	6.7 U	6.14 U	0.654 U
Trichloroethene	9 UL	17 U	9.8 U	9.1 U	1.34 J	0.898 J	4.59 U	1.42 UJ	6.8 U	6.7 U	6.14 U	1.29 J
Vinyl chloride	7 U	17 U	9.8 U	9.1 U	6.27 U	1.36 U	2.83 J	2.84 UJ	6.8 U	6.7 U	6.14 U	1.31 U
Semivolatile Organic Compounds (UG/KG)												
1,1-Biphenyl	450 U	77 J	1,300 U	1,200 U	248 U	115 U	308 U	212 U	450 U	440 U	234 U	110 U
2,4-Dinitrotoluene	450 U	1,100 U	1,300 U	1,200 U	248 U	115 U	308 U	212 U	450 U	440 U	234 U	110 U
2,6-Dinitrotoluene	450 U	1,100 U	1,300 U	1,200 U	248 U	115 U	308 U	212 U	450 U	440 U	234 U	110 U
2-Chloronaphthalene	450 U	230 U	260 U	240 U	248 U	115 U	308 U	212 U	91 U	89 U	234 U	110 U
2-Methylnaphthalene	450 U	160 J	260 U	240 U	248 U	115 U	308 U	212 U	27 J	89 U	234 U	110 U
2-Methylphenol	840 U	1,100 U	1,300 U	1,200 U	248 U	115 U	308 U	212 U	450 U	440 U	234 U	110 U
2-Nitroaniline	1,100 U	5,800 U	6,600 U	6,100 U	1,240 U	574 U	1,230 U	1,060 U	2,300 U	2,300 U	1,170 U	552 U
2-Nitrophenol	700 U	1,100 U	1,300 U	1,200 U	248 U	115 U	308 U	212 U	450 U	440 U	234 U	110 U
3,3'-Dichlorobenzidine	480 U	1,100 U	1,300 U	1,200 U	496 U	230 U	308 U	424 U	450 U	440 U	468 U	221 U
3-Nitroaniline	1,100 U	5,800 U	6,600 U	6,100 U	1,240 U	574 U	1,230 U	1,060 U	2,300 U	2,300 U	1,170 U	552 U
4,6-Dinitro-2-methylphenol	1,400 U	5,800 U	6,600 U	6,100 U	1,240 U	574 U	3,080 U	1,060 U	2,300 U	2,300 U	1,170 U	552 U
4-Bromophenyl-phenylether	450 U	1,100 U	1,300 U	1,200 U	248 U	115 U	308 U	212 U	450 U	440 U	234 U	110 U
4-Chloro-3-methylphenol	690 U	1,100 U	1,300 U	1,200 U	248 U	115 U	308 U	212 U	450 U	440 U	234 U	110 U
4-Chloroaniline	490 U	1,100 U	1,300 U	1,200 U	248 U	115 U	308 U	212 U	450 U	440 U	234 U	110 U
4-Methylphenol	NA	190 J	85 J	130 J	NA	NA	308 U	NA	450 U	440 U	NA	NA
Acenaphthylene	450 U	230 U	260 U	240 U	248 U	115 U	308 U	212 U	91 U	89 U	234 U	110 U
Acetophenone	740 U	1,100 U	1,300 U	1,200 U	248 U	115 U	308 U	212 U	450 U	440 U	234 U	110 U
Anthracene	450 U	230 U	260 U	47 J	248 U	115 U	308 U	212 U	91 U	89 U	234 U	110 U
Benzaldehyde	510 UL	980 J	1,500	1,400	248 U	115 R	308 U	212 U	450 U	440 U	234 U	110 R
Benzo(a)anthracene	450 U	110 J	140 J	120 J	248 U	115 U	308 U	212 U	39 J	34 J	234 U	110 U
Benzo(a)pyrene	450 U	78 J	100 J	110 J	248 U	115 U	308 U	212 U	28 J	28 J	234 U	110 U
Benzo(b)fluoranthene	560 U	190 J	140 J	140 J	248 U	115 U	197 J	212 U	56 J	29 J	234 U	110 U
Benzo(g,h,i)perylene	450 U	530	97 J	77 J	248 U	115 U	308 U	212 U	210	17 J	234 U	110 U
Benzo(k)fluoranthene	450 U	230 U	55 J	54 J	248 U	115 U	308 U	212 U	91 U	89 U	234 U	110 U
bis(2-Chloroethyl)ether	450 U	230 U	260 U	240 U	248 U	115 U	308 U	212 U	91 U	89 U	234 U	110 U
bis(2-Ethylhexyl)phthalate	450 U	270 J	140 J	1,200 U	248 U	115 U	308 U	212 U	450 U	440 U	234 U	110 U
Butylbenzylphthalate	450 U	1,100 U	1,300 U	1,200 U	248 U	115 U	308 U	212 U	450 U	440 U	234 U	110 U
Caprolactam	600 U	5,800 U	660 J	570 J	248 U	115 U	308 U	212 UJ	2,300 U	230 J	234 U	110 U
Carbazole	470 U	230 U	260 U	240 U	248 U	115 U	308 U	212 U	91 U	13 J	234 U	110 U
Chrysene	450 U	160 J	190 J	180 J	248 U	115 U	166 J	212 U	46 J	46 J	234 U	110 U
Dibenz(a,h)anthracene	540 U	230 U	260 U	240 U	248 U	115 U	308 U	212 U	91 U	89 U	234 U	110 U
SVOA (PG/G)												
Dibenzofuran	450,000 U	1,100,000 U	NA	NA	NA	NA	NA	NA	450,000 U	NA	NA	NA
SVOA (UG/KG)												
Dibenzofuran	NA	NA	1,300 U	1,200 U	248 U	115 U	308 U	212 U	NA	440 U	234 U	110 U
Diethylphthalate	450 U	1,100 U	1,300 U	76 J	248 U	115 U	308 U	212 U	450 U	440 U	234 U	110 U
Di-n-octylphthalate	880 U	1,100 U	1,300 U	1,200 U	248 U	115 U	308 U	212 U	450 U	440 U	234 U	110 U
Fluoranthene	450 U	200 J	220 J	230 J	248 U	170 J	239 J	212 U	78 J	66 J	234 U	110 U
Fluorene	450 U	230 U	260 U	36 J	248 U	115 U	308 U	212 U	91 U	89 U	234 U	110 U
Indeno(1,2,3-cd)pyrene	510 U	600	61 J	75 J	248 U	115 U	308 U	212 U	230	17 J	234 U	110 U
Isophorone	450 U	1,100 U	1,300 U	1,200 U	248 U	115 U	308 U	212 U	450 U	440 U	234 U	110 U
Naphthalene	450 U	230 U	260 U	240 U	248 U	115 U	308 U	212 U	91 U	89 U	234 U	110 U
n-Nitroso-di-n-propylamine	450 U	230 U	260 U	240 U	248 U	115 U	308 U	212 U	91 U	89 U	234 U	110 U
Phenanthrene	450 U	210 J	160 J	250	248 U	162 J	165 J	212 U	45 J	76 J	234 U	110 U
Pyrene	450 U	140 J	180 J	200 J	248 U	143 J	218 J	212 U	42 J	51 J	234 U	110 U

CTO-WE13
ABL, Site 1
Validated Sediment Raw Analytical Results
2008-2012 LTM

Station ID	1SD-9/1SW-9								1SD-9A			
Sample ID	AS01-SD09-R14	AS01-SD09-R15	AS01-SD09P-R16	AS01-SD09-R16	AS01-SD09-R17	AS01-SD09-R18	AS01-SD09-R19	AS01-SD09-R20	AS01-SD09A-R15	AS01-SD09A-R16	AS01-SD09A-R17	AS01-SD09A-R18
Sample Date	08/13/08	10/08/08	07/16/09	07/16/09	04/19/10	07/07/11	10/04/11	08/28/12	10/08/08	07/16/09	04/19/10	07/07/11
Chemical Name												
Total Metals (MG/KG)												
Aluminum	5,140	14,000	7,360	6,840	2,780	3,590	6,120	4,010	3,820	4,860	2,900	3,320
Antimony	0.32 U	3.3 UL	0.65 B	0.62 B	0.974 U	0.631 L	3.54 R	9.72 UL	0.3 L	0.58 B	0.962 U	0.507 L
Arsenic	9.8	14.4	10.4	9.9	6.65	7.81	8.54	7.81 L	8	12.4	7.5	6.55
Barium	58.1	172	111	103	26.9	49.4	76.3	37.3 L	55.9	54.2	28.2	36.9
Beryllium	1.2	4.1	2	1.9	1.03	1.13	1.63 L	0.996 L	1.4	1.6	1.21	1.03
Cadmium	0.44 J	2	1 U	0.93 U	0.253 J	0.255 UL	0.885 U	0.486 U	0.31 J	1.4 U	0.481 U	0.241 UL
Calcium	917	5,180	3,670	3,030	641	1,030	2,050 J	877	982	1,050	791	1,290
Chromium	12.9	18.7	13.5	13.4	9.68	8.53	12.9	6.12 L	11.2	15	10.8	6.66
Cobalt	35.1	110	49.3	43.5	23.4	28.8	37 L	33.2 L	32.8	34.1	29.9	27
Copper	17.5	50.5	30.2	27.2	15.5	18	24.1	17.3 L	18.2	21.2	18.8	16.7
Cyanide	0.7 U	6.4 L	0.98 U	1.5	0.677 U	0.326 U	0.474 R	0.658 U	2 L	0.67 U	0.66 U	0.358 U
Iron	29,900	41,000	33,100	33,500	30,500	28,300	33,500	32,500 J	28,100	48,500	32,100	24,500
Lead	19.9	36.6	28.5	26.3	40.5	20.6 L	25.3	22.5 L	20.4	22.1	19	17.4 L
Magnesium	624	1,820	1,330	1,140	431	513	940 K	468 L	543 J	624 J	460	529
Manganese	720	2,900	623	554	508	812	679	726	811	870	670	857
Mercury	0.05	0.16	0.1	0.095	0.0337 J	0.0314 J	0.0921	0.0389 J	0.042 B	0.031 J	0.0285 J	0.0331 J
Nickel	66.7	191	83.6	76.6	45.6	60.2	70.7 L	44.1 L	63.1	68.5	56.2	62
Potassium	756	989 L	870 J	829 J	194	290	707 K	239 L	439 L	660 J	202	202
Selenium	0.45 J	2.5 J	0.68 J	0.58 J	0.678 J	2.55 U	2.21 U	4.86 UL	0.89 J	1.4 U	0.739 J	2.41 U
Silver	0.1 U	0.96 B	0.38 J	0.35 J	0.487 U	0.33 J	0.885 U	1.94 U	0.31 J	0.31 J	0.481 U	0.314 J
Sodium	53.6 J	375 J	147 J	148 J	17.4 J	44.7	1,330 U	33.3 B	124 J	686 U	21.4 J	44.2
Thallium	0.22 U	5 U	3 U	0.7 J	1.11 J	12.7 R	1.77 UL	24.4 R	2 U	1 J	1.39 J	12.1 R
Vanadium	15.5	25.7	26.4	23.8	14.3	13.3	19.5	13.5 L	14.4	21	16	11.5
Zinc	164	540 L	226	207	124	154	202	167 L	165 L	183	157	146
Acid Volatile Sulfide/Simultaneously Extractable Metals (UMOL/G)												
Zinc, SEM	0.492 J	4.7 J	1.6	1.6	0.301	1.47	1.73	0.746	1.5 L	NA	NA	NA
AVSSEM (UMOL/G)												
Acid volatile sulfide, SEM	NA	NA	NA	NA	NA	NA	NA	0.56 L	NA	NA	NA	NA
AVSSEM (UMOL/G)												
Cadmium, SEM	0.0013 J	0.011 J	0.0034	0.0033	6.81E-04 B	0.00386	0.00513 J	0.00112 J	0.002 L	NA	NA	NA
Copper, SEM	0.053 J	0.44 J	0.2	0.21	0.039	0.2	0.234	0.0964	0.14 L	NA	NA	NA
Lead, SEM	0.0195 J	0.12 J	0.073	0.082	0.0154	0.0947	0.0788	0.0444	0.076 L	NA	NA	NA
Mercury, SEM	0 B	1.00E-04	1.20E-04 U	1.10E-04 U	1.30E-05 U	3.18E-05 UL	3.77E-05 U	2.50E-05 U	1.00E-04	NA	NA	NA
Nickel, SEM	0.106 J	1.9 J	0.53 B	0.53 B	0.0772	0.445	0.59	0.204	0.71 L	NA	NA	NA
Silver, SEM	1.00E-04 UL	0.0053 L	6.50E-04 J	7.80E-04 J	0.0012 U	0.00148 U	0.0181 U	6.61E-04 J	0.0016 L	NA	NA	NA
Wet Chemistry												
% Solids (pct)	73	29.2	NA	NA	76.8	NA	NA	NA	73.8	NA	78.7	NA
Carbon (ug/g)	23,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
pH (ph)	7	12	6.8	6.8	6.57	6.68 J	7.43 J	7.03	8	7.2	6.55	6.84 J
Total organic carbon (TOC) (mg/kg)	NA	74,600	63,800	46,100	6,410	34,400 L	69,100	11,000 K	7,600	1,760 J	5,990	10,900 L
Grain Size (PCT)												
Coarse Gravel (%)	NA	NA	NA	NA	0	NA	NA	0 U	NA	NA	0	NA
Coarse Sand (%)	0.1	2	0.1	0.2	0	0.7	NA	0.1	0.3	0.1	0.2	0.2
Fine gravel (%)	NA	NA	NA	NA	0	NA	NA	0 U	NA	NA	0	NA
Fine Sand (%)	91.8	56.9	61.4	64	84.3	79.2	NA	93.3	64.2	82.1	49.3	73.9
Fines (%)	2.5	38.4	35.8	33.5	1.7	3.8	NA	5.8	2	2	0.7	0.9
Gravel (%)	0.1	0	0.1	0.1	NA	0.1	NA	NA	0	0	NA	0.5
GS03 Sieve 3" (75 mm)	100	100	100	100	NA	100	NA	NA	100	100	NA	100
GS05 Sieve 2" (50 mm)	100	100	100	100	NA	100	NA	NA	100	100	NA	100
GS06 Sieve 1.5" (37.5 mm)	100	100	100	100	NA	100	NA	NA	100	100	NA	100
GS07 Sieve 1" (25.0 mm)	100	100	100	100	NA	100	NA	NA	100	100	NA	100
GRAINSIZE (PCT/P)												
GS07 Sieve 1" (25.0 mm)	NA	NA	NA	NA	NA	NA	100	NA	NA	NA	NA	NA
GRAINSIZE (PCT)												
GS08 Sieve 0.75" (19.0 mm)	100	100	100	100	NA	100	NA	NA	100	100	NA	100
GRAINSIZE (PCT/P)												
GS08 Sieve 0.75" (19.0 mm)	NA	NA	NA	NA	NA	NA	100	NA	NA	NA	NA	NA

Station ID	1SD-9/1SW-9								1SD-9A			
Sample ID	AS01-SD09-R14	AS01-SD09-R15	AS01-SD09P-R16	AS01-SD09-R16	AS01-SD09-R17	AS01-SD09-R18	AS01-SD09-R19	AS01-SD09-R20	AS01-SD09A-R15	AS01-SD09A-R16	AS01-SD09A-R17	AS01-SD09A-R18
Sample Date	08/13/08	10/08/08	07/16/09	07/16/09	04/19/10	07/07/11	10/04/11	08/28/12	10/08/08	07/16/09	04/19/10	07/07/11
Chemical Name												
GS09 Sieve 0.5" (12.5 mm)	NA	NA	NA	NA	NA	NA	100	NA	NA	NA	NA	NA
GRAINSIZE (PCT)												
GS10 Sieve 0.375" (9.5 mm)	100	100	100	100	NA	100	NA	NA	100	100	NA	100
Medium Sand (%)	5.6	2.7	2.5	2.2	14	16.1	NA	0.8	33.6	15.7	49.8	24.5
Sand (%)	NA	NA	NA	NA	NA	96	NA	NA	NA	NA	NA	98.6
Sieve No. 004 (4.75 mm)	99.9	100	99.9	99.9	NA	99.9	NA	NA	100	100	NA	99.5
GRAINSIZE (PCT/P)												
Sieve No. 004 (4.75 mm)	NA	NA	NA	NA	NA	NA	100	NA	NA	NA	NA	NA
GRAINSIZE (PCT)												
Sieve No. 010 (2.00 mm)	99.9	98	99.8	99.8	NA	99.2	NA	NA	99.7	99.9	NA	99.3
GRAINSIZE (PCT/P)												
Sieve No. 010 (2.00 mm)	NA	NA	NA	NA	NA	NA	100	NA	NA	NA	NA	NA
GRAINSIZE (PCT)												
Sieve No. 020 (850 um)	99.3	97.9	99.3	99.4	NA	95.5	NA	NA	97.8	99.3	NA	97.5
Sieve No. 040 (425 um)	94.3	95.3	97.3	97.6	NA	83.1	NA	NA	66.1	84.2	NA	74.8
GRAINSIZE (PCT/P)												
Sieve No. 040 (425 um)	NA	NA	NA	NA	NA	NA	97	NA	NA	NA	NA	NA
GRAINSIZE (PCT)												
Sieve No. 060 (250 um)	37.6	82.6	82	80.7	NA	29.1	NA	NA	10.5	14.4	NA	15.7
Sieve No. 100 (150 um)	6.6	56.2	55.8	52.8	NA	NA	NA	NA	3.2	2.8	NA	NA
GRAINSIZE (PCT/P)												
Sieve No. 100 (150 um)	NA	NA	NA	NA	NA	NA	19	NA	NA	NA	NA	NA
GRAINSIZE (PCT)												
Sieve No. 140 (106 um)	11.5	64.2	65.4	62.7	NA	NA	NA	NA	3.9	3.9	NA	NA
Sieve No. 200 (75 um)	2.5	38.4	35.8	33.5	NA	3.9	NA	NA	2	2	NA	0.9
GRAINSIZE (PCT/P)												
Sieve No. 200 (75 um)	NA	NA	NA	NA	NA	NA	10	NA	NA	NA	NA	NA

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Notes:

Shading indicates detections
NA - Not analyzed
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
R - Unreliable Result
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
MG/KG - Milligrams per kilogram
PCT - Percent
PH - pH units
UG/G - Micrograms per gram
UG/KG - Micrograms per kilogram
UMOL/G - Micromoles per gram

CTO-WE13
ABL, Site 1
Validated Sediment Raw Analytical Results
2008-2012 LTM

Station ID	1SD-9A	
Sample ID	AS01-SD09A-R19	AS01-SD09A-R20
Sample Date	10/04/11	08/28/12
Chemical Name		
Volatile Organic Compounds (UG/KG)		
1,1-Dichloroethene	4.64 U	2.6 U
1,2-Dichloroethene (total)	NA	NA
2-Butanone	4.86 J	6.52 U
Acetone	40.3 B	13 U
cis-1,2-Dichloroethene	15.5	1.3 U
Methylene chloride	9.28 U	2.6 U
Tetrachloroethene	4.64 U	1.3 U
Toluene	4.64 U	1.3 U
trans-1,2-Dichloroethene	4.64 U	1.3 U
Trichloroethene	4.64 U	1.3 U
Vinyl chloride	9.41 J	2.6 U
Semivolatile Organic Compounds (UG/KG)		
1,1-Biphenyl	304 U	214 U
2,4-Dinitrotoluene	304 U	214 U
2,6-Dinitrotoluene	304 U	214 U
2-Chloronaphthalene	304 U	214 U
2-Methylnaphthalene	304 U	214 U
2-Methylphenol	304 U	214 U
2-Nitroaniline	1,210 U	1,070 U
2-Nitrophenol	304 U	214 U
3,3'-Dichlorobenzidine	304 U	430 U
3-Nitroaniline	1,210 U	1,070 U
4,6-Dinitro-2-methylphenol	3,040 U	1,070 U
4-Bromophenyl-phenylether	304 U	214 U
4-Chloro-3-methylphenol	304 U	214 U
4-Chloroaniline	304 U	214 U
4-Methylphenol	304 U	NA
Acenaphthylene	304 U	214 U
Acetophenone	304 U	214 U
Anthracene	304 U	214 U
Benzaldehyde	304 U	214 U
Benzo(a)anthracene	205 J	214 U
Benzo(a)pyrene	304 U	214 U
Benzo(b)fluoranthene	202 J	214 U
Benzo(g,h,i)perylene	304 U	214 U
Benzo(k)fluoranthene	304 U	214 U
bis(2-Chloroethyl)ether	304 U	214 U
bis(2-Ethylhexyl)phthalate	304 U	214 U
Butylbenzylphthalate	304 U	214 U
Caprolactam	304 U	214 UJ
Carbazole	304 U	214 U
Chrysene	207 J	214 U
Dibenz(a,h)anthracene	304 U	214 U
SVOA (PG/G)		
Dibenzofuran	NA	NA
SVOA (UG/KG)		
Dibenzofuran	304 U	214 U
Diethylphthalate	304 U	214 U
Di-n-octylphthalate	304 U	214 U
Fluoranthene	266 J	214 U
Fluorene	304 U	214 U
Indeno(1,2,3-cd)pyrene	304 U	214 U
Isophorone	304 U	214 U
Naphthalene	304 U	214 U

Station ID	1SD-9A	
Sample ID	AS01-SD09A-R19	AS01-SD09A-R20
Sample Date	10/04/11	08/28/12
Chemical Name		
n-Nitroso-di-n-propylamine	304 U	214 U
Phenanthrene	304 U	214 U
Pyrene	261 J	214 U
Total Metals (MG/KG)		
Aluminum	5,730	3,880
Antimony	3.57 R	9.34 UL
Arsenic	6.88	10.2 L
Barium	74.8	42.5 L
Beryllium	1.47 L	1.24 L
Cadmium	0.466 J	0.468 U
Calcium	2,240	826
Chromium	13.4	6.69 L
Cobalt	42.1 L	37.5 L
Copper	24.3	18.8 L
Cyanide	0.467 R	0.65 U
Iron	28,400	40,500 J
Lead	23.1	17.6 L
Magnesium	965 K	433 L
Manganese	1,190	1,270
Mercury	0.107	0.0645 J
Nickel	74.7 L	62.5 L
Potassium	670 K	272 L
Selenium	2.23 U	4.68 UL
Silver	0.894 U	1.87 U
Sodium	1,340 U	46.7 B
Thallium	2 L	23.4 R
Vanadium	17.6	16.9 L
Zinc	202	184 L
Acid Volatile Sulfide/Simultaneously Extractable Metals (UMOL/G)		
Zinc, SEM	NA	NA
AVSSEM (UMOL/G)		
Acid volatile sulfide, SEM	NA	NA
AVSSEM (UMOL/G)		
Cadmium, SEM	NA	NA
Copper, SEM	NA	NA
Lead, SEM	NA	NA
Mercury, SEM	NA	NA
Nickel, SEM	NA	NA
Silver, SEM	NA	NA
Wet Chemistry		
% Solids (pct)	NA	NA
Carbon (ug/g)	NA	NA
pH (ph)	7.82 J	7.65
Total organic carbon (TOC) (mg/kg)	98,400	35,700 K
Grain Size (PCT)		
Coarse Gravel (%)	NA	0 U
Coarse Sand (%)	NA	0.9
Fine gravel (%)	NA	0 U
Fine Sand (%)	NA	28.2
Fines (%)	NA	3.6
Gravel (%)	NA	NA
GS03 Sieve 3" (75 mm)	NA	NA
GS05 Sieve 2" (50 mm)	NA	NA

Station ID	1SD-9A	
Sample ID	AS01-SD09A-R19	AS01-SD09A-R20
Sample Date	10/04/11	08/28/12
Chemical Name		
GS06 Sieve 1.5" (37.5 mm)	NA	NA
GS07 Sieve 1" (25.0 mm)	NA	NA
GRAINSIZE (PCT/P)		
GS07 Sieve 1" (25.0 mm)	97	NA
GRAINSIZE (PCT)		
GS08 Sieve 0.75" (19.0 mm)	NA	NA
GRAINSIZE (PCT/P)		
GS08 Sieve 0.75" (19.0 mm)	97	NA
GS09 Sieve 0.5" (12.5 mm)	97	NA
GRAINSIZE (PCT)		
GS10 Sieve 0.375" (9.5 mm)	NA	NA
Medium Sand (%)	NA	67.3
Sand (%)	NA	NA
Sieve No. 004 (4.75 mm)	NA	NA
GRAINSIZE (PCT/P)		
Sieve No. 004 (4.75 mm)	97	NA
GRAINSIZE (PCT)		
Sieve No. 010 (2.00 mm)	NA	NA
GRAINSIZE (PCT/P)		
Sieve No. 010 (2.00 mm)	97	NA
GRAINSIZE (PCT)		
Sieve No. 020 (850 um)	NA	NA
Sieve No. 040 (425 um)	NA	NA
GRAINSIZE (PCT/P)		
Sieve No. 040 (425 um)	54	NA
GRAINSIZE (PCT)		
Sieve No. 060 (250 um)	NA	NA
Sieve No. 100 (150 um)	NA	NA
GRAINSIZE (PCT/P)		
Sieve No. 100 (150 um)	4	NA
GRAINSIZE (PCT)		
Sieve No. 140 (106 um)	NA	NA
Sieve No. 200 (75 um)	NA	NA
GRAINSIZE (PCT/P)		
Sieve No. 200 (75 um)	3	NA

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Notes:

Shading indicates detections
NA - Not analyzed
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
R - Unreliable Result
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
MG/KG - Milligrams per kilogram
PCT - Percent
PH - pH units
UG/G - Micrograms per gram
UG/KG - Micrograms per kilogram
UMOL/G - Micromoles per gram

CTO-WE13
ABL, Site 1
Validated Surface Water Detected Analytical Results
2008-2012 LTM

Station ID	1SW-7A						1SW-9A						
Sample ID	AS01-SW07AP-R15	AS01-SW07A-R15	AS01-1SW07A-R16	AS01-SW07A-R17	AS01-SW07A-R18	AS01-SW07A-R20	AS01-SW09A-R14	AS01-SW09A-R15	AS01-SW09A-R16	AS01-SW09A-R17	AS01-SW09A-R18	AS01-SW09A-R19	AS01-SW09A-R20
Sample Date	10/09/08	10/09/08	07/17/09	04/20/10	07/07/11	08/29/12	08/13/08	10/08/08	07/16/09	04/19/10	07/07/11	10/04/11	08/28/12
Chemical Name													
Volatile Organic Compounds (UG/L)													
1,4-Dichlorobenzene	5 U	5 U	0.39 L	5 U	0.125 U	0.25 U	1 U	5 U	0.25 J	5 U	0.125 U	0.5 U	0.25 U
Acetone	20 U	20 U	5 UL	3.76 J	2.5 U	5 UJ	4 B	20 U	5 U	10 R	2.5 U	2.86 J	3.64 B
Carbon disulfide	5 U	5 U	1 UL	5 U	0.5 U	1 U	1 U	5 U	1 U	5 U	0.5 U	0.5 U	1 U
Chloroform	5 U	5 U	1 UL	5 U	0.125 U	0.25 U	1 U	5 U	1 U	5 U	0.125 U	0.5 U	0.25 U
Chloromethane	5 U	5 U	1 UL	5 U	0.5 U	1 U	2 U	5 U	1 U	5 U	0.5 U	0.5 U	1 U
cis-1,2-Dichloroethene	5 U	5 U	1 UL	5 U	0.25 U	0.5 U	1 U	5 U	1 U	5 U	0.25 U	0.5 U	0.5 U
Dibromochloromethane	5 U	5 U	1 UL	5 U	0.25 U	0.5 U	1 U	5 U	1 U	5 U	0.25 U	0.5 U	0.5 U
Methylene chloride	5 U	5 U	1 UL	5 U	0.25 U	0.5 U	5 U	5 U	1 U	5 U	0.25 U	1 U	0.5 U
Trichloroethene	5 U	5 U	1 UL	5 U	0.25 U	0.5 U	2 U	5 U	1 U	5 U	0.25 U	0.5 U	0.5 U
Total Metals (UG/L)													
Aluminum	208	195 J	124	381	179	108 J	142 J	205	147	359	160	280	328 B
Antimony	10 U	10 U	0.16 B	1 U	0.5 U	1 U	1.6 U	10 U	0.15 B	1 U	0.5 U	2 U	1 U
Arsenic	10 U	10 U	1 U	1 U	0.526 J	0.9 J	0.98 U	10 U	1 U	1 U	0.5 U	1.5 U	1.03 J
Barium	75.4 J	76.2 J	48.2	50.8	54.9	70.9	66.8	82.6 J	45.2	56	53.2	53	65.6
Beryllium	4 U	4 U	1 U	2 U	1 U	2 U	0.15 U	4 U	1 U	0.543 J	1 U	0.5 U	2 U
Cadmium	5 U	5 U	1 U	0.5 U	0.25 U	0.44 J	0.1 U	5 U	1 U	0.5 U	0.25 U	0.5 U	0.5 U
Calcium	61,000	61,200	44,600	53,000	52,100	69,300	50,600	63,600	44,100	51,200	50,000	51,000	67,000
Chromium	5 U	5 U	4.2	20 U	10 U	20 U	0.68 J	5 U	4.1	2.7 J	10 U	1 U	20 U
Cobalt	1.1 J	50 U	0.5	2.58	0.671 J	0.677 J	0.57 J	50 U	0.64	2.87	0.5 U	2.5 U	0.875 J
Copper	25 U	25 U	1 J	20 U	10 U	20 U	2.5 J	25 U	0.99 J	20 U	10 U	1.79 J	20 U
Iron	172	145	144	295	390	258	172	183	167	314	351	400	481
Lead	10 U	10 U	0.1 J	5 U	2.5 U	1 U	1.2 J	10 U	0.14 J	5 U	2.5 U	0.75 U	1 U
Magnesium	13,800	13,900	13,700	15,400	14,400	16,900	13,100	14,000	13,400	15,300	14,500	13,700	18,000
Manganese	119	117	73.8	231	87.3 K	137	117	154	78.7	298	67.2 K	87.4	157
Mercury	0.024 B	0.017 B	0.2 U	0.2 U	0.1 U	0.2 U	0.02 U	0.019 J	0.2 U	0.2 U	0.1 U	0.2 U	0.2 U
Nickel	6.2 J	5.1 J	4.1	11.3	5.97	5.71 J	4.7 J	5.8 J	4.7	11.9	5.49	6.55	5.92 J
Potassium	3,580 J	3,600 J	3,270	2,720	2,870	5,960	3,650	3,900 J	3,310	2,690	2,860	2,790	5,180
Selenium	10 U	10 U	0.66 J	10 U	5 U	2.49	2.1 U	10 U	0.5 J	10 U	5 U	1.25 U	2.73
Sodium	41,200	43,500	20,100	26,700	27,100	55,300	34,500	40,100	20,700	24,400	26,600	22,100	43,000
Vanadium	2.9 J	1.9 J	8.6	1.53	1.16	0.698 J	0.56 J	1.7 J	7.2	1.25	1	2.5 U	1.06 J
Zinc	8.6 B	7.8 B	3.7 J	8.81 J	10 U	20 U	7.2 B	43.6	4.1 J	12.7 J	10 U	7.76	20 U
Dissolved Metals (UG/L)													
Aluminum, Dissolved	82.8 J	82.6 J	71.8	198	50 U	100 U	77.7 B	107 J	76	138	50 U	91.3	108 B
Arsenic, Dissolved	10 U	10 U	0.46 B	1 U	0.508 J	0.866 J	0.98 U	10 U	1 U	1 U	0.5 U	1.5 U	0.898 J
Barium, Dissolved	74.3 J	72.4 J	46.6	49.3	53.9	69.3	65.1	80.2 J	44.7	54.2	52.8	52.4	62.6
Cadmium, Dissolved	5 U	5 U	1 U	0.5 U	0.25 U	0.5 U	0.1 U	5 U	1 U	0.5 U	0.25 U	0.5 U	0.31 J
Calcium, Dissolved	60,900	60,800	44,000	51,900	52,200	67,900	50,400	64,300	43,100	48,400	49,800	52,200	67,300
Chromium, Dissolved	5 U	5 U	5.1	2.81 J	10 U	20 U	0.54 J	5 U	3.8	2.69 J	10 U	1 U	20 U
Cobalt, Dissolved	50 U	50 U	0.33 J	2.44	0.5 U	1 U	0.4 J	50 U	0.33 J	2.66	0.5 U	2.5 U	1 U
Copper, Dissolved	25 U	25 U	1.1 J	20 U	10 U	20 U	1.9 J	25 U	1.1 J	20 U	10 U	1.39 J	20 U
Iron, Dissolved	100 U	100 U	24.6 J	35.8 J	95.4 J	100 U	32.7 J	37.7 J	24 J	31.1 J	128	29	100 U
Lead, Dissolved	10 U	10 U	1 U	5 U	2.5 U	1 U	1 U	10 U	1 U	5 U	2.5 U	0.75 U	1 U
Magnesium, Dissolved	14,100	13,600	13,400	15,200	14,000	16,700	13,000	14,000	13,200	15,200	14,100	13,900	17,500
Manganese, Dissolved	81.6	81.1	56.4	242	45.7	105	82.3	109	54.7	288	43.1	56.7	135
Mercury, Dissolved	0.021 J	0.016 J	0.2 U	0.2 U	0.1 U	0.2 U	0.02 U	0.2 U	0.2 U	0.2 U	0.1 U	0.2 U	0.2 U
Nickel, Dissolved	5.1 J	5 J	4.2	11.9	6.63	4.93 J	3.8 J	5.6 J	4.3	11.2	6.58	6.13	5.44 J
Potassium, Dissolved	3,470 J	3,460 J	3,260	2,680	2,770	5,870	3,780	3,860 J	3,270	2,630	2,830	2,820	5,100
Selenium, Dissolved	10 U	10 U	0.46 B	10 U	5 UJ	2.83	2.1 U	10 U	0.68 B	10 U	5 UJ	1.25 U	2.88
Silver, Dissolved	5 U	5 U	1 U	1 U	0.5 U	1 U	0.52 U	5 U	1 U	1 U	0.5 U	0.5 U	1 U
Sodium, Dissolved	40,200	41,900	19,100	26,700	27,500	54,800	34,500	39,300	19,600	24,000	27,100	22,400	42,600
Thallium, Dissolved	15 U	15 U	1 U	0.2 U	0.1 U	0.2 U	1.1 U	15 U	1 U	0.2 U	0.1 U	1 U	0.2 U
Vanadium, Dissolved	1.7 B	50 U	6.9	1.21	0.805 J	1 U	0.48 U	50 U	6.7	0.839 J	0.741 J	2.5 U	0.516 J
Zinc, Dissolved	7.1 B	9.3 B	2.8 J	20 U	10 U	286	5.2 B	8.2 B	3.4 J	6.75 J	10 U	3.25 J	20 U

CTO-WE13
ABL, Site 1
Validated Surface Water Detected Analytical Results
2008-2012 LTM

Station ID	1SW-7A						1SW-9A						
Sample ID	AS01-SW07AP-R15	AS01-SW07A-R15	AS01-1SW07A-R16	AS01-SW07A-R17	AS01-SW07A-R18	AS01-SW07A-R20	AS01-SW09A-R14	AS01-SW09A-R15	AS01-SW09A-R16	AS01-SW09A-R17	AS01-SW09A-R18	AS01-SW09A-R19	AS01-SW09A-R20
Sample Date	10/09/08	10/09/08	07/17/09	04/20/10	07/07/11	08/29/12	08/13/08	10/08/08	07/16/09	04/19/10	07/07/11	10/04/11	08/28/12
Chemical Name													
Wet Chemistry													
Hardness (mg/l)	209	210	168	184	192	230	180	216	165	186	180	168	232

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Notes:

Shading indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/L - Milligrams per liter

UG/L - Micrograms per liter

CTO-WE13
ABL, Site 1
Validated Surface Water Detected Analytical Results
2008-2012 LTM

Station ID	1SD-0/1SW-0								1SD-0/1SW-0	1SD-0A/1SW-0A		
Sample ID	AS01-SW00-R14	AS01-SW00-R15	AS01-1SW00P-R16	AS01-1SW00-R16	AS01-SW00-R17	AS01-SW00P-R18	AS01-SW00-R18	AS01-SW00-R19	AS01-SW00-R20	AS01-SW00A-R14	AS01-SW00A-R15	AS01-1SW00A-R16
Sample Date	08/13/08	10/14/08	07/21/09	07/21/09	04/20/10	07/08/11	07/08/11	10/05/11	08/30/12	08/14/08	10/13/08	07/21/09
Chemical Name												
Volatile Organic Compounds (UG/L)												
1,4-Dichlorobenzene	1 U	5 U	0.32 J	0.38 J	5 U	0.125 U	0.125 U	0.5 U	0.25 U	1 U	5 U	0.3 J
Acetone	5 B	20 U	5 U	5 U	3.43 J	2.5 U	2.5 U	5 U	5 R	4 B	20 U	5 U
Carbon disulfide	0.3 K	5 U	1 U	0.35 J	0.585 J	0.5 U	0.5 U	0.5 U	1 U	1 U	5 U	1 U
Chloroform	1 U	5 U	1 U	1 U	5 U	0.125 U	0.125 U	0.5 U	0.25 U	1 U	5 U	1 U
Chloromethane	2 U	5 U	1 U	1 U	5 U	0.5 U	0.5 U	0.5 U	1 U	2 U	5 U	1 U
cis-1,2-Dichloroethene	1 U	5 U	1 U	1 U	5 U	0.25 U	0.25 U	0.5 U	0.5 U	1 U	5 U	1 U
Dibromochloromethane	1 U	5 U	1 U	1 U	5 U	0.25 U	0.25 U	0.5 U	0.5 U	1 U	5 U	1 U
Methylene chloride	5 U	5 U	1 U	1 U	5 U	0.25 U	0.25 U	1 U	0.5 U	5 U	5 U	1 U
Trichloroethene	2 U	5 U	1 U	1 U	5 U	0.25 U	0.25 U	0.5 U	0.5 U	2 U	5 U	1 U
Total Metals (UG/L)												
Aluminum	144 J	186 J	159	158	365	157 J	175 J	241	196 J	136 J	195 J	171
Antimony	1.6 U	10 U	0.2 B	0.24 B	1 U	0.5 U	0.5 U	2 U	1 U	1.6 U	10 U	0.21 B
Arsenic	0.98 U	10 U	1 U	1 U	1 U	0.5 U	0.5 U	1.5 U	1.05 J	0.98 U	10 U	1 U
Barium	60.7	71.4 J	44.7	47	53.7	57.4	60.2	52.2	71.6	61.3	71.5 J	46.9
Beryllium	0.15 U	4 U	1 U	1 U	2 U	1 U	1 U	0.5 U	2 U	0.15 U	4 U	1 U
Cadmium	0.1 U	5 U	1 U	1 U	0.5 U	0.25 U	0.25 U	0.5 U	0.5 U	0.1 U	5 U	1 U
Calcium	45,400	57,100	43,200	45,300	55,500	54,000	57,200	50,200	68,800	50,000	56,900	44,800
Chromium	0.42 J	5 U	4.3 B	3.9 B	20 U	10 U	10 U	1 U	20 U	0.51 J	5 U	3.9 B
Cobalt	0.5 J	50 U	0.55	0.6	3.03	0.549 J	0.612 J	2.5 U	0.713 J	0.44 J	50 U	0.66
Copper	2 J	25 U	0.99 J	0.98 J	6.21 J	10 U	10 U	1.24 J	20 U	2.1 J	25 U	1.5 J
Iron	168	151	174	171	316	361	352	329	236	164	157	194
Lead	1.3 J	10 U	0.15 J	0.15 J	5 U	2.5 U	2.5 U	0.75 U	1 U	1 U	10 U	0.2 J
Magnesium	11,800	13,800	13,500	14,100	15,700	14,000	14,200	13,200	16,300	12,800	13,800	13,800
Manganese	117	114	77.4	77	253	85.1 K	89.3 K	75.1	160	117	121	83.5
Mercury	0.02 U	0.042 J	0.2 U	0.2 U	0.2 U	0.1 U	0.1 U	0.2 U	0.2 U	0.02 U	0.2 U	0.2 U
Nickel	4.8 J	6 J	4.4 J	4.7	12	6.26	6.42	5.8	4.7 J	4.7 J	6.6 J	5.4
Potassium	3,350	3,650 J	6,040	6,390	2,750	2,810	2,890	2,700	5,740	3,510	3,710 J	6,400
Selenium	2.1 U	10 U	1 B	0.72 B	10 U	25 U	25 U	1.25 U	3.18	2.1 U	10 U	0.72 B
Sodium	30,700	49,200	32,600	34,400	27,400	28,000	27,200	21,800	55,200	41,300	46,700	34,400
Vanadium	0.48 U	2.6 J	21.4 J	22.2	1.48	1.26	1.39	2.5 U	0.706 J	0.48 U	2.2 J	22.4
Zinc	9.8 J	8.4 B	4.5 B	6.9	10.3 J	10 U	11.5 J	6.58 K	20 U	6.8 B	9.1 B	10.6
Dissolved Metals (UG/L)												
Aluminum, Dissolved	64.1 J	82.6 J	85.3	87.4	152	50 U	50 U	90.1	98.1 J	89.1 J	70.4 J	80.2
Arsenic, Dissolved	0.98 U	10 U	1 U	1 U	1 U	0.5 U	0.5 U	1.5 U	0.958 J	0.98 U	10 U	1 U
Barium, Dissolved	62.6	68.2 J	50.6	50.8	56.2	56.1	56.7	51.1	69.8	56.6	68.5 J	46.2
Cadmium, Dissolved	0.1 U	5 U	1 U	1 U	0.5 U	0.25 U	0.25 U	0.5 U	0.5 U	0.1 U	5 U	1 U
Calcium, Dissolved	48,200	58,400	44,800	44,500	55,700	53,500	53,500	51,700	68,700	44,200	58,000	44,000
Chromium, Dissolved	0.61 J	5 U	2.8 B	4.9 B	20 U	10 U	10 U	1 U	20 U	0.42 J	5 U	4.6 B
Cobalt, Dissolved	0.25 U	50 U	1	0.99	2.7	0.5 U	0.5 U	2.5 U	1 U	0.25 U	50 U	0.31 J
Copper, Dissolved	2.5 J	25 U	0.93 J	0.96 J	20 U	10 U	10 U	2 U	20 U	2.9 J	25 U	0.86 J
Iron, Dissolved	32 J	100 U	74	75.1	27.7 J	169	149	29.5	100 U	37.6 J	100 U	25.2 J
Lead, Dissolved	1.4 J	10 U	0.12 J	0.15 B	5 U	2.5 U	2.5 U	0.75 U	1 U	1.1 J	10 U	1 U
Magnesium, Dissolved	12,600	13,700	13,800	13,600	15,600	14,200	13,500	13,400	16,000	11,300	13,800	13,800
Manganese, Dissolved	83.2	78	247	248	262	60	64.9	56.7	129	72.5	69.4	54
Mercury, Dissolved	0.02 U	0.02 J	0.2 U	0.2 U	0.2 U	0.1 U	0.1 U	0.2 U	0.2 U	0.02 U	0.021 J	0.2 U
Nickel, Dissolved	3.9 J	5.3 J	4.4 J	4.5	11.6	6.57	6.18	5.16	4.24 J	3.7 J	4.7 J	4.2
Potassium, Dissolved	3,610	3,530 J	6,370	6,270	2,710	2,780	2,680	2,730	5,560	3,320	3,650 J	6,360
Selenium, Dissolved	2.1 U	10 U	0.47 B	0.81 B	10 U	50 UJ	50 UJ	1.25 U	2.94	2.1 U	10 U	0.7 B
Silver, Dissolved	0.52 U	5 U	1 U	1 U	1 U	0.5 U	0.5 U	0.5 U	1 U	0.52 U	5 U	1 U
Sodium, Dissolved	33,400	49,000	35,400	33,800	26,800	26,800	27,400	21,900	54,800	36,600	45,600	34,200

CTO-WE13
ABL, Site 1
Validated Surface Water Detected Analytical Results
2008-2012 LTM

Station ID	1SD-0/1SW-0								1SD-0/1SW-0	1SD-0A/1SW-0A		
Sample ID	AS01-SW00-R14	AS01-SW00-R15	AS01-1SW00P-R16	AS01-1SW00-R16	AS01-SW00-R17	AS01-SW00P-R18	AS01-SW00-R18	AS01-SW00-R19	AS01-SW00-R20	AS01-SW00A-R14	AS01-SW00A-R15	AS01-1SW00A-R16
Sample Date	08/13/08	10/14/08	07/21/09	07/21/09	04/20/10	07/08/11	07/08/11	10/05/11	08/30/12	08/14/08	10/13/08	07/21/09
Chemical Name												
Thallium, Dissolved	1.1 U	15 U	1 U	1 U	0.2 U	0.1 U	0.1 U	1 U	0.2 U	1.1 U	15 U	1 U
Vanadium, Dissolved	0.48 U	3.2 B	15.2 J	17.8	1.06	0.995 J	1.16	2.5 U	1 U	0.48 U	3.6 B	17.8
Zinc, Dissolved	6 B	5.7 B	4.6 B	4.2 B	20 U	16.3 J	10 U	2.46 K	20 U	6.8 B	6.4 B	3.7 B
Wet Chemistry												
Hardness (mg/l)	162	199	163	171	182	198	192	187	230	178	199	169

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Notes:

Shading indicates detections

NA - Not analyzed
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
R - Unreliable Result
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
MG/L - Milligrams per liter
UG/L - Micrograms per liter

CTO-WE13
ABL, Site 1
Validated Surface Water Detected Analytical Results
2008-2012 LTM

Station ID	1SD-0A/1SW-0A				1SD-1/1SW-1						
Sample ID	AS01-SW00A-R17	AS01-SW00A-R18	AS01-SW00A-R19	AS01-SW00A-R20	AS01-SW01-R14	AS01-SW01-R15	AS01-1SW01-R16	AS01-SW01-R17	AS01-SW01-R18	AS01-SW01-R19	AS01-SW01-R20
Sample Date	04/20/10	07/08/11	10/05/11	08/30/12	08/14/08	10/10/08	07/20/09	04/20/10	07/08/11	10/05/11	08/30/12
Chemical Name											
Volatile Organic Compounds (UG/L)											
1,4-Dichlorobenzene	5 U	0.125 U	0.5 U	0.25 U	1 U	5 U	0.46 J	5 U	0.125 U	0.5 U	0.25 U
Acetone	10 R	2.5 U	5 U	5 R	2 B	20 U	5 U	5.12 J	2.58 J	3.62 J	5 R
Carbon disulfide	5 U	0.5 U	0.5 U	1 U	0.3 K	5 U	0.58 J	0.578 J	0.5 U	0.5 U	1 U
Chloroform	5 U	0.125 U	0.5 U	0.25 U	1 U	5 U	1 U	5 U	0.125 U	0.5 U	0.25 U
Chloromethane	5 U	0.5 U	0.5 U	1 U	2 U	5 U	1 U	5 U	0.5 U	0.5 U	1 U
cis-1,2-Dichloroethene	5 U	0.25 U	0.5 U	0.5 U	1 U	5 U	1 U	5 U	0.25 U	0.5 U	0.5 U
Dibromochloromethane	5 U	0.25 U	0.5 U	0.5 U	1 U	5 U	1 U	5 U	0.25 U	0.5 U	0.5 U
Methylene chloride	5 U	0.25 U	1 U	0.5 U	5 U	5 U	1 U	0.281 B	0.25 U	1 U	0.5 U
Trichloroethene	5 U	0.25 U	0.5 U	0.5 U	2 U	5 U	1 U	5 U	0.25 U	0.5 U	0.5 U
Total Metals (UG/L)											
Aluminum	347	223	272	213	247 J	164 J	175	353	185	245	136 J
Antimony	1 U	0.5 U	2 U	1 U	1.6 U	10 U	0.25 B	1 U	0.5 U	2 U	1 U
Arsenic	1 U	0.5 U	1.5 U	1.02 J	0.98 U	10 U	0.47 J	0.525 J	0.5 U	1.5 U	0.872 J
Barium	53.6	55.6	55	71.1	66.7	78.5 J	49.6	54.3	58.8	50.9	68.7
Beryllium	2 U	1 U	0.5 U	2 U	0.15 U	4 U	1 U	2 U	1 U	0.5 U	2 U
Cadmium	0.5 U	0.25 U	0.5 U	0.5 U	0.1 U	5 U	1 U	0.5 U	0.25 U	0.5 U	0.37 J
Calcium	53,100	50,600	51,800	72,200	50,300	63,000	45,900	53,300	54,300	48,100	68,000
Chromium	20 U	10 U	1 U	20 U	0.8 J	5 U	4 B	20 U	10 U	1 U	20 U
Cobalt	3.18	0.737 J	2.5 U	0.768 J	1.4 J	50 U	0.62	3.13	0.756 J	2.5 U	0.72 J
Copper	20 U	10 U	1.38 J	20 U	2.3 J	25 U	1.1 J	20 U	10 U	1.26 J	20 U
Iron	298	423	378	268	342	159	184	299	394	341	277
Lead	5 U	2.5 U	0.75 U	1 U	1 U	10 U	0.18 J	5 U	2.5 U	0.75 U	1 U
Magnesium	15,000	15,200	13,900	16,100	13,200	13,900	14,200	15,200	14,200	12,900	16,400
Manganese	262	91.7 K	89.4	153	186	110	87.1	271	95.7 K	76.9	147
Mercury	0.2 U	0.1 U	0.2 U	0.2 U	0.02 U	0.018 B	0.2 U	0.2 U	0.1 U	0.2 U	0.2 U
Nickel	12.9	6.58	6.48	5.41 J	5.9 J	5.2 J	4.9	12.6	6.81	5.94	5.4 J
Potassium	2,660	3,070	2,950	5,520	3,650	3,580 J	6,660	2,730	2,860	2,740	5,360
Selenium	10 U	5 U	1.25 U	3.21	2.1 U	10 U	0.36 B	10 U	25 U	1.25 U	3.02
Sodium	26,800	28,500	23,500	56,200	32,900	37,300	43,800	27,900	27,500	21,700	50,700
Vanadium	1.47	1.41	2.5 U	0.633 J	0.87 J	3.4 J	22	1.52	1.35	2.5 U	1 U
Zinc	8.65 J	10 U	7.47 K	20 U	12.3 J	6.9 B	8.9 B	8.34 J	12.4 J	6.79 K	20 U
Dissolved Metals (UG/L)											
Aluminum, Dissolved	173	50 U	95.1	86.8 J	93.5 J	61 J	94.1	162	83.6 J	91.5	100 U
Arsenic, Dissolved	1 U	0.5 U	1.5 U	0.896 J	0.98 U	10 U	0.6 J	0.531 J	0.5 U	1.5 U	0.892 J
Barium, Dissolved	51.4	56.6	54.4	71.1	61.7	75 J	47	52	56.2	51	69
Cadmium, Dissolved	0.5 U	0.25 U	0.5 U	0.5 U	0.1 U	5 U	1 U	0.5 U	0.25 U	0.5 U	0.34 J
Calcium, Dissolved	53,000	52,600	53,000	68,600	48,600	63,300	44,200	51,000	52,400	49,100	68,800
Chromium, Dissolved	20 U	10 U	1 U	20 U	0.63 J	5 U	4.8	20 U	10 U	1 U	20 U
Cobalt, Dissolved	2.75	0.5 U	2.5 U	1 U	0.25 U	50 U	0.4 J	2.94	0.5 U	2.5 U	1 U
Copper, Dissolved	20 U	10 U	2 U	20 U	2.4 J	25 U	0.95 J	20 U	10 U	1.62 J	20 U
Iron, Dissolved	100 U	125	19.4 J	100 U	37.8 B	100 U	32.6 J	100 U	212	25 J	52.1 J
Lead, Dissolved	5 U	2.5 U	0.75 U	1 U	2.2 J	10 U	1 U	5 U	2.5 U	0.75 U	1 U
Magnesium, Dissolved	14,900	13,700	14,000	16,200	12,700	13,700	13,700	15,200	13,600	13,100	16,800
Manganese, Dissolved	247	48.2	61	117	91.8	76.3	63.6	270	58.6	56.1	104
Mercury, Dissolved	0.2 U	0.1 U	0.2 U	0.2 U	0.02 U	0.2 U	0.2 U	0.2 U	0.1 U	0.2 U	0.2 U
Nickel, Dissolved	11.8	6.79	5.59	4.67 J	3.6 J	5 J	4.3	12.5	7.3	5.87	4.98 J
Potassium, Dissolved	2,630	2,750	2,900	5,310	3,540	3,420 J	6,450	2,720	2,740	2,770	5,460
Selenium, Dissolved	10 U	5 UJ	1.25 U	2.95	2.1 U	10 U	0.99 B	10 U	50 UJ	1.25 U	3.08
Silver, Dissolved	1 U	0.5 U	0.5 U	1 U	0.52 U	5 U	1 U	1 U	0.5 U	0.5 U	1 U
Sodium, Dissolved	26,100	27,700	23,100	54,200	31,900	35,800	41,800	27,300	28,100	22,000	51,700

CTO-WE13
ABL, Site 1
Validated Surface Water Detected Analytical Results
2008-2012 LTM

Station ID	1SD-0A/1SW-0A				1SD-1/1SW-1						
Sample ID	AS01-SW00A-R17	AS01-SW00A-R18	AS01-SW00A-R19	AS01-SW00A-R20	AS01-SW01-R14	AS01-SW01-R15	AS01-1SW01-R16	AS01-SW01-R17	AS01-SW01-R18	AS01-SW01-R19	AS01-SW01-R20
Sample Date	04/20/10	07/08/11	10/05/11	08/30/12	08/14/08	10/10/08	07/20/09	04/20/10	07/08/11	10/05/11	08/30/12
Chemical Name											
Thallium, Dissolved	0.2 U	0.1 U	1 U	0.2 U	1.1 U	15 U	1 U	0.2 U	0.1 U	1 U	0.2 U
Vanadium, Dissolved	1.05	1.05	2.5 U	1 U	0.66 J	50 U	16.6	1.26	1.13	2.5 U	1 U
Zinc, Dissolved	20 U	10 U	2.43 K	20 U	6 B	11.8 J	5.1	20 U	10 U	4.14 K	20 U
Wet Chemistry											
Hardness (mg/l)	182	194	174	232	180	215	173	190	190	174	234

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Notes:

Shading indicates detections

NA - Not analyzed
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
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R - Unreliable Result
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UL - Analyte not detected, quantitation limit is probably higher
MG/L - Milligrams per liter
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CTO-WE13
ABL, Site 1
Validated Surface Water Detected Analytical Results
2008-2012 LTM

Station ID	1SD-1A/1SW-1A							1SD-2/1SW-2				
Sample ID	AS01-SW01A-R14	AS01-SW01A-R15	AS01-1SW01A-R16	AS01-SW01A-R17	AS01-SW01A-R18	AS01-SW01A-R19	AS01-SW01A-R20	AS01-SW02P-R14	AS01-SW02-R14	AS01-SW02-R15	AS01-1SW02A-R16	AS01-1SW02-R16
Sample Date	08/14/08	10/10/08	07/20/09	04/20/10	07/08/11	10/05/11	08/30/12	08/14/08	08/14/08	10/10/08	07/20/09	07/20/09
Chemical Name												
Volatile Organic Compounds (UG/L)												
1,4-Dichlorobenzene	1 U	5 U	0.31 J	5 U	0.125 U	0.5 U	0.25 U	1 U	1 U	5 U	0.29 J	0.22 J
Acetone	3 B	20 U	5 U	4.56 J	3.09 J	5 U	5 R	4 B	6 B	20 U	5 U	5 U
Carbon disulfide	1 U	5 U	1 U	0.625 J	0.5 U	0.5 U	1 U	1 U	1 U	5 U	0.44 J	0.58 J
Chloroform	1 U	5 U	1 U	5 U	0.125 U	0.5 U	0.25 U	1 U	1 U	5 U	1 U	1 U
Chloromethane	2 U	5 U	1 U	5 U	0.5 U	0.5 U	1 U	2 U	2 U	5 U	1 U	1 U
cis-1,2-Dichloroethene	1 U	5 U	1 U	5 U	0.25 U	0.5 U	0.5 U	1 U	1 U	5 U	1 U	1 U
Dibromochloromethane	1 U	5 U	1 U	5 U	0.25 U	0.5 U	0.5 U	1 U	1 U	5 U	1 U	1 U
Methylene chloride	5 U	5 U	1 U	0.434 B	0.25 U	1 U	0.5 U	5 U	5 U	5 U	1 U	1 U
Trichloroethene	2 U	5 U	1 U	5 U	0.25 U	0.5 U	0.5 U	2 U	2 U	5 U	1 U	1 U
Total Metals (UG/L)												
Aluminum	147 J	153 B	176	361	181	269	148 J	136 J	138 J	162 J	183	254
Antimony	1.6 U	10 U	0.35 B	1 U	0.5 U	2 U	1 U	1.6 U	1.6 U	10 U	0.2 B	0.18 B
Arsenic	0.98 U	10 U	1 U	1 U	0.5 U	1.5 U	0.948 J	0.98 U	1.3 J	10 U	0.44 J	1 U
Barium	63.5	80.2 J	47.2	53.9	57.4	53.4	69.8	61.5	61.5	79 J	47.8	48.8
Beryllium	0.15 U	4 U	1 U	2 U	1 U	0.5 U	2 U	0.15 U	0.15 U	4 U	1 U	1 U
Cadmium	0.1 U	5 U	1 U	0.5 U	0.25 U	0.5 U	0.33 J	0.1 U	0.1 U	5 U	1 U	1 U
Calcium	48,900	64,500	44,200	53,800	53,200	49,900	68,200	47,300	49,200	63,000	44,400	44,900
Chromium	0.69 J	5 U	3.7 B	20 U	10 U	1 U	20 U	0.84 J	0.72 J	5 U	4.3 B	4.3 B
Cobalt	0.8 J	50 U	0.63	3.17	0.721 J	2.5 U	0.754 J	0.44 J	0.77 J	50 U	0.57	1.1
Copper	2.6 J	25 U	1.4 J	20 U	10 U	1.25 J	20 U	3.7 J	2.3 J	25 U	1.1 J	1.3 J
Iron	194	143	182	317	381	387	288	171	203	164	192	331
Lead	1.3 J	10 U	0.19 J	5 U	2.5 U	0.75 U	1 U	1.4 J	2.5 J	10 U	0.17 J	0.33 J
Magnesium	12,900	14,300	13,500	15,500	14,400	13,400	16,600	12,400	12,900	13,900	13,800	13,800
Manganese	116	108	86	286	95.2 K	93.1	151	109	123	111	85.6	127
Mercury	0.02 U	0.031 B	0.2 U	0.2 U	0.1 U	0.2 U	0.2 U	0.02 U	0.02 U	0.029 B	0.2 U	0.2 U
Nickel	5 J	5.5 J	4.9	12.7	6.52	6.43	5.46 J	4.5 J	4.7 J	5.4 J	4.8	5.6 J
Potassium	3,640	3,640 J	6,360	2,780	2,860	2,820	5,150	3,520	3,540	3,510 J	6,500	6,460
Selenium	2.1 U	10 U	0.66 B	10 U	25 U	1.25 U	2.95	2.1 U	2.1 U	10 U	0.44 B	0.82 B
Sodium	31,900	37,900	41,200	27,500	28,400	22,100	50,800	31,200	31,400	36,200	42,100	42,300
Vanadium	0.66 J	1.8 J	17.4	1.51	1.34	2.5 U	0.524 J	0.64 J	0.49 J	2.7 J	17.9	20.5 J
Zinc	13.1 J	10.9 B	7.3 B	8.23 J	10.9 J	7.53 K	20 U	7.8 B	9.7 J	7.4 B	7.3 B	7.3 B
Dissolved Metals (UG/L)												
Aluminum, Dissolved	30.8 J	53.7 J	89.8	153	50 U	98.1	100 U	64.8 J	66.5 J	64.9 J	89.6	88.7
Arsenic, Dissolved	0.98 U	10 U	1 U	1 U	0.5 U	1.5 U	0.898 J	0.98 U	0.98 U	10 U	0.47 B	1 U
Barium, Dissolved	57	75.3 J	47.1	51.3	52.4	50.4	67.9	60	67.1	75.4 J	47.1	47.9
Cadmium, Dissolved	0.1 U	5 U	1 U	0.5 U	0.25 U	0.5 U	0.5 U	0.1 U	0.1 U	5 U	1 U	1 U
Calcium, Dissolved	45,000	63,800	45,100	51,700	49,000	47,700	67,500	47,400	52,700	63,800	45,400	46,000
Chromium, Dissolved	0.48 J	5 U	4.3	20 U	10 U	1 U	20 U	0.44 J	0.98 J	5 U	4.8	4.7
Cobalt, Dissolved	0.25 U	50 U	0.37 J	2.75	0.5 U	2.5 U	1 U	0.25 U	0.25 U	50 U	0.37 J	0.38 J
Copper, Dissolved	3.9 J	25 U	0.87 J	20 U	10 U	1.61 J	20 U	3.2 J	2.9 J	25 U	0.89 J	0.97 J
Iron, Dissolved	33.2 B	100 U	25.9 J	100 U	129	32.4	100 U	26.6 B	36.6 B	100 U	29.6 J	30.6 J
Lead, Dissolved	1 U	10 U	1 U	5 U	2.5 U	0.75 U	1 U	1.2 J	1 J	10 U	1 U	1 U
Magnesium, Dissolved	11,800	13,900	13,800	14,900	14,000	12,900	16,600	12,400	13,900	14,100	13,900	14,200
Manganese, Dissolved	66.5	73.4	62.8	262	47.7	55.6	103	73.4	81.5	73	61.7	72.4
Mercury, Dissolved	0.02 U	0.017 B	0.2 U	0.2 U	0.1 U	0.2 U	0.2 U	0.02 U	0.02 U	0.021 B	0.2 U	0.2 U
Nickel, Dissolved	3.4 J	3.7 J	4.4	11.5	7.29	5.4	4.99 J	3.4 J	3.6 J	4.3 J	4.6	4.6 J
Potassium, Dissolved	3,390	3,410 J	6,580	2,660	2,820	2,730	5,390	3,540	3,870	3,400 J	6,540	6,610
Selenium, Dissolved	2.1 U	10 U	1.1 B	10 U	25 UJ	1.25 U	2.83	2.1 U	2.1 U	10 U	0.94 B	0.47 B
Silver, Dissolved	0.52 U	5 U	1 U	1 U	0.5 U	0.5 U	1 U	0.52 U	0.52 U	5 U	1 U	1 U
Sodium, Dissolved	29,500	36,100	42,400	26,600	28,300	21,400	52,700	31,300	34,600	35,600	41,300	42,200

CTO-WE13
ABL, Site 1
Validated Surface Water Detected Analytical Results
2008-2012 LTM

Station ID	1SD-1A/1SW-1A							1SD-2/1SW-2				
Sample ID	AS01-SW01A-R14	AS01-SW01A-R15	AS01-1SW01A-R16	AS01-SW01A-R17	AS01-SW01A-R18	AS01-SW01A-R19	AS01-SW01A-R20	AS01-SW02P-R14	AS01-SW02-R14	AS01-SW02-R15	AS01-1SW02A-R16	AS01-1SW02-R16
Sample Date	08/14/08	10/10/08	07/20/09	04/20/10	07/08/11	10/05/11	08/30/12	08/14/08	08/14/08	10/10/08	07/20/09	07/20/09
Chemical Name												
Thallium, Dissolved	1.1 U	15 U	1 U	0.2 U	0.1 U	1 U	0.2 U	1.1 U	1.1 U	15 U	1 U	1 U
Vanadium, Dissolved	0.48 U	4 B	16	1	1.07	2.5 U	1 U	0.48 U	0.48 U	2.2 B	14.9	15.9 J
Zinc, Dissolved	6.6 B	21.9	3.3 J	20 U	10 U	2.59 K	20 U	4.8 B	6.7 B	9.6 B	4 J	2.8 J
Wet Chemistry												
Hardness (mg/l)	175	220	166	184	196	171	228	169	176	215	168	169

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Notes:

Shading indicates detections

NA - Not analyzed
B - Analyte not detected above the level reported in blanks
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CTO-WE13
ABL, Site 1
Validated Surface Water Detected Analytical Results
2008-2012 LTM

Station ID	1SD-2/1SW-2						1SD-2A/1SW-2A				
Sample ID	AS01-SW02P-R17	AS01-SW02-R17	AS01-SW02A-R18	AS01-SW02-R18	AS01-SW02-R19	AS01-SW02-R20	AS01-SW02A-R14	AS01-SW02A-R15	AS01-SW02A-R17	AS01-SW02A-R19	AS01-SW02A-R20
Sample Date	04/20/10	04/20/10	07/07/11	07/07/11	10/05/11	08/29/12	08/14/08	10/10/08	04/20/10	10/05/11	08/29/12
Chemical Name											
Volatile Organic Compounds (UG/L)											
1,4-Dichlorobenzene	5 U	5 U	0.125 U	0.125 U	0.5 U	0.25 U	1 U	5 U	5 U	0.5 U	0.25 U
Acetone	4.79 J	4.19 J	3.49 J	3.7 J	5 U	5 UJ	3 B	20 U	4.04 J	5 U	5 UJ
Carbon disulfide	5 U	5 U	0.5 U	0.5 U	0.5 U	1 U	1 U	5 U	5 U	0.5 U	1 U
Chloroform	5 U	5 U	0.125 U	0.125 U	0.5 U	0.25 U	1 U	5 U	5 U	0.5 U	0.25 U
Chloromethane	5 U	5 U	0.5 U	0.5 U	0.5 U	1 U	0.7 B	5 U	5 U	0.5 U	1 U
cis-1,2-Dichloroethene	5 U	5 U	0.25 U	0.25 U	0.5 U	0.5 U	1 U	5 U	5 U	0.5 U	0.5 U
Dibromochloromethane	5 U	5 U	0.25 U	0.25 U	0.5 U	0.5 U	1 U	5 U	5 U	0.5 U	0.5 U
Methylene chloride	0.605 B	0.316 B	0.25 U	0.25 U	1 U	0.5 U	5 U	5 U	0.415 B	1 U	0.5 U
Trichloroethene	5 U	5 U	0.25 U	0.25 U	0.5 U	0.5 U	2 U	5 U	5 U	0.5 U	0.5 U
Total Metals (UG/L)											
Aluminum	360	354	160	148	292	222	124 J	186 J	347	265	159 J
Antimony	1 U	1 U	0.5 U	0.5 U	2 U	1 U	1.6 U	10 U	1 U	2 U	1 U
Arsenic	1 U	1 U	0.5 U	0.5 U	1.5 U	1.03 J	0.98 U	10 U	1 U	1.5 U	0.931 J
Barium	52.9	51.8	54.2	55.5	51.7	71.9	63.6	77.6 J	51.7	52.4	71
Beryllium	2 U	2 U	1 U	1 U	0.5 U	2 U	0.15 U	4 U	2 U	0.5 U	2 U
Cadmium	0.5 U	0.5 U	0.25 U	0.25 U	0.5 U	0.49 J	0.1 U	5 U	0.5 U	0.5 U	0.44 J
Calcium	53,200	52,100	55,400	53,100	49,800	68,900	49,200	62,300	52,900	49,000	68,400
Chromium	20 U	20 U	10 U	10 U	1 U	20 U	0.72 J	5 U	20 U	1 U	20 U
Cobalt	2.72	2.78	0.538 J	0.5 U	1.3 J	1.04 J	0.49 J	50 U	2.87	2.5 U	0.633 J
Copper	20 U	20 U	10 U	10 U	1.45 J	20 U	2.1 J	25 U	20 U	1.22 J	20 U
Iron	300	289	334	330	449	412	156	167	279	371	271
Lead	5 U	5 U	2.5 U	2.5 U	0.75 U	1 U	1.4 J	10 U	5 U	0.75 U	1 U
Magnesium	15,200	15,000	14,400	14,600	13,200	16,900	12,900	13,900	15,100	13,200	16,700
Manganese	238	246	81.5 K	72 K	100	189	108	108	251	101	135
Mercury	0.2 U	0.2 U	0.1 U	0.1 U	0.2 U	0.2 U	0.02 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	11.5	11.9	6.21	5.93	6.45	6.18 J	4.6 J	5.2 J	12.2	6.3	5.51 J
Potassium	2,680	2,640	2,920	2,840	2,750	6,020	3,710	3,440 J	2,730	2,750	5,950
Selenium	10 U	10 U	25 U	25 U	1.25 U	3.01	2.1 U	10 U	10 U	1.25 U	2.99
Sodium	26,900	26,700	27,400	27,000	21,400	55,700	32,500	36,000	26,900	21,200	55,700
Vanadium	1.49	1.57	1.43	1.23	2.5 U	0.699 J	0.64 J	1.5 J	1.58	2.5 U	0.521 J
Zinc	8.37 J	8.17 J	10 U	10 U	8.4 K	20 U	7.5 B	8.7 B	7.71 J	7.39 K	20 U
Dissolved Metals (UG/L)											
Aluminum, Dissolved	194	189	50 U	114	99.8	100 U	69.9 J	69.1 J	173	86.6	50.3 J
Arsenic, Dissolved	1 U	1 U	0.5 U	0.5 U	1.5 U	0.925 J	0.98 U	10 U	1 U	1.5 U	0.928 J
Barium, Dissolved	51.4	50.7	51.8	51.7	56	66.5	57.2	74.8 J	50.9	50.5	69.8
Cadmium, Dissolved	0.5 U	0.5 U	0.25 U	0.25 U	0.5 U	0.5 U	0.1 U	5 U	0.5 U	0.5 U	0.43 J
Calcium, Dissolved	53,000	52,700	54,300	52,800	54,000	69,800	44,600	63,200	52,900	47,600	69,700
Chromium, Dissolved	20 U	20 U	10 U	10 U	1 U	20 U	0.38 J	5 U	20 U	1 U	20 U
Cobalt, Dissolved	2.56	2.54	0.5 U	0.5 U	2.5 U	1 U	0.25 U	50 U	2.52	2.5 U	1 U
Copper, Dissolved	20 U	20 U	10 U	10 U	1 J	20 U	2.8 J	25 U	20 U	2 U	20 U
Iron, Dissolved	55.9 J	52.1 J	111	251	33.5	100 U	23.6 B	100 U	100 U	18.8 J	100 U
Lead, Dissolved	5 U	5 U	2.5 U	2.5 U	0.75 U	1 U	1.4 J	10 U	5 U	0.75 U	1 U
Magnesium, Dissolved	15,300	15,100	14,200	14,100	14,400	16,300	11,700	13,800	15,000	12,900	17,000
Manganese, Dissolved	242	244	50.6	62.3	62.9	120	65.8	70.1	243	53.7	114
Mercury, Dissolved	0.2 U	0.2 U	0.1 U	0.1 U	0.2 U	0.2 U	0.02 U	0.018 B	0.2 U	0.2 U	0.2 U
Nickel, Dissolved	11.1	10.8	6.47	5.72	5.92	5.22 J	3.3 J	4.4 J	11	5.37	5.3 J
Potassium, Dissolved	2,700	2,680	2,860	2,870	3,010	5,650	3,390	3,350 J	2,680	2,690	5,950
Selenium, Dissolved	10 U	10 U	5 UJ	25 UJ	1.25 U	2.93	2.1 U	10 U	10 U	1.25 U	3.1
Silver, Dissolved	1 U	1 U	0.5 U	0.5 U	0.5 U	1 U	0.52 U	5 U	1 U	0.5 U	1 U
Sodium, Dissolved	26,900	26,700	27,300	27,200	23,300	53,700	29,800	35,100	26,600	21,100	56,600

CTO-WE13
ABL, Site 1
Validated Surface Water Detected Analytical Results
2008-2012 LTM

Station ID	1SD-2/1SW-2						1SD-2A/1SW-2A				
Sample ID	AS01-SW02P-R17	AS01-SW02-R17	AS01-SW02A-R18	AS01-SW02-R18	AS01-SW02-R19	AS01-SW02-R20	AS01-SW02A-R14	AS01-SW02A-R15	AS01-SW02A-R17	AS01-SW02A-R19	AS01-SW02A-R20
Sample Date	04/20/10	04/20/10	07/07/11	07/07/11	10/05/11	08/29/12	08/14/08	10/10/08	04/20/10	10/05/11	08/29/12
Chemical Name											
Thallium, Dissolved	0.2 U	0.2 U	0.1 U	0.1 U	1 U	0.2 U	1.1 U	15 U	0.2 U	1 U	0.2 U
Vanadium, Dissolved	1.33	1.2	0.876 J	1.06	2.5 U	1 U	0.48 U	3.8 B	1.1	2.5 U	1 U
Zinc, Dissolved	20 U	20 U	10 U	10 U	3.12 K	20 U	5.2 B	5 B	20 U	2.35 K	20 U
Wet Chemistry											
Hardness (mg/l)	190	188	190	186	173	230	176	213	190	175	230

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Notes:

Shading indicates detections

NA - Not analyzed
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
R - Unreliable Result
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
MG/L - Milligrams per liter
UG/L - Micrograms per liter

CTO-WE13
ABL, Site 1
Validated Surface Water Detected Analytical Results
2008-2012 LTM

Station ID	1SD-3/1SW-3								1SD-3A/1SW-3A				
Sample ID	AS01-SW03-R14	AS01-SW03-R15	AS01-1SW03-R16	AS01-SW03-R17	AS01-SW03P-R18	AS01-SW03-R18	AS01-SW03-R19	AS01-SW03-R20	AS01-SW03A-R14	AS01-SW03A-R15	AS01-1SW03A-R16	AS01-SW03A-R17	AS01-SW03A-R18
Sample Date	08/14/08	10/09/08	07/17/09	04/20/10	07/07/11	07/07/11	10/05/11	08/29/12	08/14/08	10/09/08	07/17/09	04/20/10	07/07/11
Chemical Name													
Volatile Organic Compounds (UG/L)													
1,4-Dichlorobenzene	1 U	5 U	1 UL	5 U	0.125 U	0.125 U	0.5 U	0.25 U	1 U	5 U	1 UL	5 U	0.125 U
Acetone	3 B	20 U	5 UL	4.01 J	2.5 U	2.5 U	3.33 J	5 UJ	6 B	20 U	5 UL	4.13 J	2.5 U
Carbon disulfide	1 U	5 U	1 UL	5 U	0.5 U	0.5 U	0.5 U	1 U	1 U	5 U	1 UL	5 U	0.5 U
Chloroform	1 U	5 U	1 UL	5 U	0.125 U	0.125 U	0.5 U	0.25 U	1 U	5 U	1 UL	5 U	0.125 U
Chloromethane	2 U	5 U	1 UL	5 U	0.5 U	0.5 U	0.5 U	1 U	0.3 J	5 U	1 UL	5 U	0.5 U
cis-1,2-Dichloroethene	1 U	5 U	1 UL	5 U	0.25 U	0.25 U	0.5 U	0.5 U	1 U	5 U	1 UL	5 U	0.25 U
Dibromochloromethane	1 U	5 U	1 UL	5 U	0.25 U	0.25 U	0.5 U	0.5 U	1 U	5 U	1 UL	5 U	0.25 U
Methylene chloride	5 U	5 U	1 UL	0.301 J	0.25 U	0.25 U	1 U	0.5 U	5 U	5 U	1 UL	0.368 B	0.25 U
Trichloroethene	2 U	5 U	1 UL	5 U	0.25 U	0.25 U	0.5 U	0.5 U	2 U	5 U	1 UL	5 U	0.25 U
Total Metals (UG/L)													
Aluminum	152 J	280	256	412	145	145	293	450	137 J	228	140	403	134
Antimony	1.6 U	10 U	0.18 B	5.27	0.5 U	0.5 U	2 U	1 U	1.6 U	10 U	0.23 B	1 U	0.5 U
Arsenic	0.98 U	10 U	0.85 J	105	0.518 J	0.5 U	1.5 U	1.01 J	0.98 U	10 U	0.21 J	1 U	0.553 J
Barium	63.2	79.1 J	48.6	50.3	54.6	53.7	49.5	74.5	62.1	78.7 J	48.2	48.8	52.9
Beryllium	0.15 U	4 U	1 U	2 U	1 U	1 U	0.5 U	2 U	0.15 U	4 U	1 U	2 U	1 U
Cadmium	0.1 U	5 U	1 U	0.5 U	0.25 U	0.25 U	0.5 U	0.28 J	0.1 U	5 U	1 U	0.5 U	0.25 U
Calcium	50,000	61,500	43,800	53,800	51,900	51,200	49,600	68,500	47,800	61,300	44,800	52,100	50,100
Chromium	0.64 J	5 U	4	20 U	10 U	10 U	1 U	20 U	0.85 J	5 U	4	20 U	10 U
Cobalt	0.49 J	1.4 J	1.2	2.14	0.548 J	0.53 J	1.34 J	2.22	0.6 J	50 U	0.6	2.43	0.53 J
Copper	3.2 J	25 U	1.2 J	20 U	10 U	10 U	1.57 J	20 U	2.4 J	25 U	0.98 J	20 U	10 U
Iron	160	303	355	321	348	321	451	869	165	209	162	303	349
Lead	1.1 J	10 U	0.37 J	5 U	2.5 U	2.5 U	0.75 U	0.908 J	1.6 J	10 U	0.14 J	5 U	2.5 U
Magnesium	13,000	13,800	13,300	15,200	14,100	14,300	13,200	16,900	12,400	13,700	13,600	15,200	13,600
Manganese	110	184	141	189	72.5 K	69 K	109	367	109	134	81.8	214	73 K
Mercury	0.02 U	0.03 B	0.2 U	0.2 U	0.1 U	0.1 U	0.2 U	0.2 U	0.02 U	0.033 B	0.2 U	0.2 U	0.1 U
Nickel	4.5 J	6.7 J	5.2	10.2	6.13	6.37	6.34	8.33	4.3 J	6 J	4.4	10.4	5.99
Potassium	3,580	3,670 J	3,200	2,650	2,740	2,790	2,660	5,640	3,530	3,690 J	3,330	2,670	2,710
Selenium	2.1 U	10 U	0.54 J	10 U	5 U	5 U	1.25 U	2.31	2.1 U	10 U	0.98 J	10 U	5 U
Sodium	33,400	40,200	19,500	26,600	26,700	26,800	21,500	54,400	32,600	40,500	20,500	26,000	26,300
Vanadium	0.48 U	1.9 J	8.4	2.44	1.08	1.13	2.5 U	1.45 J	0.49 J	2.3 J	8.4	1.59	1.15
Zinc	6.3 B	10.6 B	5.3	8.56 J	10 U	10 U	8.18	22.9 J	7.2 B	21.3 B	4.2 J	8.02 J	10 U
Dissolved Metals (UG/L)													
Aluminum, Dissolved	60 J	80 J	72.3	221	50 U	50 U	98.9	100 U	76.4 J	92.5 J	71.4	237	92.8 J
Arsenic, Dissolved	0.98 U	10 U	1 U	1 U	0.517 J	0.5 U	1.5 U	0.91 J	0.98 U	10 U	0.61 B	1 U	0.5 U
Barium, Dissolved	61.6	74.7 J	47	49.4	51.6	53.3	54.5	70.2	63.9	75.1 J	46.4	48.8	53.3
Cadmium, Dissolved	0.1 U	5 U	1 U	0.5 U	0.25 U	0.25 U	0.5 U	0.26 J	0.1 U	5 U	1 U	0.5 U	0.25 U
Calcium, Dissolved	48,400	61,700	44,100	53,000	50,700	51,300	55,400	67,900	49,200	61,200	43,900	52,400	51,200
Chromium, Dissolved	0.86 J	5 U	5.2	20 U	10 U	10 U	1 U	20 U	0.54 J	5 U	4.6	20 U	10 U
Cobalt, Dissolved	0.25 U	50 U	0.32 J	2.15	0.5 U	0.5 U	2.5 U	0.604 J	0.25 U	0.77 J	0.32 J	2.3	0.5 U
Copper, Dissolved	2.4 J	25 U	1 J	20 U	10 U	10 U	1.32 J	20 U	1.4 J	25 U	0.91 J	20 U	10 U
Iron, Dissolved	32.2 J	100 U	28.8 J	32.5 J	93.2 J	122	25.2	100 U	35.4 J	40.2 J	23.5 J	51.4 J	266
Lead, Dissolved	1 U	10 U	1 U	5 U	2.5 U	5 U	0.447 J	1 U	1 U	10 U	1 U	5 U	2.5 U
Magnesium, Dissolved	12,700	13,700	13,700	15,200	13,700	14,300	15,000	17,100	12,900	13,500	13,300	15,000	14,000
Manganese, Dissolved	74	94.9	79.2	210	42.8	44.4	65.5	215	75.6	88.2	56.2	222	58.3
Mercury, Dissolved	0.02 U	0.019 J	0.2 U	0.2 U	0.1 U	0.1 U	0.2 U	0.2 U	0.02 U	0.2 U	0.2 U	0.2 U	0.1 U
Nickel, Dissolved	3.8 J	4.6 J	4	9.8	5.31	7.02	6.35	5.4 J	4 J	5 J	3.9	14.8	6.96
Potassium, Dissolved	3,630	3,510 J	3,300	2,670	2,660	2,760	3,020	5,830	3,690	3,520 J	3,280	2,650	2,750
Selenium, Dissolved	2.1 U	10 U	0.89 B	10 U	5 UJ	5 UJ	1.25 U	2.98	2.1 U	10 U	0.73 B	10 U	5 UJ
Silver, Dissolved	0.52 U	5 U	1 U	1 U	0.5 U	0.5 U	0.5 U	1 U	0.52 U	0.73 J	1 U	1 U	0.5 U
Sodium, Dissolved	32,500	39,100	19,800	27,000	26,100	26,400	24,500	55,000	33,600	39,100	19,200	26,400	26,500

CTO-WE13
ABL, Site 1
Validated Surface Water Detected Analytical Results
2008-2012 LTM

Station ID	1SD-3/1SW-3								1SD-3A/1SW-3A				
Sample ID	AS01-SW03-R14	AS01-SW03-R15	AS01-1SW03-R16	AS01-SW03-R17	AS01-SW03P-R18	AS01-SW03-R18	AS01-SW03-R19	AS01-SW03-R20	AS01-SW03A-R14	AS01-SW03A-R15	AS01-1SW03A-R16	AS01-SW03A-R17	AS01-SW03A-R18
Sample Date	08/14/08	10/09/08	07/17/09	04/20/10	07/07/11	07/07/11	10/05/11	08/29/12	08/14/08	10/09/08	07/17/09	04/20/10	07/07/11
Chemical Name													
Thallium, Dissolved	1.1 U	15 U	1 U	0.2 U	0.1 U	0.1 U	1 U	0.2 U	1.1 U	15 U	1 U	0.2 U	0.1 U
Vanadium, Dissolved	0.48 U	1.8 B	6.2	1.31	0.817 J	0.832 J	2.5 U	1 U	0.48 U	1.2 B	3.9	1.35	1.11
Zinc, Dissolved	4.6 B	5.4 B	2.8 J	20 U	10 U	10 U	2.44 J	20 U	6.2 B	4.3 B	3.4 J	20 U	10 U
Wet Chemistry													
Hardness (mg/l)	179	210	164	180	174	194	170	240	170	209	168	182	192

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Notes:

Shading indicates detections

NA - Not analyzed

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L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

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MG/L - Milligrams per liter

UG/L - Micrograms per liter

CTO-WE13
ABL, Site 1
Validated Surface Water Detected Analytical Results
2008-2012 LTM

Station ID	1SD-3A/1SW-3A			1SD-4/1SW-4							
Sample ID	AS01-SW03AP-R19	AS01-SW03A-R19	AS01-SW03A-R20	AS01-SW04-R14	AS01-SW04-R15	AS01-SW04-R16	AS01-SW04-R17	AS01-SW04-R18	AS01-SW04-R19	AS01-SW04P-R20	AS01-SW04-R20
Sample Date	10/05/11	10/05/11	08/29/12	08/13/08	10/08/08	07/16/09	04/19/10	07/07/11	10/04/11	08/29/12	08/29/12
Chemical Name											
Volatile Organic Compounds (UG/L)											
1,4-Dichlorobenzene	0.5 U	0.5 U	0.25 U	1 U	5 U	0.8 J	5 U	0.125 U	0.5 U	0.25 U	0.25 U
Acetone	5 U	3.88 J	2.9 B	4 B	20 U	5 U	3.15 B	2.5 U	5 U	3.03 B	2.68 B
Carbon disulfide	0.5 U	0.5 U	1 U	1 U	5 U	1 U	5 U	0.5 U	0.5 U	1 U	1 U
Chloroform	0.5 U	0.5 U	0.25 U	1 U	5 U	1 U	5 U	0.125 U	0.5 U	0.25 U	0.25 U
Chloromethane	0.5 U	0.5 U	1 U	2 U	5 U	1 U	5 U	0.5 U	0.5 U	1 U	1 U
cis-1,2-Dichloroethene	0.5 U	0.5 U	0.5 U	1 U	5 U	1 U	5 U	0.25 U	0.5 U	0.5 U	0.5 U
Dibromochloromethane	0.5 U	0.5 U	0.5 U	1 U	5 U	1 U	5 U	0.25 U	0.5 U	0.5 U	0.5 U
Methylene chloride	1 U	1 U	0.5 U	5 U	5 U	1 U	0.506 B	0.25 U	1 U	0.5 U	0.5 U
Trichloroethene	0.5 U	0.5 U	0.5 U	2 U	5 U	1 U	5 U	0.25 U	0.5 U	0.5 U	0.5 U
Total Metals (UG/L)											
Aluminum	261	304	127 J	414	186 J	124	358	136	275	216 B	259 B
Antimony	2 U	2 U	1 U	1.6 U	10 U	0.3 B	1 U	0.5 U	2 U	1 U	1 U
Arsenic	1.5 U	1.5 U	0.867 J	0.98 U	10 U	1 U	1 U	0.5 U	1.5 U	1.04 J	0.949 J
Barium	49.2	52	69.7	70.3	80.7 J	45.4	54.9	53.7	54	68.4	70
Beryllium	0.5 U	0.5 U	2 U	0.15 U	4 U	1 U	2 U	1 U	0.5 U	2 U	2 U
Cadmium	0.5 U	0.5 U	0.39 J	0.1 U	5 U	1 U	0.5 U	0.25 U	0.5 U	0.5 U	0.5 U
Calcium	49,400	51,300	67,100	51,500	62,400	44,800	50,000	51,000	53,400	68,000	68,300
Chromium	1 U	1 U	20 U	1.1 J	5 U	3.8	2.63 J	10 U	1 U	20 U	20 U
Cobalt	2.5 U	1.32 J	0.681 J	2.5 J	50 U	0.5	2.8	0.5 U	2.5 U	0.699 J	0.705 J
Copper	1.36 J	1.57 J	20 U	3 J	25 U	0.85 J	20 U	10 U	1.42 J	20 U	20 U
Iron	378	455	274	571	151	142	323	332	399	273	280
Lead	0.75 U	0.75 U	1 U	1.5 J	10 U	1 U	5 U	2.5 U	0.75 U	1 U	1 U
Magnesium	13,200	13,800	16,500	13,400	13,900	13,600	15,200	14,200	14,300	16,100	16,600
Manganese	92.2	111	139	280	133	72.8	297	70.9 K	87.5	168	167
Mercury	0.2 U	0.2 U	0.2 U	0.02 U	0.027 J	0.2 U	0.2 U	0.1 U	0.2 U	0.2 U	0.2 U
Nickel	6.17	6.63	5.55 J	7.8 J	5 J	4.5	11.7	5.68	6.52	5.62 J	5.54 J
Potassium	2,680	2,810	5,910	3,700	3,820 J	3,280	2,640	2,780	2,880	5,610	5,540
Selenium	1.25 U	1.25 U	2.33	2.1 U	10 U	1.3 J	10 U	5 U	1.25 U	3.01	2.7
Sodium	21,200	22,600	55,400	35,000	42,900	20,500	24,000	26,600	23,000	53,800	54,500
Vanadium	2.5 U	2.5 U	0.658 J	0.73 J	1.5 J	7.1	1.23	0.994 J	2.5 U	0.829 J	0.925 J
Zinc	6.78	7.92	20 U	16.8 J	10.6 B	9.6	12.4 J	10 U	7.48	20 U	20 U
Dissolved Metals (UG/L)											
Aluminum, Dissolved	126	121	100 U	70.7 B	108 J	80.4	151	50 U	90.2	50.2 B	92.1 B
Arsenic, Dissolved	1.5 U	1.5 U	0.96 J	0.98 U	10 U	1 U	1 U	0.5 U	1.5 U	0.987 J	0.873 J
Barium, Dissolved	52.1	49.1	68.9	59.3	78.9 J	46	55.2	54.8	49.9	66.8	67.5
Cadmium, Dissolved	0.5 U	0.5 U	0.35 J	0.1 U	5 U	1 U	0.5 U	0.25 U	0.5 U	0.26 J	0.28 J
Calcium, Dissolved	51,500	50,500	67,800	49,600	65,200	44,900	49,900	52,700	49,400	66,900	65,900
Chromium, Dissolved	1 U	1 U	20 U	0.37 U	5 U	3.8	2.64 J	10 U	1 U	20 U	20 U
Cobalt, Dissolved	2.5 U	2.5 U	1 U	0.25 U	0.93 J	0.38 J	2.9	0.5 U	2.5 U	1 U	1 U
Copper, Dissolved	1.16 J	1.14 J	20 U	2.8 J	25 U	1.1 J	20 U	10 U	2 U	20 U	20 U
Iron, Dissolved	82.3	77.5	100 U	39 J	35.1 J	27.3 J	45.2 J	122	28.4	56.9 J	51.8 J
Lead, Dissolved	0.75 U	0.75 U	1 U	1 U	10 U	0.11 B	5 U	2.5 U	0.75 U	1 U	1 U
Magnesium, Dissolved	14,000	13,400	16,700	12,800	14,100	13,600	15,300	14,600	13,300	16,300	16,400
Manganese, Dissolved	62.9	63.2	104	98.3	113	60.6	286	47.9	54.5	139	126
Mercury, Dissolved	0.2 U	0.2 U	0.2 U	0.02 U	0.2 U	0.2 U	0.2 U	0.1 U	0.2 U	0.2 U	0.2 U
Nickel, Dissolved	5.73	5.41	4.97 J	3.4 J	4.9 J	4	11.8	5.22	5.44	5.1 J	5.08 J
Potassium, Dissolved	2,850	2,720	5,830	3,560	3,860 J	3,340	2,640	2,860	2,670	5,460	5,610
Selenium, Dissolved	1.25 U	1.25 U	3.13	2.1 U	10 U	0.75 B	10 U	5 UJ	1.25 U	3.05	2.68
Silver, Dissolved	0.5 U	0.5 U	1 U	0.52 U	5 U	1 U	1 U	0.5 U	0.5 U	1 U	1 U
Sodium, Dissolved	22,900	21,600	55,200	33,900	42,300	20,100	24,200	27,400	21,300	53,200	53,900

CTO-WE13
ABL, Site 1
Validated Surface Water Detected Analytical Results
2008-2012 LTM

Station ID	1SD-3A/1SW-3A			1SD-4/1SW-4							
Sample ID	AS01-SW03AP-R19	AS01-SW03A-R19	AS01-SW03A-R20	AS01-SW04-R14	AS01-SW04-R15	AS01-SW04-R16	AS01-SW04-R17	AS01-SW04-R18	AS01-SW04-R19	AS01-SW04P-R20	AS01-SW04-R20
Sample Date	10/05/11	10/05/11	08/29/12	08/13/08	10/08/08	07/16/09	04/19/10	07/07/11	10/04/11	08/29/12	08/29/12
Chemical Name											
Thallium, Dissolved	1 U	1 U	0.2 U	1.1 U	15 U	1 U	0.2 U	0.1 U	1 U	0.2 U	0.2 U
Vanadium, Dissolved	2.5 U	2.5 U	1 U	0.48 U	3.3 B	5.8	0.848 J	0.697 J	2.5 U	0.569 J	0.518 J
Zinc, Dissolved	2.92 J	2.78 J	20 U	5.9 B	9.2 B	2.7 J	6.86 J	10 U	2.43 K	20 U	20 U
Wet Chemistry											
Hardness (mg/l)	174	170	246	184	213	168	184	188	178	240	236

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Notes:

Shading indicates detections

NA - Not analyzed
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
R - Unreliable Result
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
UL - Analyte not detected, quantitation limit is probably higher
MG/L - Milligrams per liter
UG/L - Micrograms per liter

CTO-WE13
ABL, Site 1
Validated Surface Water Detected Analytical Results
2008-2012 LTM

Station ID	1SD-4A/1SW-4A								1SD-5/1SW-5			
Sample ID	AS01-SW04A-R14	AS01-SW04A-R15	AS01-SW04A-R16	AS01-SW04A-R17	AS01-SW04A-R18	AS01-SW04A-R19	AS01-SW04AP-R20	AS01-SW04A-R20	AS01-SW05-R14	AS01-SW05-R15	AS01-SW05-R16	AS01-SW05-R17
Sample Date	08/13/08	10/08/08	07/16/09	04/19/10	07/07/11	10/04/11	08/29/12	08/29/12	08/12/08	10/07/08	07/15/09	04/19/10
Chemical Name												
Volatile Organic Compounds (UG/L)												
1,4-Dichlorobenzene	1 U	5 U	1 U	5 U	0.125 U	0.5 U	0.25 U	0.25 U	1 U	5 U	1 U	5 U
Acetone	4 B	20 U	5 U	2.73 B	2.5 U	5 U	5 UJ	2.75 B	5 B	20 U	5 U	2.75 B
Carbon disulfide	1 U	5 U	1 U	5 U	0.5 U	0.5 U	1 U	1 U	1 U	5 U	1 U	5 U
Chloroform	1 U	5 U	1 U	5 U	0.125 U	0.5 U	0.25 U	0.25 U	1 U	5 U	1 U	5 U
Chloromethane	2 U	5 U	1 U	5 U	0.5 U	0.5 U	1 U	1 U	2 U	5 U	1 U	5 U
cis-1,2-Dichloroethene	1 U	5 U	1 U	5 U	0.25 U	0.5 U	0.5 U	0.5 U	1 U	5 U	1 U	5 U
Dibromochloromethane	1 U	5 U	1 U	5 U	0.25 U	0.5 U	0.5 U	0.5 U	1 U	5 U	1 U	5 U
Methylene chloride	5 U	5 U	1 U	5 U	0.25 U	1 U	0.5 U	0.5 U	5 U	5 U	1 U	0.516 B
Trichloroethene	2 U	5 U	1 U	5 U	0.25 U	0.5 U	0.5 U	0.5 U	2 U	5 U	1 U	5 U
Total Metals (UG/L)												
Aluminum	147 J	194 J	128	374	151	296	203 B	218 B	554	187 J	140	384
Antimony	1.6 U	10 U	0.72 B	1 U	0.5 U	2 U	1 U	1 U	1.6 U	10 U	0.23 B	1 U
Arsenic	0.98 U	10 U	1 U	1 U	0.5 U	1.5 U	1.1 J	1.09 J	0.98 U	10 U	0.82 J	0.641 J
Barium	60.8	79.4 J	44.9	55.6	53.7	52.5	70.7	68.7	67.5	81.9 J	44.5	56
Beryllium	0.15 U	4 U	1 U	2 U	1 U	0.5 U	2 U	2 U	0.15 U	4 U	1 U	2 U
Cadmium	0.1 U	5 U	1 U	0.5 U	0.25 U	0.5 U	0.28 J	0.29 J	0.1 U	5 U	1 U	0.5 U
Calcium	47,000	60,800	43,100	48,700	50,900	51,100	68,600	65,300	47,100	64,000	43,900	51,000
Chromium	0.37 U	5 U	3.4	3.03 J	10 U	1 U	20 U	20 U	1.2 J	5 U	4 B	3.2 J
Cobalt	0.25 U	50 U	0.51	3.44	0.5 U	2.5 U	0.715 J	0.77 J	3.8 J	0.89 J	0.6	2.8
Copper	2 J	25 U	0.9 J	20 U	10 U	1.44 J	20 U	20 U	3.2 J	25 U	0.94 J	20 U
Iron	156	162	141	339	313	455	330	315	860	187	149	339
Lead	2.1 J	10 U	0.12 J	5 U	2.5 U	0.75 U	1 U	1 U	2.3 J	10 U	0.13 J	5 U
Magnesium	12,300	13,600	13,200	15,000	14,100	13,700	16,600	16,300	12,400	13,900	13,400	15,600
Manganese	106	138	70.5	299	65.1 K	97.7	144	146	374	145	79	284
Mercury	0.02 U	0.2 U	0.2 U	0.2 U	0.1 U	0.2 U	0.2 U	0.2 U	0.02 U	0.2 U	0.2 U	0.2 U
Nickel	4.5 J	6 J	4.4	13.9	5.68	6.62	5.83 J	5.8 J	10.2 J	6.4 J	4.5	11.9
Potassium	3,480	3,780 J	3,200	2,600	2,790	2,770	5,730	5,720	3,650	3,980 J	3,340	2,650
Selenium	2.1 U	10 U	0.9 J	10 U	25 U	1.25 U	3.26	3.13	2.1 U	10 U	0.84 B	10 U
Sodium	32,500	41,200	19,900	23,800	26,800	21,900	55,300	55,700	30,100	40,500	21,200	24,800
Vanadium	0.8 J	2.2 J	6.1	1.36	1.08	2.5 U	0.82 J	0.898 J	0.94 J	1.7 J	5.1	1.4
Zinc	7.1 B	8.7 B	6.4	13.1 J	10 U	8.28 K	20 U	20 U	21.3 J	9.9 B	4.3 B	13.3 J
Dissolved Metals (UG/L)												
Aluminum, Dissolved	95.5 B	102 J	73.5	147	73.7 J	96.6	96.6 B	108 B	55.4 B	94.5 J	80.6	152
Arsenic, Dissolved	0.98 U	10 U	1 U	1 U	0.5 U	1.5 U	1.14 J	1.02 J	0.98 U	10 U	1 U	1 U
Barium, Dissolved	62	77.9 J	43.4	56.7	52.6	51.1	64.8	69.2	61.6	81.2 J	44.5	56.9
Cadmium, Dissolved	0.1 U	5 U	1 U	0.5 U	0.25 U	0.5 U	0.5 U	0.5 U	0.1 U	5 U	1 U	0.5 U
Calcium, Dissolved	48,500	63,000	41,800	50,500	50,200	50,200	65,800	68,300	47,000	65,900	44,000	51,000
Chromium, Dissolved	0.37 U	5 U	4.6	2.54 J	10 U	1 U	20 U	20 U	0.37 U	5 U	3.4 B	2.78 J
Cobalt, Dissolved	0.25 U	0.85 J	0.32 J	2.84	0.5 U	2.5 U	0.535 J	0.503 J	0.25 U	50 U	0.39 J	2.36
Copper, Dissolved	2.4 J	25 U	1 J	20 U	10 U	1.13 J	20 U	20 U	2.3 J	25 U	0.93 B	20 U
Iron, Dissolved	28 J	34.6 J	22.1 J	34.8 J	204	28	68.2 J	77.3 J	40.7 J	100 U	22.2 J	35.2 J
Lead, Dissolved	1.9 J	10 U	1 U	5 U	2.5 U	0.75 U	0.822 J	1 U	1 U	10 U	1 U	5 U
Magnesium, Dissolved	12,500	13,800	12,800	15,500	14,000	13,500	15,800	16,600	12,300	14,300	13,500	15,700
Manganese, Dissolved	80.8	109	54	305	55	58.6	120	118	239	107	61.3	242
Mercury, Dissolved	0.02 U	0.017 B	0.2 U	0.2 U	0.1 U	0.2 U	0.2 U	0.2 U	0.02 U	0.2 U	0.2 U	0.2 U
Nickel, Dissolved	3.8 J	4.6 J	3.8	11.8	7.03	6.18	5.29 J	5.58 J	4.1 J	5.4 J	4.2	10.6
Potassium, Dissolved	3,510	3,760 J	3,100	2,700	2,790	2,750	5,540	5,830	3,450	3,700 J	3,370	2,790
Selenium, Dissolved	2.1 U	10 U	0.57 B	10 U	10 UJ	1.25 U	3.27	3.3	2.1 U	10 U	1.1 B	10 U
Silver, Dissolved	0.52 U	5 U	1 U	1 U	0.585 J	0.5 U	1 U	1 U	0.52 U	5 U	1 U	1 U
Sodium, Dissolved	33,500	40,700	18,400	24,900	26,500	21,700	52,500	55,100	30,100	40,600	20,900	25,300

CTO-WE13
ABL, Site 1
Validated Surface Water Detected Analytical Results
2008-2012 LTM

Station ID	1SD-4A/1SW-4A								1SD-5/1SW-5			
Sample ID	AS01-SW04A-R14	AS01-SW04A-R15	AS01-SW04A-R16	AS01-SW04A-R17	AS01-SW04A-R18	AS01-SW04A-R19	AS01-SW04AP-R20	AS01-SW04A-R20	AS01-SW05-R14	AS01-SW05-R15	AS01-SW05-R16	AS01-SW05-R17
Sample Date	08/13/08	10/08/08	07/16/09	04/19/10	07/07/11	10/04/11	08/29/12	08/29/12	08/12/08	10/07/08	07/15/09	04/19/10
Chemical Name												
Thallium, Dissolved	1.1 U	15 U	1 U	0.2 U	0.1 U	1 U	0.2 U	0.2 U	1.1 U	15 U	1 U	0.2 U
Vanadium, Dissolved	0.72 J	50 U	5	0.874 J	0.954 J	2.5 U	0.77 J	0.701 J	0.51 J	50 U	4.6	0.95 J
Zinc, Dissolved	6.7 B	5.9 B	3.9 J	6.76 J	10 U	3.1 K	20 U	20 U	5.8 B	6.1 B	2.3 B	7.22 J
Wet Chemistry												
Hardness (mg/l)	168	208	162	182	186	173	224	224	169	217	165	182

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Notes:

Shading indicates detections

NA - Not analyzed
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
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R - Unreliable Result
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UL - Analyte not detected, quantitation limit is probably higher
MG/L - Milligrams per liter
UG/L - Micrograms per liter

CTO-WE13
ABL, Site 1
Validated Surface Water Detected Analytical Results
2008-2012 LTM

Station ID	1SD-5/1SW-5			1SD-5A/1SW-5A							1SD-5C/1SW-5C	
Sample ID	AS01-SW05-R18	AS01-SW05-R19	AS01-SW05-R20	AS01-SW05A-R14	AS01-SW05A-R15	AS01-SW05A-R16	AS01-SW05A-R17	AS01-SW05A-R18	AS01-SW05A-R19	AS01-SW05A-R20	AS01-SW05C-R14	AS01-SW05C-R15
Sample Date	07/06/11	10/04/11	08/28/12	08/12/08	10/07/08	07/15/09	04/19/10	07/06/11	10/04/11	08/28/12	08/12/08	10/07/08
Chemical Name												
Volatile Organic Compounds (UG/L)												
1,4-Dichlorobenzene	0.125 U	0.5 U	0.25 U	1 U	5 U	1 U	5 U	0.125 U	0.5 U	0.25 U	1 U	5 U
Acetone	2.5 U	5 U	5 R	7 U	20 U	5 U	2.67 B	2.5 U	5 U	5 R	3 B	20 U
Carbon disulfide	0.5 U	0.5 U	1 U	1 U	5 U	1 U	5 U	0.5 U	0.5 U	1 U	1 U	5 U
Chloroform	0.125 U	0.5 U	0.25 U	1 U	5 U	1 U	5 U	0.125 U	0.5 U	0.25 U	1 U	5 U
Chloromethane	0.5 U	0.5 U	1 U	2 U	5 U	1 U	5 U	0.5 U	0.5 U	1 U	2 U	5 U
cis-1,2-Dichloroethene	0.25 U	0.5 U	0.5 U	1 U	5 U	1 U	5 U	0.25 U	0.5 U	0.5 U	1 U	5 U
Dibromochloromethane	0.25 U	0.5 U	0.5 U	1 U	5 U	1 U	5 U	0.25 U	0.5 U	0.5 U	1 U	5 U
Methylene chloride	0.25 U	1 U	0.5 U	5 U	5 U	1 U	0.564 B	0.25 U	1 U	0.5 U	5 U	5 U
Trichloroethene	0.25 U	0.5 U	0.5 U	2 U	5 U	1 U	5 U	0.25 U	0.5 U	0.5 U	2 U	5 U
Total Metals (UG/L)												
Aluminum	178	283	325 B	124 J	179 J	143	387	169	295	483	755	941
Antimony	0.5 U	2 U	1 U	1.6 U	10 U	0.17 B	1 U	0.5 U	2 U	1 U	1.6 U	10 U
Arsenic	0.5 U	1.5 U	1.03 J	0.98 U	10 U	1 U	1 U	0.5 U	1.5 U	0.942 J	0.98 U	10 U
Barium	57	50.2	68.1	58.8	81.5 J	43.3	56.1	54.2	54.4	65.6	70.1	90 J
Beryllium	1 U	0.5 U	2 U	0.15 U	4 U	1 U	0.524 J	1 U	0.5 U	2 U	0.15 U	4 U
Cadmium	0.25 U	0.5 U	0.27 J	0.1 U	5 U	1 U	0.5 U	0.25 U	0.5 U	0.31 J	0.1 U	5 U
Calcium	49,300	50,000	64,900	45,200	63,000	42,900	52,700	48,000	54,300	63,600	48,000	62,100
Chromium	10 U	1 U	20 U	0.61 J	5 U	4.3 B	2.67 J	10 U	1 U	20 U	1.1 J	1.3 J
Cobalt	0.604 J	2.5 U	1.03 J	0.41 J	50 U	0.62	2.69	0.5 U	2.5 U	1.05 J	5 J	4.6 J
Copper	10 U	1.43 J	20 U	2.9 J	25 U	0.75 J	20 U	10 U	1.44 J	20 U	5.2 J	25 U
Iron	342	429	508	158	169	152	334	330	444	763	1,330	1,330
Lead	2.5 U	0.75 U	1 U	1.8 J	10 U	0.13 J	5 U	2.5 U	0.75 U	0.514 J	2.7 J	10 U
Magnesium	15,500	13,400	19,100	11,800	13,700	13,000	15,600	15,300	14,400	18,300	12,400	13,700
Manganese	81 K	93.2	207	111	133	78.7	290	74.3 K	93.9	147	439	539
Mercury	0.1 U	0.2 U	0.2 U	0.02 U	0.2 U	0.2 U	0.2 U	0.1 U	0.2 U	0.2 U	0.02 U	0.023 J
Nickel	6.3	6.51	6.51 J	4.4 J	5.2 J	4.4	11.3	6.4	6.88	5.95 J	12 J	12.2 J
Potassium	3,210	2,680	4,410	3,490	3,640 J	3,240	2,740	3,120	2,890	4,750	3,700	4,140 J
Selenium	5 U	1.25 U	2.61	2.1 U	10 U	0.96 B	10 U	10 U	1.25 U	2.41	2.1 U	10 U
Sodium	30,800	21,300	37,400	29,500	37,700	20,600	25,100	29,600	22,700	38,000	30,400	40,200
Vanadium	1.03	2.5 U	1.24 J	0.48 U	1.5 J	9.5	1.39	1.09	2.5 U	1.01 J	1.7 J	4.3 J
Zinc	10 U	7.9	12 J	6.8 B	10.2 B	11.4 B	13.7 J	10 U	8.22	20 U	38.1	33
Dissolved Metals (UG/L)												
Aluminum, Dissolved	50 U	92.3	100 U	53.9 B	101 J	91.6	159	50 U	87.7	83.8 B	44.8 B	89.5 J
Arsenic, Dissolved	0.5 U	1.5 U	0.839 J	0.98 U	10 U	0.82 B	1 U	0.5 U	1.5 U	0.787 J	0.98 U	10 U
Barium, Dissolved	53.9	47.3	63.7	60.8	80.2 J	43.3	54.4	57	51.9	59.6	59.8	79.6 J
Cadmium, Dissolved	0.25 U	0.5 U	0.28 J	0.1 U	5 U	1 U	0.5 U	0.25 U	0.5 U	0.5 U	0.1 U	5 U
Calcium, Dissolved	49,000	46,400	67,300	47,700	66,100	44,000	48,800	51,000	50,400	57,600	47,800	65,700
Chromium, Dissolved	10 U	1 U	20 U	0.73 J	1.6 J	4.2 B	2.57 J	10 U	1 U	20 U	0.37 U	5 U
Cobalt, Dissolved	0.5 U	2.5 U	0.589 J	0.25 U	0.99 J	0.44 J	2.29	0.5 U	2.5 U	1 U	0.4 J	50 U
Copper, Dissolved	10 U	2 U	20 U	1.3 J	25 U	1.1 B	20 U	10 U	1.11 J	20 U	2.1 J	25 U
Iron, Dissolved	152	49	100 U	28.9 J	42.9 J	43.8 J	48.8 J	86.1 J	25.5	100 U	39.1 J	33.1 J
Lead, Dissolved	2.5 U	0.75 U	1 U	1 U	10 U	0.14 B	5 U	2.5 U	0.75 U	1 U	1.1 J	10 U
Magnesium, Dissolved	14,900	12,600	18,700	12,400	14,000	13,400	15,200	16,000	13,700	17,800	12,000	14,100
Manganese, Dissolved	54.7	51.3	176	91.1	108	65.3	243	52	53.8	100	163	163
Mercury, Dissolved	0.1 U	0.2 U	0.2 U	0.02 U	0.02 B	0.2 U	0.2 U	0.1 U	0.2 U	0.2 U	0.02 U	0.2 U
Nickel, Dissolved	6.62	5.55	5.15 J	3.6 J	6 J	3.9	10.5	6.58	5.96	4.73 J	4 J	5.4 J
Potassium, Dissolved	3,050	2,530	4,400	3,650	3,720 J	3,310	2,720	3,260	2,770	4,460	3,320	3,670 J
Selenium, Dissolved	50 UJ	1.25 U	2.33	2.1 U	10 U	0.84 B	10 U	25 UJ	1.25 U	2.39	2.1 U	10 U
Silver, Dissolved	0.5 U	0.5 U	1 U	0.52 U	1.2 J	1 U	1 U	0.5 U	0.5 U	1 U	0.52 U	5 U
Sodium, Dissolved	29,800	20,300	37,000	30,800	40,000	20,700	24,600	31,100	22,000	36,700	30,300	39,100

CTO-WE13
ABL, Site 1
Validated Surface Water Detected Analytical Results
2008-2012 LTM

Station ID	1SD-5/1SW-5			1SD-5A/1SW-5A							1SD-5C/1SW-5C	
Sample ID	AS01-SW05-R18	AS01-SW05-R19	AS01-SW05-R20	AS01-SW05A-R14	AS01-SW05A-R15	AS01-SW05A-R16	AS01-SW05A-R17	AS01-SW05A-R18	AS01-SW05A-R19	AS01-SW05A-R20	AS01-SW05C-R14	AS01-SW05C-R15
Sample Date	07/06/11	10/04/11	08/28/12	08/12/08	10/07/08	07/15/09	04/19/10	07/06/11	10/04/11	08/28/12	08/12/08	10/07/08
Chemical Name												
Thallium, Dissolved	0.1 U	1 U	0.2 U	1.1 U	15 U	1 U	0.2 U	0.1 U	1 U	0.2 U	1.1 U	15 U
Vanadium, Dissolved	0.852 J	2.5 U	1 U	0.48 U	2.8 B	4.6	0.937 J	0.779 J	2.5 U	1 U	0.48 U	2.4 B
Zinc, Dissolved	10 U	2.85 J	20 U	4.5 B	5.5 B	4.6 B	7.15 J	10 U	2.69 J	20 U	7 B	6.7 B
Wet Chemistry												
Hardness (mg/l)	182	169	250	162	214	165	186	178	171	196	171	211

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Notes:

Shading indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

MG/L - Milligrams per liter

UG/L - Micrograms per liter

CTO-WE13
ABL, Site 1
Validated Surface Water Detected Analytical Results
2008-2012 LTM

Station ID	1SD-5C/1SW-5C						1SD-7/1SW-7					
Sample ID	AS01-SW05C-R16	AS01-SW05C-R17	AS01-SW05C-R18	AS01-SW05CP-R19	AS01-SW05C-R19	AS01-SW05C-R20	AS01-SW07-R14	AS01-SW07P-R15	AS01-SW07-R15	AS01-1SW07-R16	AS01-SW07P-R17	AS01-SW07-R17
Sample Date	07/15/09	04/19/10	07/06/11	10/04/11	10/04/11	08/28/12	08/14/08	10/09/08	10/09/08	07/17/09	04/20/10	04/20/10
Chemical Name												
Volatile Organic Compounds (UG/L)												
1,4-Dichlorobenzene	1 U	5 U	0.125 U	0.5 U	0.5 U	0.25 U	1 U	5 U	5 U	0.36 L	5 U	5 U
Acetone	5 U	10 R	2.5 U	5 U	5 U	5 UJ	5 B	20 U	20 U	5 UL	4.81 J	4.11 J
Carbon disulfide	1 U	5 U	0.5 U	0.5 U	0.5 U	1 U	0.3 K	5 U	5 U	1 UL	5 U	5 U
Chloroform	1 U	5 U	0.125 U	0.5 U	0.5 U	0.132 J	1 U	5 U	5 U	1 UL	5 U	5 U
Chloromethane	1 U	5 U	0.5 U	0.5 U	0.5 U	1 U	2 U	5 U	5 U	1 UL	5 U	5 U
cis-1,2-Dichloroethene	1 U	5 U	0.25 U	0.5 U	0.5 U	0.5 U	1 U	5 U	5 U	1 UL	5 U	5 U
Dibromochloromethane	1 U	5 U	0.25 U	0.5 U	0.5 U	0.342 J	1 U	5 U	5 U	1 UL	5 U	5 U
Methylene chloride	1 U	5 U	0.25 U	1 U	1 U	0.5 U	5 U	5 U	5 U	1 UL	0.296 B	5 U
Trichloroethene	1 U	5 U	0.25 U	0.5 U	0.5 U	0.5 U	2 U	5 U	5 U	1 UL	5 U	5 U
Total Metals (UG/L)												
Aluminum	197	432	230	337	289	337 B	141 J	196 J	195 J	140	377	369
Antimony	0.24 B	1 U	0.5 U	2 U	2 U	1 U	1.6 U	10 U	10 U	0.18 B	1 U	1 U
Arsenic	1 U	0.551 J	0.5 U	1.5 U	1.5 U	2.19	0.98 U	10 U	10 U	0.28 J	1 U	1 U
Barium	48	55.1	58.3	48.4	52.9	75.3	59.7	76.9 J	76.4 J	48	50.6	51.1
Beryllium	1 U	2 U	1 U	0.5 U	0.5 U	2 U	0.15 U	4 U	4 U	1 U	2 U	2 U
Cadmium	1 U	0.5 U	0.98	0.5 U	0.5 U	0.32 J	0.1 U	5 U	5 U	1 U	0.5 U	0.5 U
Calcium	46,700	50,500	51,600	47,500	53,600	81,500	50,100	62,100	61,800	45,700	52,700	53,400
Chromium	3.4 B	2.87 J	10 U	1 U	1 U	20 U	0.7 J	5 U	5 U	3.7	20 U	20 U
Cobalt	1.1	2.77	0.851 J	1.65 J	2.5 U	1.72 J	0.44 J	50 U	1.1 J	0.54	2.56	2.49
Copper	1 J	20 U	10 U	1.92 J	1.68 J	20 U	1.9 J	25 U	25 U	1 J	20 U	20 U
Iron	270	400	428	576 J	443 J	559	167	158	185	144	295	280
Lead	0.27 J	5 U	2.5 U	0.75 U	0.75 U	0.651 J	1 U	10 U	10 U	0.12 J	5 U	5 U
Magnesium	13,100	15,400	15,600	12,800	14,300	17,400	13,100	14,000	13,900	13,900	15,400	15,000
Manganese	140	298	109 K	131 J	93.4 J	286	112	117	115	81.2	224	219
Mercury	0.2 U	0.2 U	0.1 U	0.2 U	0.2 U	0.2 U	0.02 U	0.036 B	0.033 B	0.2 U	0.2 U	0.2 U
Nickel	4.7	11.3	7.04	7.08	6.84	7.03 J	4.5 J	4.6 J	6.2 J	4.4	11	10.8
Potassium	3,050	2,760	3,340	2,590	2,860	4,160	3,530	3,640 J	3,640 J	3,290	2,690	2,620
Selenium	0.92 B	10 U	5 U	1.25 U	1.25 U	2.59	2.1 U	10 U	10 U	0.91 J	10 U	10 U
Sodium	21,400	25,000	30,900	21,000	23,200	80,200	33,200	40,200	40,200	20,800	26,500	26,400
Vanadium	6.1	1.47	1.18	2.5 U	2.5 U	3.5	0.82 J	1.6 J	2.1 J	7.4	1.48	1.53
Zinc	4.6 B	25.6	17.4 J	13 J	9.95 J	14 J	6.8 B	7.8 B	13.2 B	4.4 J	8.11 J	7.93 J
Dissolved Metals (UG/L)												
Aluminum, Dissolved	80	154	50 U	87.3	83.8	100 U	83.8 J	82.9 J	89.6 J	68.6	196	203
Arsenic, Dissolved	1 U	1 U	0.5 U	1.5 U	1.5 U	1.94 J	0.98 U	10 U	10 U	1 U	1 U	1 U
Barium, Dissolved	48	56	56	50.1	51.4	71.7	60.9	73.2 J	71.4 J	46.8	49.3	51.2
Cadmium, Dissolved	1 U	0.5 U	0.25 U	0.5 U	0.5 U	0.5 U	0.1 U	5 U	5 U	1 U	0.5 U	0.5 U
Calcium, Dissolved	47,700	49,300	50,300	52,000	52,500	85,200	48,000	61,800	61,700	45,100	52,300	53,800
Chromium, Dissolved	3.1 B	2.54 J	10 U	1 U	1 U	20 U	0.72 J	5 U	1.2 J	4.8	20 U	20 U
Cobalt, Dissolved	0.67	2.38	0.5 U	2.5 U	2.5 U	0.977 J	0.25 U	50 U	1.1 J	0.32 J	2.26	2.3
Copper, Dissolved	1 B	20 U	10 U	1.39 J	1.15 J	20 U	2.4 J	25 U	25 U	1.1 J	20 U	20 U
Iron, Dissolved	46.6 J	35.7 J	85.2 J	40.9 J	22.1 J	84.8 J	38.3 J	100 U	100 U	28.9 J	26.4 J	30.3 J
Lead, Dissolved	0.12 B	5 U	2.5 U	0.75 U	0.75 U	1 U	1 U	10 U	10 U	1 U	5 U	5 U
Magnesium, Dissolved	13,500	15,600	15,400	14,000	14,100	17,300	12,600	13,800	13,500	13,500	15,000	15,600
Manganese, Dissolved	94.2	267	66.7	61.6	55.3	215	76.2	82.7	82.7	60.1	223	236
Mercury, Dissolved	0.2 U	0.2 U	0.1 U	0.2 U	0.2 U	0.2 U	0.02 U	0.017 J	0.018 B	0.2 U	0.2 U	0.2 U
Nickel, Dissolved	3.9	10.9	7.1	5.75	5.82	5.53 J	3.8 J	5 J	5.2 J	4	10.4	12.6
Potassium, Dissolved	3,190	2,760	3,130	2,800	2,830	4,120	3,570	3,500 J	3,520 J	3,270	2,600	2,700
Selenium, Dissolved	0.57 B	10 U	25 UJ	1.25 U	1.25 U	2.74	2.1 U	10 U	10 U	0.62 B	10 U	10 U
Silver, Dissolved	1 U	1 U	0.5 U	0.5 U	0.5 U	1 U	0.52 U	0.78 J	1.1 J	1 U	1 U	1 U
Sodium, Dissolved	21,800	25,300	30,900	22,800	23,000	80,400	32,400	39,000	38,600	19,800	26,200	27,100

CTO-WE13
ABL, Site 1
Validated Surface Water Detected Analytical Results
2008-2012 LTM

Station ID	1SD-5C/1SW-5C						1SD-7/1SW-7					
Sample ID	AS01-SW05C-R16	AS01-SW05C-R17	AS01-SW05C-R18	AS01-SW05CP-R19	AS01-SW05C-R19	AS01-SW05C-R20	AS01-SW07-R14	AS01-SW07P-R15	AS01-SW07-R15	AS01-1SW07-R16	AS01-SW07P-R17	AS01-SW07-R17
Sample Date	07/15/09	04/19/10	07/06/11	10/04/11	10/04/11	08/28/12	08/14/08	10/09/08	10/09/08	07/17/09	04/20/10	04/20/10
Chemical Name												
Thallium, Dissolved	0.24 J	0.2 U	0.1 U	1 U	1 U	0.2 U	1.1 U	15 U	15 U	1 U	0.2 U	0.2 U
Vanadium, Dissolved	4.3	0.908 J	0.705 J	2.5 U	2.5 U	2.62	0.48 U	1.3 B	3.8 B	4.5	1.16	1.18
Zinc, Dissolved	4.1 B	17.7 J	10 U	6.12 J	4.26 J	20 U	8.2 B	6.7 B	6.9 B	4.2 J	20 U	20 U
Wet Chemistry												
Hardness (mg/l)	171	192	186	167	173	280	179	213	212	171	180	182

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Notes:

Shading indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

K - Analyte present, value may be biased high, actual value may be lower

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MG/L - Milligrams per liter

UG/L - Micrograms per liter

CTO-WE13
ABL, Site 1
Validated Surface Water Detected Analytical Results
2008-2012 LTM

Station ID	1SD-7/1SW-7			1SD-9/1SW-9								1SD-9/1SW-9	1SW-7A
Sample ID	AS01-SW07-R18	AS01-SW07-R19	AS01-SW07-R20	AS01-SW09P-R14	AS01-SW09-R14	AS01-SW09-R15	AS01-SW09P-R16	AS01-SW09-R16	AS01-SW09-R17	AS01-SW09-R18	AS01-SW09-R19	AS01-SW09-R20	AS01-SW07A-R14
Sample Date	07/07/11	10/05/11	08/29/12	08/13/08	08/13/08	10/07/08	07/16/09	07/16/09	04/19/10	07/07/11	10/04/11	08/28/12	08/14/08
Chemical Name													
Volatile Organic Compounds (UG/L)													
1,4-Dichlorobenzene	0.125 U	0.5 U	0.25 U	1 U	1 U	5 U	0.23 J	0.24 J	5 U	0.125 U	0.5 U	0.25 U	1 U
Acetone	2.5 U	5 U	5 UJ	5 B	5 B	20 U	5 U	5 U	10 R	2.5 U	5 U	5 UJ	3 B
Carbon disulfide	0.5 U	0.5 U	1 U	1 U	1 U	5 U	1 U	1 U	5 U	0.5 U	0.5 U	1 U	0.3 K
Chloroform	0.125 U	0.5 U	0.25 U	1 U	1 U	5 U	1 U	1 U	5 U	0.125 U	0.5 U	0.25 U	1 U
Chloromethane	0.5 U	0.5 U	1 U	2 U	2 U	5 U	1 U	1 U	5 U	0.5 U	0.5 U	1 U	2 U
cis-1,2-Dichloroethene	0.25 U	0.5 U	0.5 U	1 U	1 U	5 U	1 U	1 U	0.755 J	0.299 J	0.5 U	0.5 U	1 U
Dibromochloromethane	0.25 U	0.5 U	0.5 U	1 U	1 U	5 U	1 U	1 U	5 U	0.25 U	0.5 U	0.5 U	1 U
Methylene chloride	0.25 U	1 U	0.5 U	5 U	5 U	5 U	1 U	1 U	5 U	0.25 U	1 U	0.5 U	5 U
Trichloroethene	0.25 U	0.5 U	0.5 U	2 U	2 U	5 U	1 U	1 U	0.437 J	0.25 U	0.5 U	0.5 U	2 U
Total Metals (UG/L)													
Aluminum	157	260	96.8 J	167 J	219 J	167 J	121	128	380	159	260	278 B	158 J
Antimony	0.5 U	2 U	1 U	1.6 U	1.6 U	10 U	0.13 B	0.16 B	1 U	0.5 U	2 U	1 U	1.6 U
Arsenic	0.5 U	1.5 U	0.952 J	0.98 U	0.98 U	10 U	1 U	1 U	1 U	0.5 U	1.5 U	0.948 J	0.98 U
Barium	54.1	53.1	68.7	63.7	63.7	81.2 J	44	45.3	56.8	53.6	51.9	66.1	61.1
Beryllium	1 U	0.5 U	2 U	0.15 U	0.15 U	4 U	1 U	1 U	2 U	1 U	0.5 U	2 U	0.15 U
Cadmium	0.25 U	0.5 U	0.42 J	0.1 U	0.1 U	5 U	1 U	1 U	0.5 U	0.25 U	0.5 U	0.5 U	0.1 U
Calcium	51,500	50,200	68,800	48,600	48,400	63,400	42,700	44,700	51,000	47,900	51,000	66,300	48,300
Chromium	10 U	1 U	20 U	0.88 J	0.39 J	5 U	4.3	3.9	2.8 J	10 U	1 U	20 U	0.76 J
Cobalt	0.636 J	2.5 U	0.652 J	0.66 J	1 J	50 U	0.52	0.5	2.72	0.512 J	2.5 U	0.905 J	0.54 J
Copper	10 U	1.28 J	20 U	2.8 J	2.2 J	25 U	0.74 J	0.85 J	20 U	10 U	1.73 J	20 U	2.2 J
Iron	340	368	229	220	269	142	141	143	341	303	367	418	163
Lead	2.5 U	0.75 U	1 U	1.6 J	2 J	10 U	0.12 J	0.11 J	5 U	2.5 U	0.75 U	1 U	2.9 J
Magnesium	14,300	13,700	16,700	12,600	12,500	13,800	13,000	13,400	16,000	14,000	13,600	18,200	12,600
Manganese	81.8 K	81.1	142	130	150	141	75.2	77	303	81.2 K	79.3	194	112
Mercury	0.1 U	0.2 U	0.105 J	0.02 U	0.02 U	0.2 U	0.2 U	0.2 U	0.2 U	0.1 U	0.2 U	0.2 U	0.02 U
Nickel	5.96	6.27	5.52 J	4.9 J	5.3 J	5.7 J	3.9	4.3	11.3	5.88	6.4	5.81 J	4.4 J
Potassium	2,770	2,770	5,670	3,500	3,530	3,690 J	3,180	3,280	2,740	2,880	2,780	5,140	3,600
Selenium	25 U	1.25 U	3.26	2.1 U	2.1 U	10 U	0.46 J	0.86 J	10 U	5 U	1.25 U	2.58	2.1 U
Sodium	26,900	21,800	53,500	32,900	32,700	38,800	19,900	20,400	24,900	27,300	21,600	42,000	32,400
Vanadium	1.17	2.5 U	0.566 J	0.48 U	0.48 U	1.8 J	7.6	6.8	1.32	1.02	2.5 U	0.871 J	0.48 U
Zinc	10 U	6.92 K	20 U	12.1 J	9.4 J	10.8 B	35	3.1 J	12.6 J	10 U	8.95	20 U	7.4 B
Dissolved Metals (UG/L)													
Aluminum, Dissolved	50 U	88.9	100 U	62.8 B	75.9 B	94.8 J	78.5	80.5	151	50 U	98.3	100 U	80.3 J
Arsenic, Dissolved	0.5 U	1.5 U	0.869 J	0.98 U	0.98 U	10 U	1 U	0.43 B	1 U	0.5 U	1.5 U	0.927 J	0.98 U
Barium, Dissolved	53.6	50.7	69.7	59.8	64.4	90.2 J	44.1	44.5	55.6	54	51.5	61.9	61.5
Cadmium, Dissolved	0.25 U	0.5 U	0.4 J	0.1 U	0.1 U	5 U	1 U	1 U	0.5 U	0.25 U	0.5 U	0.33 J	0.1 U
Calcium, Dissolved	51,600	50,100	70,400	45,500	49,400	66,100	42,800	43,600	52,000	51,400	49,400	63,700	47,300
Chromium, Dissolved	10 U	1 U	20 U	0.37 U	0.38 J	1.5 J	4.7	4.2	2.67 J	10 U	1 U	20 U	0.69 J
Cobalt, Dissolved	0.5 U	2.5 U	1 U	0.25 U	0.25 U	1.8 J	0.37 J	0.37 J	2.43	0.5 U	2.5 U	1 U	0.25 U
Copper, Dissolved	10 U	2 U	20 U	2 J	1.6 J	25 U	0.92 J	0.97 J	20 U	10 U	1.56 J	20 U	2.1 J
Iron, Dissolved	150	21.7 J	100 U	59.9 J	38.8 J	219	34.7 J	33.3 J	51.6 J	115	34.5	100 U	39.8 J
Lead, Dissolved	2.5 U	0.75 U	1 U	1 J	1.7 J	10 U	1 U	1 U	5 U	2.5 U	0.75 U	1 U	1.4 J
Magnesium, Dissolved	14,200	13,400	17,300	11,700	12,800	14,100	13,000	13,100	15,600	14,500	13,500	17,600	12,400
Manganese, Dissolved	53.5	54.4	113	124	130	543	70.1	71.2	300	53.3	54.9	172	74.2
Mercury, Dissolved	0.1 U	0.2 U	0.111 J	0.02 U	0.02 U	0.025 B	0.2 U	0.2 U	0.2 U	0.1 U	0.2 U	0.2 U	0.02 U
Nickel, Dissolved	7.35	5.36	5.23 J	3.5 J	4 J	6.1 J	3.7	4.2	10.7	6.47	6.04	5 J	4.2 J
Potassium, Dissolved	2,810	2,730	5,920	3,320	3,510	3,720 J	3,190	3,250	2,740	2,970	2,790	4,940	3,640
Selenium, Dissolved	5 UJ	1.25 U	2.58	2.1 U	2.1 U	10 U	0.95 B	0.82 B	10 U	5 UJ	1.25 U	2.75	2.1 U
Silver, Dissolved	0.5 U	0.5 U	1 U	0.52 U	0.52 U	1.1 J	1 U	1 U	1 U	0.5 U	0.5 U	1 U	0.52 U
Sodium, Dissolved	27,000	21,300	55,700	31,200	33,700	38,900	19,200	19,400	25,000	27,300	21,900	40,400	32,100

CTO-WE13
ABL, Site 1
Validated Surface Water Detected Analytical Results
2008-2012 LTM

Station ID	1SD-7/1SW-7			1SD-9/1SW-9								1SD-9/1SW-9	1SW-7A
Sample ID	AS01-SW07-R18	AS01-SW07-R19	AS01-SW07-R20	AS01-SW09P-R14	AS01-SW09-R14	AS01-SW09-R15	AS01-SW09P-R16	AS01-SW09-R16	AS01-SW09-R17	AS01-SW09-R18	AS01-SW09-R19	AS01-SW09-R20	AS01-SW07A-R14
Sample Date	07/07/11	10/05/11	08/29/12	08/13/08	08/13/08	10/07/08	07/16/09	07/16/09	04/19/10	07/07/11	10/04/11	08/28/12	08/14/08
Chemical Name													
Thallium, Dissolved	0.1 U	1 U	0.2 U	1.4 J	1.1 U	15 U	1 U	1 U	0.2 U	0.1 U	1 U	0.2 U	1.1 U
Vanadium, Dissolved	0.926 J	2.5 U	1 U	0.48 U	0.48 J	2 B	6.2	3.1	1.2	0.75 J	2.5 U	1 U	0.5 J
Zinc, Dissolved	10 U	2.42 K	20 U	4.9 B	5.7 B	21.2	3.1 J	3 J	7.16 J	10 U	5.58	20 U	5.9 B
Wet Chemistry													
Hardness (mg/l)	188	172	234	173	172	215	160	167	186	178	175	238	172

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Notes:

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NA - Not analyzed
B - Analyte not detected above the level reported in blanks
J - Analyte present, value may or may not be accurate or precise
K - Analyte present, value may be biased high, actual value may be lower
L - Analyte present, value may be biased low, actual value may be higher
R - Unreliable Result
U - The material was analyzed for, but not detected
UJ - Analyte not detected, quantitation limit may be inaccurate
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MG/L - Milligrams per liter
UG/L - Micrograms per liter

CTO-WE13
ABL, Site 5
Validated Groundwater Exceedance Analytical Results
2008-2012 LTM

Station ID	**CLEAN MCL-Groundwater**	5GW03	5GW09	5GW13						
Sample ID		AS05-5GW03-R23	AS05-5GW09-R23	AS05-5GW13-R17	AS05-5GW13-R18	AS05-5GW13-R19	AS05-5GW13-R20	AS05-5GW13-R21	AS05-5GW13-R22	AS05-5GW13-R23
Sample Date		08/22/12	08/21/12	02/01/08	10/22/08	07/09/09	04/22/10	01/15/11	10/11/11	08/22/12
Chemical Name										
Volatile Organic Compounds (UG/L)										
Benzene	5	0.25 U	0.25 U	0.5 U	5 U	1 U	5 U	0.125 U	0.5 U	0.25 U
Carbon disulfide	--	1 U	1 U	0.5 U	5 U	1 U	5 U	0.5 U	0.5 U	1 U
Chloromethane	--	1 U	1 U	0.5 U	5 U	1 U	**0.526 J**	0.5 U	0.5 U	1 U
cis-1,2-Dichloroethene	70	**0.89 J**	**1.72**	**1**	**2.5 J**	**3**	**1.38 J**	**6.02**	**3.43**	**3.1**
Dichlorodifluoromethane (Freon-12)	--	**1.07**	0.5 U	0.5 U	5 U	1 U	5 U	0.25 U	1 U	0.5 U
trans-1,2-Dichloroethene	100	0.5 U	0.5 U	0.5 U	5 U	1 U	5 U	0.25 U	0.5 U	0.5 U
Trichloroethene	5	**9.1**	**22.2**	**9 L**	**5.6**	**7.9**	**9.11**	**8.83**	**6.88**	**5.93**
Vinyl chloride	2	0.5 U	0.5 U	0.5 U	5 U	1 U	2 U	**0.312 J**	0.5 U	0.5 U
Total Metals (UG/L)										
Iron	--	680 B	**3,370**	59.7 B	**598**	**403**	**33.6 J**	**1,850**	**775**	**884**
Manganese	--	**298**	**1,730**	**464**	**3,420**	**1,960**	**245**	**3,450**	**2,830**	**2,020**
Dissolved Metals (UG/L)										
Iron, Dissolved	--	100 U	**2,870**	**148**	**354**	**209**	**47.8 J**	**1,340**	**738**	**788**
Manganese, Dissolved	--	**12.6**	**1,760**	**638**	**2,700**	**1,490**	**183 L**	**1,920**	**2,190**	**1,430**

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UG/L - Micrograms per liter

CTO-WE13
ABL, Site 5
Validated Groundwater Exceedance Analytical Results
2008-2012 LTM

Station ID	CLEAN MCL-Groundwater	5GW17							
Sample ID		AS05-5GW17-R17	AS05-5GW17PDB-R18	AS05-5GW17-R18	AS05-5GW17RPP-R18	AS05-5GW17P-R19	AS05-5GW17-R19	AS05-5GW17-R20	AS05-5GW17-R21
Sample Date		02/01/08	10/12/08	10/21/08	10/21/08	07/09/09	07/09/09	04/21/10	01/15/11
Chemical Name									
Volatile Organic Compounds (UG/L)									
Benzene	5	0.5 U	5 U	5 U	NA	1 U	1 U	5 U	0.125 U
Carbon disulfide	--	0.5 U	5 U	5 U	NA	1 U	1 U	5 U	0.5 U
Chloromethane	--	0.5 U	5 U	5 U	NA	1 U	1 U	5 U	0.5 U
cis-1,2-Dichloroethene	70	**2**	**3 J**	**3.9 J**	NA	**3.3**	**3.3**	**2.58 J**	**4.25 J**
Dichlorodifluoromethane (Freon-12)	--	0.5 U	5 U	5 U	NA	1 U	1 U	5 U	0.25 U
trans-1,2-Dichloroethene	100	**0.3 J**	5 U	5 U	NA	1 U	1 U	5 U	0.25 U
Trichloroethene	5	**10**	**13**	**14**	NA	**13**	**12**	**8.63**	**14**
Vinyl chloride	2	0.5 U	5 U	5 U	NA	1 U	1 U	2 U	0.25 U
Total Metals (UG/L)									
Iron	--	**80,300**	NA	196 B	100 U	**3,990**	**6,150**	**448**	**2,840**
Manganese	--	**199**	NA	**482**	17.1 B	**547**	**470**	**131**	**193**
Dissolved Metals (UG/L)									
Iron, Dissolved	--	28.5 B	NA	100 U	NA	**81.8 J**	**242**	**419**	**162**
Manganese, Dissolved	--	**115**	NA	**492**	NA	**567**	**530**	**262 L**	**188**

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CTO-WE13
ABL, Site 5
Validated Groundwater Exceedance Analytical Results
2008-2012 LTM

Station ID	CLEAN MCL-Groundwater	5GW17			5GW18							
Sample ID		AS05-5GW17P-R22	AS05-5GW17-R22	AS05-5GW17-R23	AS05-5GW18-R17	AS05-5GW18PDB-R18	AS05-5GW18RPP-R18	AS05-5GW18P-R18	AS05-5GW18-R18	AS05-5GW18-R19	AS05-5GW18P-R20	AS05-5GW18-R20
Sample Date		10/11/11	10/11/11	08/22/12	02/01/08	10/21/08	10/21/08	10/22/08	10/22/08	07/09/09	04/21/10	04/21/10
Chemical Name												
Volatile Organic Compounds (UG/L)												
Benzene	5	0.5 U	0.5 U	0.25 U	0.5 U	5 U	NA	5 U	5 U	1 U	5 U	5 U
Carbon disulfide	--	0.5 U	0.5 U	1 U	0.5 U	5 U	NA	5 U	5 U	1 U	5 U	5 U
Chloromethane	--	0.5 U	0.5 U	1 U	0.5 U	5 U	NA	5 U	5 U	1 U	5 U	5 U
cis-1,2-Dichloroethene	70	**2.17**	**2.1**	**6.44**	**11**	**7.6**	NA	**9.7**	**9.9**	**6.6**	**4.72 J**	**4.79 J**
Dichlorodifluoromethane (Freon-12)	--	1 U	1 U	0.5 U	0.5 U	5 U	NA	5 U	5 U	1 U	5 U	5 U
trans-1,2-Dichloroethene	100	0.5 U	0.5 U	0.5 U	**0.3 J**	**0.77 J**	NA	5 U	5 U	**0.31 J**	5 U	5 U
Trichloroethene	5	**7.55**	**7.19**	**11.8**	**39**	**11**	NA	**15**	**15**	**35**	**38.2**	**38.2**
Vinyl chloride	2	0.5 U	0.5 U	0.5 U	**3**	**2.8 J**	NA	**2.4 J**	**2.4 J**	**0.55 J**	2 U	2 U
Total Metals (UG/L)												
Iron	--	**15,100 J**	**10,400 J**	**628**	**20,700**	NA	**10,200**	**12,200**	**12,400**	**5,400**	**165 J**	**123 J**
Manganese	--	**105**	**92**	**1,580**	**383**	NA	**330**	**412**	**414**	**175**	22.7 B	23.6 B
Dissolved Metals (UG/L)												
Iron, Dissolved	--	**15.4 J**	**17.2 J**	**119 J**	**11,300**	NA	NA	**12,100**	**12,700**	**1,670**	**104**	**68.5 J**
Manganese, Dissolved	--	**39.1**	**45.6**	**1,110**	**471**	NA	NA	**413**	**426**	**141**	22.5 B	23.2 B

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UG/L - Micrograms per liter

CTO-WE13
ABL, Site 5
Validated Groundwater Exceedance Analytical Results
2008-2012 LTM

Station ID	CLEAN MCL-Groundwater	5GW18				5GW19	5GW20	5GW21	5GW22	5GW25		
Sample ID		AS05-5GW18-R21	AS05-5GW18-R22	AS05-5GW18P-R23	AS05-5GW18-R23	AS05-5GW19-R23	AS05-5GW20-R23	AS05-5GW21-R23	AS05-5GW22-R23	AS05-5GW25P-R17	AS05-5GW25-R17	AS05-5GW25PDB-R18
Sample Date		01/15/11	10/11/11	08/21/12	08/21/12	08/22/12	08/22/12	08/22/12	08/22/12	01/31/08	01/31/08	10/21/08
Chemical Name												
Volatile Organic Compounds (UG/L)												
Benzene	5	0.125 U	0.5 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	**0.3 J**	**0.3 J**	5 U
Carbon disulfide	--	0.5 U	0.5 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	5 U
Chloromethane	--	**0.636 J**	0.5 U	1 U	1 U	1 U	1 U	1 U	1 U	0.5 U	0.5 U	5 U
cis-1,2-Dichloroethene	70	**7.38**	**5.38**	**6.42**	**6.35**	0.5 U	**0.393 J**	0.5 U	**2.48**	**1**	**1**	**2.7 J**
Dichlorodifluoromethane (Freon-12)	--	0.25 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	5 U
trans-1,2-Dichloroethene	100	**0.899 J**	**1**	**0.996 J**	**0.973 J**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	5 U
Trichloroethene	5	**33.1**	**28.9**	**34.2**	**36.9**	0.5 U	**12.1**	**0.389 J**	**47.1**	0.5 U	0.5 U	5 U
Vinyl chloride	2	**1.14 J**	**0.885 J**	**0.718 J**	**0.74 J**	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	5 U
Total Metals (UG/L)												
Iron	--	**3,440**	**2,760**	**3,520 J**	**2,770 J**	**2,780**	**4,090**	**3,270**	**2,190**	**4,240**	**3,880**	NA
Manganese	--	**348**	**184**	**135**	**130**	**459**	**111**	**6.6**	**88.7**	**651**	**662**	NA
Dissolved Metals (UG/L)												
Iron, Dissolved	--	**2,930**	**876**	**1,170**	**1,130**	100 U	**63.9 J**	**90.3 J**	**61.3 J**	**3,910**	**3,960**	NA
Manganese, Dissolved	--	**340**	**141**	**122**	**123**	**26.6**	**2.96 J**	**37**	**4.9**	**662**	**668**	NA

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UG/L - Micrograms per liter

CTO-WE13
ABL, Site 5
Validated Groundwater Exceedance Analytical Results
2008-2012 LTM

Station ID	CLEAN MCL-Groundwater	5GW25							
Sample ID		AS05-5GW25-R18	AS05-5GW25RPP-R18	AS05-5GW25-R19	AS05-5GW25-R20	AS05-5GW25P-R21	AS05-5GW25-R21	AS05-5GW25-R22	AS05-5GW25-R23
Sample Date		10/21/08	10/21/08	07/09/09	04/21/10	01/15/11	01/15/11	10/11/11	08/22/12
Chemical Name									
Volatile Organic Compounds (UG/L)									
Benzene	5	5 U	NA	**0.39 J**	**0.385 J**	**0.544 J**	**0.544 J**	**0.544 J**	**0.638**
Carbon disulfide	--	5 U	NA	1 U	**0.592 J**	0.5 U	0.5 U	0.5 U	1 U
Chloromethane	--	5 U	NA	1 U	5 U	0.5 U	0.5 U	0.5 U	1 U
cis-1,2-Dichloroethene	70	**2.3 J**	NA	**3.1**	**3.88 J**	**5.11**	**4.93 J**	**5.83**	**6.82**
Dichlorodifluoromethane (Freon-12)	--	5 U	NA	1 U	5 U	0.25 U	0.25 U	1 U	0.5 U
trans-1,2-Dichloroethene	100	5 U	NA	1 U	5 U	0.25 U	0.25 U	0.5 U	0.5 U
Trichloroethene	5	5 U	NA	**0.34 J**	**0.268 J**	**0.268 J**	**0.3 J**	**0.298 J**	0.5 U
Vinyl chloride	2	5 U	NA	1 U	2 U	0.25 U	0.25 U	0.5 U	**0.264 J**
Total Metals (UG/L)									
Iron	--	**5,250**	**3,610**	**4,580**	**4,580**	**5,150**	**5,170**	**7,010**	**8,150**
Manganese	--	**660**	**508**	**657**	**616**	**586**	**562**	**500**	**401**
Dissolved Metals (UG/L)									
Iron, Dissolved	--	**3,780**	NA	**4,140**	**4,210**	**4,040**	**4,020**	**4,510**	**3,320**
Manganese, Dissolved	--	**627**	NA	**639**	**611 L**	**591**	**582**	**481**	**385**

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UG/L - Micrograms per liter

CTO-WE13
ABL, Site 10
Validated Groundwater Exceedance Analytical Results
2008-2012 LTM

Station ID	CLEAN MCL-Groundwater	10EW35							10EW36					
Sample ID		AS10-10EW35-R13	AS10-10EW35-R14	AS10-10EW35-R15	AS10-10EW35-R16	AS10-10EW35-R17	AS10-10EW35P-R18	AS10-10EW35-R18	AS10-10EW36-R13	AS10-10EW36-R14	AS10-10EW36-R15	AS10-10EW36-R16	AS10-10EW36-R18	AS10-10EW36-R19
Sample Date		01/28/08	10/16/08	07/22/09	04/22/10	01/15/11	10/12/11	10/12/11	01/28/08	10/16/08	07/22/09	04/22/10	10/12/11	08/28/12
Chemical Name														
Volatile Organic Compounds (UG/L)														
1,1,1-Trichloroethane	200	10 U	5 U	**0.48 J**	**0.647 J**	**0.783 J**	**0.642 J**	**0.63 J**	**2 J**	**1.9 J**	**1.4 J**	**1.29 J**	0.5 U	**0.952 J**
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	--	**43**	**55**	**22**	**28.2**	**33.4**	**24.9**	**25.1**	**5 J**	**7.1**	**2.3 J**	**2.61 J**	**7.01**	**4.89 J**
1,1-Dichloroethane	--	10 U	5 U	1 U	5 U	**0.161 J**	0.5 U	0.5 U	10 U	5 U	4 UJ	**0.212 J**	0.5 U	**0.132 J**
1,1-Dichloroethene	7	10 U	5 U	1 U	5 U	0.5 U	0.5 U	0.5 U	10 U	5 U	4 UJ	5 U	0.5 U	1 U
1,2-Dichloroethene (total)	70	**1 J**	NA	NA	NA	NA	NA	NA	**33**	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	--	10 U	5 U	5 U	5 U	2.5 U	2.5 U	2.5 U	10 U	5 U	20 UJ	5 U	2.5 U	5 U
Acetone	--	10 U	20 U	5 U	10 R	2.5 R	5 U	5 U	10 U	20 U	20 UJ	10 R	5 U	5 U
Benzene	5	10 U	5 U	1 U	5 U	0.125 U	0.5 U	0.5 U	10 U	5 U	4 UJ	5 U	0.5 U	0.25 U
Carbon tetrachloride	5	10 U	5 U	1 U	5 U	0.25 U	0.5 U	0.5 U	10 U	5 U	4 UJ	5 U	0.5 U	0.5 U
Chlorobenzene	100	10 U	5 U	1 U	5 U	0.125 U	0.5 U	0.5 U	10 U	**0.59 J**	4 UJ	5 U	0.5 U	0.25 U
Chloroform	80	10 U	5 U	1 U	5 U	0.129 B	0.5 U	0.5 U	10 U	5 U	4 UJ	**0.127 J**	0.5 U	0.25 U
cis-1,2-Dichloroethene	70	**1 J**	**1.9 J**	**1.2**	**1.54 J**	**4.31 J**	**1.94**	**2.01**	**33**	**29**	**29 J**	**24.3**	0.5 U	**33.9**
Dichlorodifluoromethane (Freon-12)	--	10 U	5 U	1 U	5 U	0.25 U	1 U	1 U	10 U	5 U	4 UJ	5 U	1 U	0.5 U
Methylene chloride	5	10 U	5 U	1 U	0.268 B	0.25 U	1 U	1 U	10 U	5 U	4 UJ	0.467 B	1 U	0.5 U
Tetrachloroethene	5	**3 J**	**2.4 J**	**2.3**	**2.44 J**	**2.89 J**	**2.61**	**2.52**	**3 J**	**2.3 J**	**1.6 J**	**2.63 J**	0.5 U	**3.44 J**
trans-1,2-Dichloroethene	100	10 U	5 U	1 U	5 U	0.25 U	0.5 U	0.5 U	10 U	5 U	4 UJ	**0.693 J**	0.5 U	**0.862 J**
Trichloroethene	5	**27**	**33**	**18**	**23.6**	**23.6**	**22.5**	**22.3**	**71**	**61**	**49 J**	**61.8**	**2.19**	**71.7**
Trichlorofluoromethane (Freon-11)	--	10 U	5 U	**0.4 J**	**0.522 J**	**0.706 J**	1 U	1 U	**2 J**	**1.4 J**	4 UJ	**1.04 J**	1 U	**0.732 J**
Vinyl chloride	2	10 U	5 U	1 U	2 U	0.25 U	0.5 U	0.5 U	10 U	5 U	4 UJ	**0.632 J**	0.5 U	**0.466 J**
Semivolatile Organic Compounds (UG/L)														
2-Methylnaphthalene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives (UG/L)														
2-Nitrotoluene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Metals (UG/L)														
Aluminum	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	1,300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Metals (UG/L)														
Aluminum, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic, Dissolved	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium, Dissolved	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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ABL, Site 10
Validated Groundwater Exceedance Analytical Results
2008-2012 LTM

Station ID	CLEAN MCL-Groundwater	10EW37								10EW38					
Sample ID		AS10-10EW37-R13	AS10-10EW37-R14	AS10-10EW37-R15	AS10-10EW37-R16	AS10-10EW37-R17	AS10-10EW37-R18	AS10-10EW37P-R19	AS10-10EW37-R19	AS10-10EW38-R13	AS10-10EW38-R14	AS10-10EW38-R15	AS10-10EW38-R16	AS10-10EW38-R17	AS10-10EW38-R18
Sample Date		01/28/08	10/16/08	07/22/09	04/22/10	01/15/11	10/12/11	08/29/12	08/29/12	01/28/08	10/16/08	07/22/09	04/22/10	01/15/11	10/12/11
Chemical Name															
Volatile Organic Compounds (UG/L)															
1,1,1-Trichloroethane	200	10 U	500 U	100 U	**0.356 J**	0.25 U	0.5 U	0.5 U	0.5 U	10 U	5 U	1 U	5 U	0.25 U	**1.14**
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	--	**1,300**	**9,100**	**1,800**	**323**	**6,800**	**894**	**475**	**416**	**44**	**120**	**14**	**4.56 J**	**162**	**3.3**
1,1-Dichloroethane	--	10 U	500 U	100 U	5 U	0.125 U	0.5 U	0.25 U	0.25 U	10 U	5 U	1 U	5 U	0.125 U	0.5 U
1,1-Dichloroethene	7	10 U	500 U	100 U	5 U	0.5 U	0.5 U	1 U	1 U	10 U	5 U	1 U	5 U	0.5 U	**0.492 J**
1,2-Dichloroethene (total)	70	10 U	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	--	10 U	500 U	500 U	5 U	2.5 U	2.5 U	5 R	5 R	10 U	5 U	5 U	5 U	2.5 U	2.5 U
Acetone	--	10 U	2,000 U	500 U	10 R	2.5 R	5 U	5 R	5 R	10 U	20 U	5 U	10 R	2.5 R	5 U
Benzene	5	10 U	500 U	100 U	5 U	0.125 U	0.5 U	0.25 U	0.25 U	10 U	5 U	1 U	5 U	0.125 U	0.5 U
Carbon tetrachloride	5	10 U	500 U	100 U	5 U	0.25 U	0.5 U	0.5 U	0.5 U	10 U	5 U	1 U	5 U	0.25 U	0.5 U
Chlorobenzene	100	10 U	500 U	100 U	5 U	0.125 U	0.5 U	0.25 U	0.25 U	10 U	5 U	1 U	5 U	0.125 U	0.5 U
Chloroform	80	10 U	500 U	100 U	**0.234 J**	0.199 B	0.5 U	0.25 U	0.25 U	10 U	5 U	1 U	5 U	0.162 B	0.5 U
cis-1,2-Dichloroethene	70	10 U	500 U	100 U	**0.565 J**	**1.03 J**	**0.944 J**	**0.764 J**	**0.724 J**	10 U	5 U	1 U	5 U	**0.252 J**	**29.1**
Dichlorodifluoromethane (Freon-12)	--	10 U	500 U	100 U	5 U	0.25 U	**16.3**	0.5 U	0.5 U	10 U	5 U	1 U	5 U	0.25 U	1 U
Methylene chloride	5	10 U	500 U	**36 J**	0.265 B	0.25 U	1 U	0.5 U	0.5 U	10 U	5 U	1 U	0.43 B	0.25 U	1 U
Tetrachloroethene	5	10 U	500 U	100 U	**0.322 J**	0.25 U	**0.362 J**	**0.268 J**	**0.298 J**	10 U	5 U	1 U	5 U	0.25 U	**2.55**
trans-1,2-Dichloroethene	100	10 U	500 U	100 U	5 U	0.25 U	0.5 U	0.5 U	0.5 U	10 U	5 U	1 U	5 U	0.25 U	**0.707 J**
Trichloroethene	5	**10**	500 U	100 U	**17.9**	**8.87**	**12.7**	**10.8**	**10.7**	**3 J**	**5.9**	**2.4**	**1.83 J**	**4.77 J**	**69.2**
Trichlorofluoromethane (Freon-11)	--	10 U	500 U	100 U	**1.32 J**	**0.815 J**	**0.864 J**	1 U	1 U	10 U	5 U	1 U	5 U	**0.626 J**	**0.862 J**
Vinyl chloride	2	10 U	500 U	100 U	2 U	0.25 U	0.5 U	0.5 U	0.5 U	10 U	5 U	1 U	2 U	0.25 U	**0.447 J**
Semivolatile Organic Compounds (UG/L)															
2-Methylnaphthalene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives (UG/L)															
2-Nitrotoluene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Metals (UG/L)															
Aluminum	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	1,300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Metals (UG/L)															
Aluminum, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic, Dissolved	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium, Dissolved	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

UG/L - Micrograms per liter

CTO-WE13
ABL, Site 10
Validated Groundwater Exceedance Analytical Results
2008-2012 LTM

Station ID	CLEAN MCL-Groundwater	10EW39							10EW40					
Sample ID		AS10-10EW39-R13	AS10-10EW39-R14	AS10-10EW39-R15	AS10-10EW39P-R16	AS10-10EW39-R16	AS10-10EW39-R17	AS10-10EW39-R19	AS10-10EW40-R13	AS10-10EW40P-R14	AS10-10EW40-R14	AS10-10EW40-R15	AS10-10EW40-R16	AS10-10EW40-R17
Sample Date		01/28/08	10/16/08	07/22/09	04/22/10	04/22/10	01/15/11	08/28/12	01/28/08	10/16/08	10/16/08	07/22/09	04/22/10	01/15/11
Chemical Name														
Volatile Organic Compounds (UG/L)														
1,1,1-Trichloroethane	200	**2 J**	5 U	**0.6 J**	**0.987 J**	**0.892 J**	**0.614 J**	**0.471 J**	**1 J**	5 U	5 U	5 U	**0.78 J**	**0.691 J**
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	--	**2 J**	**4.7 J**	**1.2**	5 U	5 U	2 U	4 U	**2 J**	**6.4**	**6.5**	**2.5 J**	5 UL	**2.15 J**
1,1-Dichloroethane	--	10 U	5 U	**0.37 J**	**0.394 J**	**0.369 J**	**0.352 J**	**0.22 J**	10 U	5 U	5 U	5 U	**0.452 J**	**0.486 J**
1,1-Dichloroethene	7	**1 J**	**1.1 J**	**0.45 J**	**0.635 J**	**0.644 J**	**0.659 J**	1 U	10 U	**1.3 J**	5 U	5 U	**0.807 J**	**0.89 J**
1,2-Dichloroethene (total)	70	**20**	NA	NA	NA	NA	NA	NA	**20**	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	--	10 U	5 U	5 U	5 U	5 U	2.5 U	5 U	10 U	5 U	5 U	25 U	5 U	2.5 U
Acetone	--	10 U	20 U	5 U	10 R	10 R	2.5 R	5 U	10 U	20 U	20 U	25 U	10 R	2.5 R
Benzene	5	10 U	5 U	1 U	5 U	5 U	0.125 U	0.25 U	10 U	5 U	5 U	5 U	5 U	0.125 U
Carbon tetrachloride	5	10 U	5 U	1 U	5 U	5 U	0.25 U	0.5 U	10 U	5 U	5 U	5 U	5 U	0.25 U
Chlorobenzene	100	10 U	5 U	1 U	5 U	5 U	0.125 U	0.25 U	10 U	5 U	5 U	5 U	5 U	0.125 U
Chloroform	80	10 U	5 U	1 U	5 U	5 U	0.125 U	0.25 U	10 U	5 U	5 U	5 U	**0.134 J**	0.139 B
cis-1,2-Dichloroethene	70	**20**	**28**	**13**	**16.8**	**16.1**	**21**	**15.8**	**20**	**28**	**29**	**17**	**17.4**	**20.2**
Dichlorodifluoromethane (Freon-12)	--	10 U	5 U	1 U	5 U	5 U	0.25 U	0.5 U	10 U	5 U	5 U	5 U	5 U	0.25 U
Methylene chloride	5	10 U	5 U	1 U	0.286 B	5 U	0.25 U	0.5 U	10 U	5 U	5 U	5 U	5 UL	0.25 U
Tetrachloroethene	5	10 U	5 U	**0.22 J**	5 U	5 U	0.25 U	0.5 U	10 U	5 U	5 U	**0.75 J**	**0.919 J**	**0.994 J**
trans-1,2-Dichloroethene	100	10 U	5 U	**0.38 J**	5 U	5 U	0.25 U	0.5 U	10 U	5 U	5 U	5 U	5 U	0.25 U
Trichloroethene	5	**30**	**33**	**28**	**23.8**	**21.9**	**25.8**	**12.7**	**81**	**87**	**89**	**58**	**59.7 L**	**65.2**
Trichlorofluoromethane (Freon-11)	--	10 U	5 U	**0.44 J**	5 U	**0.517 J**	0.5 U	1 U	**1 J**	5 U	5 U	5 U	**0.82 J**	**0.671 J**
Vinyl chloride	2	10 U	5 U	1 U	2 U	2 U	0.25 U	0.5 U	10 U	5 U	5 U	5 U	2 U	0.25 U
Semivolatile Organic Compounds (UG/L)														
2-Methylnaphthalene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives (UG/L)														
2-Nitrotoluene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Metals (UG/L)														
Aluminum	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	1,300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Metals (UG/L)														
Aluminum, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic, Dissolved	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium, Dissolved	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Notes:

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UG/L - Micrograms per liter

CTO-WE13
ABL, Site 10
Validated Groundwater Exceedance Analytical Results
2008-2012 LTM

Station ID	CLEAN MCL-Groundwater	10EW40		10EW41								10EW41	10EW42	
Sample ID		AS10-10EW40-R18	AS10-10EW40-R19	AS10-10EW41P-R13	AS10-10EW41-R13	AS10-10EW41-R14	AS10-10EW41P-R15	AS10-10EW41-R15	AS10-10EW41-R16	AS10-10EW41-R17	AS10-10EW41-R18	AS10-10EW41-R19	AS10-10EW42-R13	AS10-10EW42-R14
Sample Date		10/12/11	08/28/12	01/31/08	01/31/08	10/16/08	07/22/09	07/22/09	04/22/10	01/15/11	10/12/11	08/28/12	01/28/08	10/16/08
Chemical Name														
Volatile Organic Compounds (UG/L)														
1,1,1-Trichloroethane	200	**0.501 J**	**0.636 J**	10 U	10 U	5 U	1 U	1 U	5 U	0.25 U	0.5 U	0.5 U	10 U	5 U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	--	**2.06**	**2.34 J**	**2 J**	**3 J**	**6.3**	**1.7**	**1.5**	**2.24 J**	2 U	**1.87 J**	4 U	**370**	**380**
1,1-Dichloroethane	--	**0.404 J**	**0.383 J**	10 U	10 U	5 U	1 U	1 U	5 U	0.125 U	0.5 U	0.25 U	10 U	5 U
1,1-Dichloroethene	7	**0.811 J**	**0.697 J**	10 U	10 U	5 U	1 U	1 U	5 U	0.5 U	0.5 U	1 U	10 U	5 U
1,2-Dichloroethene (total)	70	NA	NA	10 U	10 U	NA	NA	NA	NA	NA	NA	NA	**3 J**	NA
4-Methyl-2-pentanone	--	2.5 U	5 U	10 U	10 U	5 U	5 U	5 U	5 U	2.5 U	2.5 U	5 R	10 U	5 U
Acetone	--	5 U	5 U	10 U	10 U	20 U	5 U	5 U	10 R	2.5 R	5 U	5 R	10 U	20 U
Benzene	5	0.5 U	0.25 U	10 U	10 U	5 U	1 U	1 U	5 U	0.125 U	0.5 U	0.25 U	10 U	5 U
Carbon tetrachloride	5	0.5 U	0.5 U	10 U	10 U	5 U	1 U	1 U	5 U	0.25 U	0.5 U	0.5 U	10 U	5 U
Chlorobenzene	100	0.5 U	0.25 U	10 U	10 U	5 U	1 U	1 U	5 U	0.125 U	0.5 U	0.25 U	10 U	5 U
Chloroform	80	0.5 U	0.25 U	10 U	10 U	5 U	1 U	**0.17 J**	**0.126 J**	0.138 B	0.5 U	0.25 U	10 U	5 U
cis-1,2-Dichloroethene	70	**18.9**	**23.1**	10 U	10 U	**1.3 J**	1 U	1 U	**1.24 J**	**1.48 J**	**1.5**	**3.87**	**3 J**	**1.7 J**
Dichlorodifluoromethane (Freon-12)	--	1 U	0.5 U	10 U	10 U	5 U	1 U	1 U	5 U	0.25 U	1 U	0.5 U	10 U	**26**
Methylene chloride	5	1 U	0.5 U	10 U	10 U	5 U	1 U	1 U	0.417 B	0.25 U	1 U	0.5 U	10 U	5 U
Tetrachloroethene	5	**0.728 J**	**0.766 J**	10 U	10 U	5 U	1 U	1 U	5 U	0.25 U	0.5 U	0.5 U	10 U	5 U
trans-1,2-Dichloroethene	100	0.5 U	0.5 U	10 U	10 U	5 U	1 U	1 U	5 U	0.25 U	0.5 U	0.5 U	10 U	5 U
Trichloroethene	5	**57.4**	**56.1**	**9 J**	**8 J**	**11**	**7.7**	**7.6**	**9.43**	**9.42**	**8.3**	**6.3**	**13**	**27**
Trichlorofluoromethane (Freon-11)	--	**0.505 J**	**0.731 J**	10 U	10 U	5 U	1 U	1 U	5 U	0.5 U	1 U	1 U	10 U	5 U
Vinyl chloride	2	0.5 U	0.5 U	10 U	10 U	5 U	1 U	1 U	2 U	0.25 U	0.5 U	0.5 U	10 U	5 U
Semivolatile Organic Compounds (UG/L)														
2-Methylnaphthalene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives (UG/L)														
2-Nitrotoluene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Metals (UG/L)														
Aluminum	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	1,300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Metals (UG/L)														
Aluminum, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic, Dissolved	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium, Dissolved	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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CTO-WE13
ABL, Site 10
Validated Groundwater Exceedance Analytical Results
2008-2012 LTM

Station ID	CLEAN MCL-Groundwater	10EW42					10GW02	10GW03				10GW04	
Sample ID		AS10-10EW42-R15	AS10-10EW42-R16	AS10-10EW42-R17	AS10-10EW42-R18	AS10-10EW42-R19	AS10-10GW02-R19	AS10-2GW03P-R14	AS10-2GW03-R14	AS10-2GW03-R15	AS10-2GW03-R16	AS10-10GW04-0611	AS10-10GW04-1111
Sample Date		07/22/09	05/07/10	01/15/11	10/12/11	08/29/12	09/13/12	10/21/08	10/21/08	07/22/09	05/07/10	06/22/11	11/15/11
Chemical Name													
Volatile Organic Compounds (UG/L)													
1,1,1-Trichloroethane	200	20 U	5 U	0.25 U	0.5 U	0.5 U	0.5 U	5 U	5 U	1 U	5 U	**0.51 J**	**0.36 J**
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	--	**240**	**185**	**318**	**194**	**219**	4 U	**0.69 J**	**1.2 J**	**2.8**	**2.97 J**	0.5 U	3 U
1,1-Dichloroethane	--	20 U	5 U	0.125 U	0.5 U	0.25 U	0.25 U	5 U	5 U	1 U	5 U	**0.349 J**	**0.19 J**
1,1-Dichloroethene	7	20 U	5 U	0.5 U	0.5 U	1 U	1 U	5 U	5 U	1 U	5 U	**0.337 J**	**0.26 J**
1,2-Dichloroethene (total)	70	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	--	100 U	5 U	2.5 U	2.5 U	5 R	5 U	5 U	5 U	**0.66 J**	5 U	2.5 U	3.2 U
Acetone	--	100 U	**8.72 J**	2.5 R	5 U	5 R	10.2 B	20 U	20 U	22 B	10 U	5 U	6.4 U
Benzene	5	20 U	5 U	0.125 U	0.5 U	0.25 U	0.25 U	5 U	5 U	1 U	5 U	0.5 U	0.2 U
Carbon tetrachloride	5	20 U	5 U	0.25 U	0.5 U	0.5 U	0.5 U	5 U	5 U	1 U	5 U	0.5 U	0.4 U
Chlorobenzene	100	20 U	5 U	0.125 U	0.5 U	0.25 U	0.25 U	5 U	5 U	1 U	5 U	0.5 U	0.2 U
Chloroform	80	20 U	5 U	0.125 U	0.5 U	0.25 U	**0.713**	5 U	5 U	1 U	5 U	0.5 U	0.2 U
cis-1,2-Dichloroethene	70	20 U	**3.55 J**	**3.91 J**	**3.65**	**3.61**	**24.5**	5 U	5 U	1 U	5 U	**0.969 J**	**0.51 J**
Dichlorodifluoromethane (Freon-12)	--	20 U	**14.2**	0.25 U	**32.4**	0.5 U	0.5 U	5 U	5 U	1 U	5 U	1 U	0.8 U
Methylene chloride	5	20 U	5 U	0.25 U	1 U	0.5 U	0.5 U	5 U	5 U	1 U	5 U	1 U	0.52 B
Tetrachloroethene	5	20 U	5 U	0.25 U	0.5 U	0.5 U	**2.84 J**	5 U	5 U	1 U	5 U	0.5 U	0.4 U
trans-1,2-Dichloroethene	100	20 U	5 U	0.25 U	0.5 U	0.5 U	**0.479 J**	5 U	5 U	1 U	5 U	0.5 U	0.2 U
Trichloroethene	5	**10 J**	**10.3**	**14.1**	**11.6**	**10.5**	**49**	**8.5**	**9.5**	**8.3**	**9.65**	**5.13**	**3.7**
Trichlorofluoromethane (Freon-11)	--	20 U	5 U	**0.509 J**	1 U	1 U	1 U	5 U	5 U	1 U	5 U	1 U	0.8 U
Vinyl chloride	2	20 U	2 U	**0.296 J**	**0.345 J**	**0.416 J**	0.5 U	5 U	5 U	1 U	2 U	0.5 U	0.8 U
Semivolatile Organic Compounds (UG/L)													
2-Methylnaphthalene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.5 U	**0.0074 J**
Naphthalene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.1 U	**0.026 J**
Explosives (UG/L)													
2-Nitrotoluene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**0.536 J**	0.15 U
Total Metals (UG/L)													
Aluminum	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**196**	31 U
Arsenic	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**7.51**	**2.7 J**
Barium	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**80.1 J**	**78**
Calcium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**114,000**	**100,000**
Chromium	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**6.21**	1.5 U
Cobalt	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5 U	**0.1 J**
Copper	1,300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**18**	0.75 B
Iron	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**97,900**	**3,900 J**
Magnesium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**16,100**	**15,000**
Manganese	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**835 J**	**360 J**
Nickel	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**43.4**	**1.9 J**
Potassium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**2,230 J**	**2,000 J**
Sodium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**7,630**	**6,500**
Zinc	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**4.49 J**	6 U
Dissolved Metals (UG/L)													
Aluminum, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**57.3**	31 U
Arsenic, Dissolved	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**2.22 J**	**2.5 J**
Barium, Dissolved	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**79.3 J**	**73 J**
Calcium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**122,000**	**100,000**
Iron, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**4,600**	**1,900**
Magnesium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**17,300**	**15,000**
Manganese, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**417 J**	**310 J**
Potassium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**2,500 J**	**2,000 J**
Sodium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**8,450**	**6,500**
Zinc, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**1.59 J**	6 U

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UG/L - Micrograms per liter

CTO-WE13
ABL, Site 10
Validated Groundwater Exceedance Analytical Results
2008-2012 LTM

Station ID	CLEAN MCL-Groundwater	10GW06								10GW07	10GW08	10GW12		
Sample ID		AS10-10GW06-R13	AS10-10GW06-R14	AS10-10GW06-R15	AS10-10GW06-R16	AS10-10GW06P-R17	AS10-10GW06-R17	AS10-10GW06-R18	AS10-10GW06-R19	AS10-10GW07-R19	AS10-10GW08-R19	AS10-10GW12-R13	AS10-10GW12-R14	AS10-10GW12P-R15
Sample Date		01/28/08	10/21/08	07/22/09	04/27/10	01/25/11	01/25/11	10/17/11	09/13/12	09/13/12	09/13/12	01/28/08	10/21/08	07/22/09
Chemical Name														
Volatile Organic Compounds (UG/L)														
1,1,1-Trichloroethane	200	10 U	5 U	1 U	5 U	0.25 U	0.25 U	0.5 U	0.5 U	**0.572 J**	0.5 U	10 U	5 U	1 U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	--	**1 J**	5 U	**0.42 J**	5 U	2 U	2 U	**1.31 J**	**3.03 J**	**11**	4 U	10 U	5 U	1 U
1,1-Dichloroethane	--	10 U	5 U	1 U	5 U	0.125 U	0.125 U	0.5 U	0.25 U	0.25 U	0.25 U	10 U	5 U	1 U
1,1-Dichloroethene	7	10 U	5 U	1 U	5 U	0.5 U	0.5 U	0.5 U	1 U	1 U	1 U	10 U	5 U	1 U
1,2-Dichloroethene (total)	70	10 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA
4-Methyl-2-pentanone	--	10 U	5 U	**0.67 J**	5 U	2.5 R	2.5 R	2.5 U	5 U	5 R	5 U	10 U	5 U	**0.84 J**
Acetone	--	4 B	20 U	16 B	10.8 B	**16.6 L**	**16.9 L**	3.6 B	12.1 B	6.68 B	12.2 B	5 B	20 U	21 B
Benzene	5	10 U	5 U	1 U	5 U	0.125 U	0.125 U	0.5 U	0.25 U	0.25 U	0.25 U	10 U	5 U	1 U
Carbon tetrachloride	5	10 U	5 U	1 U	5 U	0.25 U	0.25 U	0.5 U	0.5 U	0.5 U	0.5 U	10 U	5 U	1 U
Chlorobenzene	100	10 U	5 U	1 U	5 U	0.125 U	0.125 U	0.5 U	0.25 U	0.25 U	0.25 U	10 U	5 U	1 U
Chloroform	80	10 U	5 U	1 U	5 U	0.125 U	0.125 U	0.5 U	0.25 U	**0.236 J**	0.25 U	10 U	5 U	1 U
cis-1,2-Dichloroethene	70	10 U	5 U	1 U	5 U	0.25 U	0.25 U	0.5 U	0.5 U	**1.83**	0.5 U	10 U	5 U	1 U
Dichlorodifluoromethane (Freon-12)	--	10 U	5 U	1 U	5 U	0.25 U	0.25 U	1 U	0.5 U	0.5 U	0.5 U	10 U	5 U	1 U
Methylene chloride	5	10 U	5 U	1 U	5 U	0.25 U	0.25 U	1 U	0.5 U	0.5 U	0.5 U	10 U	5 U	1 U
Tetrachloroethene	5	10 U	5 U	1 U	5 U	0.25 U	0.25 U	0.5 U	0.5 U	**0.498 J**	0.5 U	10 U	5 U	1 U
trans-1,2-Dichloroethene	100	10 U	5 U	1 U	5 U	0.25 U	0.25 U	0.5 U	0.5 U	0.5 U	0.5 U	10 U	5 U	1 U
Trichloroethene	5	10 U	5 U	**0.33 J**	**0.265 J**	**0.461 J**	**0.292 J**	0.5 U	**0.913 J**	**25.3**	**1.64**	10 U	5 U	1 U
Trichlorofluoromethane (Freon-11)	--	10 U	5 U	1 U	**0.648 J**	0.5 U	0.5 U	1 U	**1.54**	**1.23**	**6.83**	10 U	5 U	1 U
Vinyl chloride	2	10 U	5 U	1 U	2 U	0.25 U	0.25 U	0.5 U	0.5 U	0.5 U	0.5 U	10 U	5 U	1 U
Semivolatile Organic Compounds (UG/L)														
2-Methylnaphthalene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives (UG/L)														
2-Nitrotoluene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Metals (UG/L)														
Aluminum	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	1,300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Metals (UG/L)														
Aluminum, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic, Dissolved	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium, Dissolved	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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CTO-WE13
ABL, Site 10
Validated Groundwater Exceedance Analytical Results
2008-2012 LTM

Station ID	CLEAN MCL-Groundwater	10GW12							10GW15					
Sample ID		AS10-10GW12-R15	AS10-10GW12C-R16	AS10-10GW12-R16	AS10-10GW12-R17	AS10-10GW12-R18	AS10-10GW12C-R18	AS10-10GW12-R19	AS10-10GW15-R13	AS10-10GW15-R14	AS10-10GW15-R15	AS10-10GW15C-R16	AS10-10GW15-R16	AS10-10GW15-R17
Sample Date		07/22/09	04/27/10	04/27/10	01/25/11	10/17/11	10/18/11	09/13/12	01/28/08	10/21/08	07/22/09	04/27/10	04/27/10	01/25/11
Chemical Name														
Volatile Organic Compounds (UG/L)														
1,1,1-Trichloroethane	200	1 U	5 U	5 U	0.25 U	0.5 U	0.5 U	0.5 U	10 U	5 U	2 U	**0.298 J**	**0.3 J**	**0.303 J**
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	--	1 U	5 U	5 U	2 U	1 U	1 U	4 U	**82**	**54 J**	**74**	**144**	**132**	**84.6**
1,1-Dichloroethane	--	1 U	5 U	5 U	0.125 U	0.5 U	0.5 U	0.25 U	10 U	5 U	2 U	5 U	5 U	0.125 U
1,1-Dichloroethene	7	1 U	5 U	5 U	0.5 U	0.5 U	0.5 U	1 U	10 U	5 U	2 U	5 U	5 U	0.5 U
1,2-Dichloroethene (total)	70	NA	NA	NA	NA	NA	NA	NA	10 U	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	--	**0.76 J**	5 U	5 U	2.5 R	2.5 U	2.5 U	5 U	10 U	5 U	10 U	5 U	5 U	2.5 U
Acetone	--	20 B	10 R	10.5 B	**11.7 L**	3.98 B	5 U	7.98 B	3 B	20 U	21 B	10.2 B	18.1 B	**29.6 L**
Benzene	5	1 U	5 U	5 U	0.125 U	0.5 U	0.5 U	0.25 U	10 U	5 U	2 U	5 U	5 U	0.125 U
Carbon tetrachloride	5	1 U	5 U	5 U	0.25 U	0.5 U	0.5 U	0.5 U	10 U	5 U	2 U	**0.292 J**	**0.313 J**	0.25 U
Chlorobenzene	100	1 U	5 U	5 U	0.125 U	0.5 U	0.5 U	0.25 U	10 U	5 U	2 U	5 U	5 U	0.125 U
Chloroform	80	1 U	5 U	5 U	0.125 U	0.5 U	0.5 U	0.25 U	10 U	5 U	2 U	5 U	5 U	0.125 U
cis-1,2-Dichloroethene	70	1 U	5 U	5 U	0.25 U	0.5 U	0.5 U	0.5 U	10 U	5 U	2 U	**0.304 J**	**0.301 J**	**0.354 J**
Dichlorodifluoromethane (Freon-12)	--	1 U	5 U	5 U	0.25 U	1 U	1 U	0.5 U	10 U	5 U	2 U	5 U	5 U	**0.366 J**
Methylene chloride	5	**0.36 J**	5 U	5 U	**0.336 J**	1 U	1 U	0.5 U	10 U	5 U	2 U	5 U	0.254 B	0.25 U
Tetrachloroethene	5	1 U	5 U	5 U	0.25 U	0.5 U	0.5 U	0.5 U	10 U	5 U	**0.43 J**	**0.607 J**	**0.492 J**	**0.626 J**
trans-1,2-Dichloroethene	100	1 U	5 U	5 U	0.25 U	0.5 U	0.5 U	0.5 U	10 U	5 U	2 U	5 U	5 U	0.25 U
Trichloroethene	5	1 U	5 U	5 U	0.25 U	0.5 U	0.5 U	0.5 U	**6 J**	**5.3**	**5.4**	**6.09**	**6.33**	**7.53**
Trichlorofluoromethane (Freon-11)	--	1 U	5 U	5 U	0.5 U	1 U	1 U	1 U	10 U	5 U	2 U	**0.91 J**	**0.911 J**	0.5 U
Vinyl chloride	2	1 U	2 U	2 U	0.25 U	0.5 U	0.5 U	0.5 U	10 U	5 U	2 U	2 U	2 U	0.25 U
Semivolatile Organic Compounds (UG/L)														
2-Methylnaphthalene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives (UG/L)														
2-Nitrotoluene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Metals (UG/L)														
Aluminum	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	1,300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Metals (UG/L)														
Aluminum, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic, Dissolved	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium, Dissolved	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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CTO-WE13
ABL, Site 10
Validated Groundwater Exceedance Analytical Results
2008-2012 LTM

Station ID	CLEAN MCL-Groundwater	10GW15			10GW16								10GW16
Sample ID		AS10-10GW15P-R18	AS10-10GW15-R18	AS10-10GW15-R19	AS10-10GW16-R13	AS10-10GW16B-R13	AS10-10GW16-R14	AS10-10GW16-R15	AS10-10GW16-R16	AS10-10GW16-R17	AS10-10GW16-R18	AS10-10GW16P-R19	AS10-10GW16-R19
Sample Date		10/17/11	10/17/11	09/13/12	01/28/08	02/01/08	10/21/08	07/22/09	04/27/10	01/25/11	10/17/11	09/13/12	09/13/12
Chemical Name													
Volatile Organic Compounds (UG/L)													
1,1,1-Trichloroethane	200	**0.258 J**	0.5 U	**0.285 J**	10 U	10 U	5 U	1 U	5 U	0.25 U	0.5 U	0.5 U	0.5 U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	--	**91.7**	**91.6**	**6.07 J**	10 U	10 U	5 U	1 U	5 UL	2 U	1 U	**7.92 J**	**9.38**
1,1-Dichloroethane	--	0.5 U	0.5 U	0.25 U	10 U	10 U	5 U	1 U	5 U	0.125 U	0.5 U	0.25 U	0.25 U
1,1-Dichloroethene	7	0.5 U	0.5 U	1 U	10 U	10 U	5 U	1 U	5 U	0.5 U	0.5 U	1 U	1 U
1,2-Dichloroethene (total)	70	NA	NA	NA	10 U	10 U	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	--	2.5 U	2.5 U	5 R	10 U	10 U	5 U	**0.78 J**	5 U	2.5 R	2.5 U	5 U	5 U
Acetone	--	3.2 B	4.26 B	7.46 B	10 U	10 U	20 U	21 B	9.51 B	**14.5 L**	5.78 B	8.16 B	7.77 B
Benzene	5	0.5 U	0.5 U	0.25 U	10 U	10 U	5 U	1 U	5 U	0.125 U	0.5 U	0.25 U	0.25 U
Carbon tetrachloride	5	0.5 U	0.5 U	0.5 U	10 U	10 U	5 U	1 U	5 U	0.25 U	0.5 U	0.5 U	0.5 U
Chlorobenzene	100	0.5 U	0.5 U	0.25 U	10 U	10 U	5 U	1 U	5 U	0.125 U	0.5 U	0.25 U	0.25 U
Chloroform	80	0.5 U	0.5 U	0.25 U	10 U	10 U	5 U	1 U	5 U	0.125 U	0.5 U	0.25 U	0.25 U
cis-1,2-Dichloroethene	70	**0.374 J**	**0.362 J**	0.5 U	10 U	10 U	5 U	1 U	5 U	0.25 U	0.5 U	**0.615 J**	**0.73 J**
Dichlorodifluoromethane (Freon-12)	--	1 U	1 U	0.5 U	10 U	10 U	5 U	1 U	5 U	0.25 U	1 U	0.5 U	0.5 U
Methylene chloride	5	1 U	1 U	0.5 U	10 U	10 U	5 U	1 U	5 U	0.25 U	1 U	0.5 U	0.5 U
Tetrachloroethene	5	**0.281 J**	**0.253 J**	**0.292 J**	10 U	10 U	5 U	1 U	5 U	0.25 U	0.5 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	100	0.5 U	0.5 U	0.5 U	10 U	10 U	5 U	1 U	5 U	0.25 U	0.5 U	0.5 U	0.5 U
Trichloroethene	5	**6.11**	**6.12**	**3.91**	10 U	10 U	5 U	1 U	5 U	0.25 U	0.5 U	**0.97 J**	**1.16**
Trichlorofluoromethane (Freon-11)	--	1 U	1 U	1 U	10 U	10 U	5 U	1 U	5 U	0.5 U	1 U	1 U	1 U
Vinyl chloride	2	0.5 U	0.5 U	0.5 U	10 U	10 U	5 U	1 U	2 U	0.25 U	0.5 U	0.5 U	0.5 U
Semivolatile Organic Compounds (UG/L)													
2-Methylnaphthalene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives (UG/L)													
2-Nitrotoluene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Metals (UG/L)													
Aluminum	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	1,300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Metals (UG/L)													
Aluminum, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic, Dissolved	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium, Dissolved	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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UG/L - Micrograms per liter

CTO-WE13
ABL, Site 10
Validated Groundwater Exceedance Analytical Results
2008-2012 LTM

Station ID	CLEAN MCL-Groundwater	10GW20								10GW21	10GW22	10GW23	
Sample ID		AS10-10GW20P-R13	AS10-10GW20-R13	AS10-10GW20-R14	AS10-10GW20-R15	AS10-10GW20-R16	AS10-10GW20-R17	AS10-10GW20-R18	AS10-10GW20-R19	AS10-10GW21-R19	AS10-10GW22-R19	AS10-10GW23-R13	AS10-10GW23-R14
Sample Date		01/28/08	01/28/08	10/21/08	07/22/09	04/27/10	01/25/11	10/17/11	09/13/12	09/13/12	09/13/12	01/28/08	10/21/08
Chemical Name													
Volatile Organic Compounds (UG/L)													
1,1,1-Trichloroethane	200	10 U	10 U	5 U	20 U	5 U	0.25 U	1 U	0.5 U	0.5 U	0.5 U	10 U	5 U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	--	**770**	**750**	**440 J**	**420**	**248 J**	**431**	**181**	**189**	**4.21 J**	4 U	**200**	**170 J**
1,1-Dichloroethane	--	10 U	10 U	5 U	20 U	5 U	0.125 U	1 U	0.25 U	0.25 U	0.25 U	10 U	5 U
1,1-Dichloroethene	7	10 U	10 U	5 U	20 U	5 U	0.5 U	1 U	1 U	1 U	1 U	10 U	5 U
1,2-Dichloroethene (total)	70	**2 J**	**2 J**	NA	NA	NA	NA	NA	NA	NA	NA	**3 J**	NA
4-Methyl-2-pentanone	--	10 U	10 U	5 U	100 U	5 U	2.5 R	5 U	5 R	5 R	5 R	10 U	5 U
Acetone	--	7 B	4 B	20 U	100 U	29.4 B	**13.3 L**	10 U	17.7 B	8.96 B	7.79 B	4 B	20 U
Benzene	5	10 U	10 U	5 U	20 U	5 U	0.125 U	1 U	0.25 U	0.25 U	0.25 U	10 U	5 U
Carbon tetrachloride	5	10 U	10 U	5 U	20 U	5 U	0.25 U	1 U	0.5 U	0.5 U	0.5 U	10 U	5 U
Chlorobenzene	100	10 U	10 U	5 U	20 U	5 U	0.125 U	1 U	0.25 U	0.25 U	0.25 U	10 U	5 U
Chloroform	80	10 U	10 U	5 U	20 U	5 U	0.125 U	1 U	0.25 U	0.25 U	0.25 U	10 U	5 U
cis-1,2-Dichloroethene	70	**2 J**	**2 J**	**2.3 J**	20 U	**1.98 J**	**2.25 J**	**1.67 J**	**2.35**	0.5 U	0.5 U	**3 J**	**4.7 J**
Dichlorodifluoromethane (Freon-12)	--	10 U	10 U	**30**	20 U	5 U	0.25 U	**15.6**	0.5 U	0.5 U	0.5 U	10 U	5 U
Methylene chloride	5	10 U	10 U	5 U	20 U	5 U	**0.288 J**	2 U	0.5 U	0.5 U	0.5 U	10 U	5 U
Tetrachloroethene	5	10 U	10 U	5 U	20 U	5 U	0.25 U	1 U	0.5 U	0.5 U	0.5 U	10 U	5 U
trans-1,2-Dichloroethene	100	10 U	10 U	5 U	20 U	5 U	0.25 U	1 U	0.5 U	0.5 U	0.5 U	10 U	5 U
Trichloroethene	5	**30**	**29 J**	**23**	**22**	**22.5**	**26.5**	**16.5**	**23.7**	**0.347 J**	0.5 U	**34**	**27**
Trichlorofluoromethane (Freon-11)	--	10 U	10 U	5 U	20 U	**0.534 J**	0.5 U	2 U	1 U	1 U	1 U	10 U	5 U
Vinyl chloride	2	10 U	10 U	5 U	20 U	2 U	0.25 U	1 U	0.5 U	0.5 U	0.5 U	10 U	5 U
Semivolatile Organic Compounds (UG/L)													
2-Methylnaphthalene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives (UG/L)													
2-Nitrotoluene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Metals (UG/L)													
Aluminum	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	1,300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Metals (UG/L)													
Aluminum, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic, Dissolved	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium, Dissolved	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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UG/L - Micrograms per liter

Station ID	CLEAN MCL-Groundwater	10GW23			
Sample ID		AS10-10GW23-R15	AS10-10GW23-R16	AS10-10GW23-R17	AS10-10GW23-R18
Sample Date		07/22/09	04/27/10	01/25/11	10/17/11
Chemical Name					
Volatile Organic Compounds (UG/L)					
1,1,1-Trichloroethane	200	10 U	**0.313 J**	**0.478 J**	**0.32 J**
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	--	**150**	**102**	**173**	**65**
1,1-Dichloroethane	--	10 U	5 U	**0.227 J**	0.5 U
1,1-Dichloroethene	7	10 U	5 U	0.5 U	0.5 U
1,2-Dichloroethene (total)	70	NA	NA	NA	NA
4-Methyl-2-pentanone	--	50 U	5 U	2.5 R	2.5 U
Acetone	--	29 B	15.7 B	**15.3 L**	5 U
Benzene	5	10 U	5 U	0.125 U	0.5 U
Carbon tetrachloride	5	10 U	5 U	0.25 U	0.5 U
Chlorobenzene	100	10 U	5 U	0.125 U	0.5 U
Chloroform	80	10 U	5 U	0.125 U	0.5 U
cis-1,2-Dichloroethene	70	10 U	**2.68 J**	**5.12**	**1.24**
Dichlorodifluoromethane (Freon-12)	--	10 U	5 U	0.25 U	1 U
Methylene chloride	5	10 U	0.374 B	0.25 U	1 U
Tetrachloroethene	5	10 U	**0.609 J**	**0.775 J**	**0.495 J**
trans-1,2-Dichloroethene	100	10 U	5 U	0.25 U	0.5 U
Trichloroethene	5	**25**	**22.9**	**29.9**	**17.3**
Trichlorofluoromethane (Freon-11)	--	10 U	5 U	0.5 U	1 U
Vinyl chloride	2	10 U	2 U	**0.533 J**	0.5 U
Semivolatile Organic Compounds (UG/L)					
2-Methylnaphthalene	--	NA	NA	NA	NA
Naphthalene	--	NA	NA	NA	NA
Explosives (UG/L)					
2-Nitrotoluene	--	NA	NA	NA	NA
Total Metals (UG/L)					
Aluminum	--	NA	NA	NA	NA
Arsenic	10	NA	NA	NA	NA
Barium	2,000	NA	NA	NA	NA
Calcium	--	NA	NA	NA	NA
Chromium	100	NA	NA	NA	NA
Cobalt	--	NA	NA	NA	NA
Copper	1,300	NA	NA	NA	NA
Iron	--	NA	NA	NA	NA
Magnesium	--	NA	NA	NA	NA
Manganese	--	NA	NA	NA	NA
Nickel	--	NA	NA	NA	NA
Potassium	--	NA	NA	NA	NA
Sodium	--	NA	NA	NA	NA
Zinc	--	NA	NA	NA	NA
Dissolved Metals (UG/L)					
Aluminum, Dissolved	--	NA	NA	NA	NA
Arsenic, Dissolved	10	NA	NA	NA	NA
Barium, Dissolved	2,000	NA	NA	NA	NA
Calcium, Dissolved	--	NA	NA	NA	NA
Iron, Dissolved	--	NA	NA	NA	NA
Magnesium, Dissolved	--	NA	NA	NA	NA
Manganese, Dissolved	--	NA	NA	NA	NA
Potassium, Dissolved	--	NA	NA	NA	NA
Sodium, Dissolved	--	NA	NA	NA	NA
Zinc, Dissolved	--	NA	NA	NA	NA

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CTO-WE13
ABL, Site 10
Validated Groundwater Exceedance Analytical Results
2008-2012 LTM

Station ID	CLEAN MCL-Groundwater	10GW23		10GW26	10GW27	10GW28	10GW29						
Sample ID		AS10-10GW23C-R18	AS10-10GW23-R19	AS10-10GW26-R19	AS10-10GW27-R19	AS10-10GW28-R19	AS10-10GW29-R13	AS10-10GW29-R14	AS10-10GW29-R15	AS10-10GW29-R16	AS10-10GW29-R17	AS10-10GW29-R18	AS10-10GW29-R19
Sample Date		10/18/11	09/13/12	09/13/12	09/13/12	09/13/12	01/28/08	10/21/08	07/22/09	04/27/10	01/25/11	10/17/11	09/13/12
Chemical Name													
Volatile Organic Compounds (UG/L)													
1,1,1-Trichloroethane	200	**0.327 J**	**0.449 J**	0.5 U	0.5 U	0.5 U	10 U	5 U	1 U	5 U	0.25 U	0.5 U	0.5 U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	--	**59.3**	**154**	4 U	4 U	4 U	10 U	5 U	1 U	5 U	2 U	**0.518 J**	4 U
1,1-Dichloroethane	--	0.5 U	0.25 U	0.25 U	0.25 U	0.25 U	10 U	5 U	1 U	5 U	0.125 U	0.5 U	0.25 U
1,1-Dichloroethene	7	0.5 U	1 U	1 U	1 U	1 U	10 U	5 U	1 U	5 U	0.5 U	0.5 U	1 U
1,2-Dichloroethene (total)	70	NA	NA	NA	NA	NA	**3 J**	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	--	2.5 U	5 R	5 U	5 U	5 U	10 U	5 U	**0.67 J**	5 U	2.5 R	2.5 U	5 U
Acetone	--	5 U	12.8 B	7.75 B	10.1 B	12.2 B	3 B	20 U	27 B	12.4 B	**13.8 L**	3.53 B	8.3 B
Benzene	5	0.5 U	0.25 U	0.25 U	**0.135 J**	0.25 U	10 U	5 U	1 U	5 U	0.125 U	0.5 U	0.25 U
Carbon tetrachloride	5	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	10 U	5 U	1 U	5 U	0.25 U	0.5 U	0.5 U
Chlorobenzene	100	0.5 U	0.25 U	0.25 U	0.25 U	0.25 U	10 U	5 U	1 U	5 U	0.125 U	0.5 U	0.25 U
Chloroform	80	0.5 U	0.25 U	0.25 U	0.25 U	0.25 U	10 U	5 U	1 U	5 U	0.125 U	0.5 U	0.25 U
cis-1,2-Dichloroethene	70	**1.39**	**5.62**	0.5 U	0.5 U	**1.54**	**3 J**	**2.7 J**	**1.8**	**3.09 J**	**2.88 J**	**2.29**	**3.7**
Dichlorodifluoromethane (Freon-12)	--	1 U	0.5 U	0.5 U	0.5 U	0.5 U	10 U	5 U	1 U	5 U	0.25 U	1 U	0.5 U
Methylene chloride	5	1 U	0.5 U	0.5 U	0.5 U	0.5 U	10 U	5 U	1 U	0.28 B	0.25 U	1 U	0.5 U
Tetrachloroethene	5	**0.649 J**	**0.878 J**	0.5 U	0.5 U	0.5 U	10 U	5 U	1 U	5 U	0.25 U	0.5 U	0.5 U
trans-1,2-Dichloroethene	100	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	10 U	5 U	1 U	5 U	0.25 U	0.5 U	0.5 U
Trichloroethene	5	**18.4**	**43.4**	0.5 U	0.5 U	**7.14**	10 U	5 U	**0.33 J**	**0.389 J**	**0.425 J**	**0.345 J**	**0.471 J**
Trichlorofluoromethane (Freon-11)	--	1 U	1 U	1 U	1 U	1 U	10 U	5 U	1 U	5 U	0.5 U	1 U	1 U
Vinyl chloride	2	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	**3 J**	**1.6 J**	**1.9**	**4.59**	**2.71**	**2.14**	**2.65**
Semivolatile Organic Compounds (UG/L)													
2-Methylnaphthalene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives (UG/L)													
2-Nitrotoluene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Metals (UG/L)													
Aluminum	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	1,300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Metals (UG/L)													
Aluminum, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic, Dissolved	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium, Dissolved	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

C:\Users\kmalley\Documents\Work\Klyukin_Rebekah\Jan 7 - FYR ABL\Appendixes\Appendix E_FYR Data\[ABL_Site 10_GW_RDE Table.xls], mmorri13, 11/13/2012

Notes:

Exceeds all criteria

Bold indicates detections

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

J - Analyte present, value may or may not be accurate or precise

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

UG/L - Micrograms per liter

CTO-WE13
ABL, Site 10
Validated Groundwater Exceedance Analytical Results
2008-2012 LTM

Station ID	CLEAN MCL-Groundwater	10GW30								10GW31	PWA-1	PWA-2
Sample ID		AS10-10GW30-R13	AS10-10GW30-R14	AS10-10GW30-R15	AS10-10GW30P-R16	AS10-10GW30-R16	AS10-10GW30-R17	AS10-10GW30-R18	AS10-10GW30-R19	AS10-10GW31-R19	AS10-PWA-1-R19	AS10-PWA-2-R19
Sample Date		01/28/08	10/21/08	07/22/09	04/27/10	04/27/10	01/25/11	10/17/11	09/13/12	09/13/12	09/13/12	09/13/12
Chemical Name												
Volatile Organic Compounds (UG/L)												
1,1,1-Trichloroethane	200	10 U	5 U	1 U	5 U	5 U	0.25 U	0.5 U	0.5 U	0.5 U	**0.308 J**	0.5 U
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon-113)	--	10 U	5 U	1 U	5 U	5 U	2 U	1 U	4 U	4 U	4 U	4 U
1,1-Dichloroethane	--	10 U	5 U	1 U	5 U	5 U	0.125 U	0.5 U	0.25 U	0.25 U	**1.46**	0.25 U
1,1-Dichloroethene	7	10 U	5 U	1 U	5 U	5 U	0.5 U	0.5 U	1 U	1 U	**0.964 J**	1 U
1,2-Dichloroethene (total)	70	10 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	--	10 U	5 U	**0.65 J**	5 U	5 U	2.5 U	2.5 U	5 U	5 U	5 U	5 U
Acetone	--	4 B	20 U	17 B	10.4 B	9.93 B	**15.5 L**	3.37 B	10.9 B	8.54 B	8.16 B	7.6 B
Benzene	5	10 U	5 U	1 U	5 U	5 U	0.125 U	0.5 U	0.25 U	0.25 U	0.25 U	0.25 U
Carbon tetrachloride	5	10 U	5 U	1 U	5 U	5 U	0.25 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Chlorobenzene	100	10 U	5 U	1 U	5 U	5 U	0.125 U	0.5 U	0.25 U	0.25 U	0.25 U	0.25 U
Chloroform	80	10 U	5 U	1 U	5 U	5 U	0.125 U	0.5 U	0.25 U	0.25 U	0.25 U	0.25 U
cis-1,2-Dichloroethene	70	10 U	5 U	1 U	5 U	5 U	0.25 U	0.5 U	0.5 U	0.5 U	**0.659 J**	**0.546 J**
Dichlorodifluoromethane (Freon-12)	--	10 U	5 U	1 U	5 U	5 U	0.25 U	1 U	0.5 U	0.5 U	0.5 U	0.5 U
Methylene chloride	5	10 U	5 U	1 U	5 U	5 U	**0.308 J**	1 U	0.5 U	0.5 U	0.5 U	0.5 U
Tetrachloroethene	5	10 U	5 U	1 U	5 U	5 U	0.25 U	0.5 U	0.5 U	0.5 U	**4.79 J**	**13.4**
trans-1,2-Dichloroethene	100	10 U	5 U	1 U	5 U	5 U	0.25 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Trichloroethene	5	10 U	5 U	1 U	5 U	5 U	0.25 U	0.5 U	0.5 U	0.5 U	**22.1**	**3.54**
Trichlorofluoromethane (Freon-11)	--	10 U	5 U	1 U	5 U	5 U	0.5 U	1 U	1 U	1 U	1 U	**0.511 J**
Vinyl chloride	2	10 U	5 U	1 U	2 U	2 U	0.25 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Semivolatile Organic Compounds (UG/L)												
2-Methylnaphthalene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Explosives (UG/L)												
2-Nitrotoluene	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Metals (UG/L)												
Aluminum	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	1,300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Metals (UG/L)												
Aluminum, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic, Dissolved	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium, Dissolved	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Calcium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc, Dissolved	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Notes:

Exceeds all criteria

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J - Analyte present, value may or may not be accurate or precise

L - Analyte present, value may be biased low, actual value may be higher

R - Unreliable Result

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

UL - Analyte not detected, quantitation limit is probably higher

UG/L - Micrograms per liter

ABL Five Year Review
ABL, Site 11
Validated Groundwater Detected Analytical Results
6/1/2012

Station ID	**Site Remediation Goal**	11GW02	11GW04	11GW06	11GW08	11GW12S/D		11GW15		11GW17	11GW18
Sample ID		AS11-11GW02-0612	AS11-11GW04-0612	AS11-11GW06-0612	AS11-11GW08-0612	AS11-11GW12S-0612	AS11-11GW12SP-0612	AS11-11GW15-0612	AS11-11GW15P-0612	AS11-11GW17-0612	AS11-11GW18-0612
Sample Date		06/26/12	06/25/12	06/26/12	06/26/12	06/26/12	06/26/12	06/26/12	06/26/12	06/26/12	06/26/12
Chemical Name											
Volatile Organic Compounds (UG/L)											
cis-1,2-Dichloroethene	70	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	**0.63 J**	1 U
Tetrachloroethene	5	**1.2 J**	1 U	1 U	1 U	NA	NA	1 U	1 U	1 U	1 U
Trichloroethene	5	1 U	1 U	**39**	1 U	1 U	1 U	**0.96 J**	**1.2 J**	**8.8**	1 U
Total Metals (UG/L)											
Antimony	6	**0.177 J**	**0.15 J**	**0.331 J**	**0.383 J**	NA	NA	0.44 U	0.44 U	**0.146 J**	0.44 U
Barium	2000	**76.1 J**	**98.2**	**2,540**	**44.8 J**	NA	NA	**100 J**	**104 J**	**327 J**	**91 J**
Chromium	100	17.3 B	29.8 B	**392**	3.98 B	NA	NA	**6.27 J**	**8.23 J**	17.4 B	6.32 B
Manganese	270	**340 J**	**127**	**45,300**	**308 J**	NA	NA	**26.3 J**	**39 J**	**2,730**	**36.9 J**
Thallium	2	**0.0846 J**	0.23 U	**1.26**	0.23 U	NA	NA	0.23 U	0.23 U	**0.185 J**	0.23 U
Dissolved Metals (UG/L)											
Arsenic, Dissolved	10	10 UJ	10 U	**2.41 J**	10 UJ	10 U	10 UJ	10 UJ	10 UJ	**3.15 J**	10 UJ
Iron, Dissolved	5400	**1,450 J**	**34.7**	**42,400**	**8.12 J**	**12.2 J**	**12.2 J**	**22.1 J**	**30.4 J**	**22,600**	**12.4 J**
Manganese, Dissolved	270	**128 J**	**5.01**	**6,380**	**6.06 J**	**13.3**	**13.1 J**	**2.09 J**	**3.13 J**	**1,600**	**1.02 J**
Thallium, Dissolved	2	0.23 U	0.23 U	**0.327 J**	0.23 U	NA	NA	0.23 U	0.23 U	**0.158 J**	0.23 U
Wet Chemistry											
Alkalinity (mg/l)	-	**290**	**320 D**	**170**	**130**	**300 D**	NA	**310**	NA	**260**	**310**
Carbon dioxide (mg/l)	-	**63.2**	**101**	**63.9**	**23.8**	**58.8**	NA	**124**	NA	**84.8**	**85.9**
Methane (mg/l)	-	**0.00109**	9.64E-04 U	9.64E-04 U	9.64E-04 U	9.64E-04 U	NA	9.64E-04 U	NA	9.64E-04 U	9.64E-04 U
Nitrate (mg/l)	-	**0.72 J**	**3.6 Q**	**1.4**	**0.72 J**	**0.9 J**	NA	**2.4 D**	NA	**1.7**	**1.4**
Sulfate (mg/l)	-	**180 D**	**170 D**	**19**	**110 D**	**100 D**	NA	**180 D**	NA	**93**	**110 D**
Total organic carbon (TOC) (mg/l)	-	**2.4**	**0.93 J**	**8.1**	**5.1**	**0.52 J**	NA	**1 D**	NA	**1.4**	**0.61 J**

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Notes:

Bold indicates detections

Shading indicates exceedances of SRGs

NA - Not analyzed

B - Analyte not detected above the level reported in blanks

D - Compound identified in an analysis at a secondary dilution factor

J - Analyte present, value may or may not be accurate or precise

Q - Quality control may have exceeded criteria

U - The material was analyzed for, but not detected

UJ - Analyte not detected, quantitation limit may be inaccurate

MG/L - Milligrams per liter

UG/L - Micrograms per liter

ABL Five Year Review
ABL, Site 12
Validated Groundwater Detected Analytical Results
6/1/2012

Station ID	**Site Remediation Goal**	12MW04S	12MW05S	12MW09D	12MW09S	12MW11S	12MW18		12MW20D
Sample ID		AS12-12MW04S-0612	AS12-12MW05S-0612	AS12-12MW09D-0612	AS12-12MW09S-0612	AS12-12MW11S-0612	AS12-12MW18-0612	AS12-12MW18P-0612	AS12-12MW20D-0612
Sample Date		06/27/12	06/29/12	06/28/12	06/28/12	06/26/12	06/29/12	06/29/12	06/27/12
Chemical Name									
Volatile Organic Compounds (UG/L)									
cis-1,2-Dichloroethene	70	1 U	1 U	1 U	**4.8**	1 U	**9.1**	**9.1**	1 U
trans-1,2-Dichloroethene	100	1 U	1 U	1 U	**1.6 J**	1 U	1 U	1 U	1 U
Trichloroethene	5	1 U	1 U	1 U	**0.9 J**	1 U	**12**	**13**	1 U
Semivolatile Organic Compounds (UG/L)									
No Detections		NA	NA	NA	NA	NA	NA	NA	NA
Total Metals (UG/L)									
Manganese	270	25.8 B	9.95 B	**433**	**219**	34.8 B	NA	NA	35.7 B
Dissolved Metals (UG/L)									
Iron, Dissolved	5400	**653 K**	150 U	**986**	**3,510**	**114 J**	150 U	**755**	**1,450**
Manganese, Dissolved	270	**21.1 J**	12.8 U	**31**	**61.2**	**11 J**	**495**	**649**	**48.2 J**
Wet Chemistry									
Alkalinity (mg/l)	-	**220 Q**	**290**	**220**	**230**	**240**	**250 D**	NA	**240**
Carbon dioxide (mg/l)	-	**59.8**	**61.5**	**66.5**	**65.1**	**15.1**	**84.8**	NA	**75.3**
Ethane (mg/l)	-	**0.00235**	0.00196 U	0.00196 U	**0.00177 J**	0.00196 U	0.00196 U	NA	**0.00166 J**
Ethene (mg/l)	-	0.00271 U	0.00271 U	0.00271 U	**0.00143 J**	0.00271 U	0.00271 U	NA	**0.00803**
Methane (mg/l)	-	**0.0362**	9.64E-04 U	**0.011**	**0.0653**	**9.04E-04 J**	**7.52E-04 J**	NA	**0.049**
Nitrate (mg/l)	-	**0.2 JQ**	**0.32 J**	0.21 U	**0.18 J**	**0.21 J**	**0.49 J**	NA	**0.62 J**
Sulfate (mg/l)	-	**1,400 DQ**	**180 D**	**1,300 D**	**1,100 D**	**220 D**	**300 DQ**	NA	**1,500 D**
Sulfide (mg/l)	-	1 U	1 U	**1.2**	1 U	1 U	1 U	NA	1 U
Total organic carbon (TOC) (mg/l)	-	**0.66 J**	**0.49 J**	**0.92 J**	**1.6**	**0.8 J**	**0.87 J**	NA	**0.62 J**

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Notes:

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D - Compound identified in an analysis at a secondary dilution factor

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K - Analyte present, value may be biased high, actual value may be lower

Q - Quality control may have exceeded criteria

U - The material was analyzed for, but not detected

MG/L - Milligrams per liter

UG/L - Micrograms per liter

ABL Five Year Review
ABL, Site 12
Validated Groundwater Detected Analytical Results
6/1/2012

Station ID	12MW20S		12MW21D	12MW21S	12MW22S
Sample ID	AS12-12MW20S-0612	AS12-12MW20SP-0612	AS12-12MW21D-0612	AS12-12MW21S-0612	AS12-12MW22S-0612
Sample Date	06/27/12	06/27/12	06/28/12	06/27/12	06/28/12
Chemical Name					
Volatile Organic Compounds (UG/L)					
cis-1,2-Dichloroethene	1 U	1 U	1 U	1 U	1 U
trans-1,2-Dichloroethene	1 U	1 U	1 U	1 U	1 U
Trichloroethene	**1.2 J**	**1.1 J**	1 U	1 U	1 U
Semivolatile Organic Compounds (UG/L)					
No Detections	NA	NA	NA	NA	NA
Total Metals (UG/L)					
Manganese	22.1 B	23.7 B	41.6 B	16 B	51.6 B
Dissolved Metals (UG/L)					
Iron, Dissolved	**1,650**	**1,730**	**4,530**	**2,180**	**1,160**
Manganese, Dissolved	**18.8 J**	**18.9 J**	**33**	**15.6 J**	**17 J**
Wet Chemistry					
Alkalinity (mg/l)	**230**	NA	**240**	**220**	**220**
Carbon dioxide (mg/l)	**79.5**	NA	**55.7**	**68.9**	**62**
Ethane (mg/l)	**0.00328**	NA	**0.02**	**0.00101 J**	**0.0116**
Ethene (mg/l)	0.00271 U	NA	0.00271 U	0.00271 U	0.00271 U
Methane (mg/l)	**0.0885**	NA	**0.565 D**	**0.0418**	**0.302 D**
Nitrate (mg/l)	0.21 U	NA	0.21 U	**0.17 J**	**0.23 J**
Sulfate (mg/l)	**1,500 D**	NA	**1,000 D**	**1,300 D**	**1,000 D**
Sulfide (mg/l)	1 U	NA	1 U	1 U	1 U
Total organic carbon (TOC) (mg/l)	**0.67 J**	NA	**1.5**	**0.75 J**	**4.2**

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Notes:

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D - Compound identified in an analysis at a secondary dilution factor

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Q - Quality control may have exceeded criteria

U - The material was analyzed for, but not detected

MG/L - Milligrams per liter

UG/L - Micrograms per liter

Appendix F
Fish Tissue Evaluation

APPENDIX F

Fish Tissue Human Health Risk Assessment

This appendix presents the human health risk assessment (HHRA) for ingestion of fish from the North Branch Potomac River adjacent to Site 1. Fish tissue samples collected in June 2010 and June 2012 are evaluated in this HHRA. The results of the risk calculations for 2012 are compared to those using the 2010 data, and these results are both compared to results from previous fish tissue sampling and risk calculations. The HHRA is composed of eight parts:

- Selection of Chemicals of Potential Concern
- Exposure Assessment
- Toxicity Assessment
- Risk Characterization
- Summary of Results and Comparison to Previous Baseline Risk Fish Tissue Assessments
- Human Health Risk Comparison - 2010 and 2012 Results
- Comparison to Previous Human Health Risk Assessments
- References

F.1 Selection of Chemicals of Potential Concern

In accordance with the Sampling and Analysis Plan, fish tissue composite samples are to be collected from five site-related locations and one upgradient location from the North Branch Potomac River. One sample of bottom-dwelling fish and one sample of free-swimming fish are to be collected from each location. During the 2010 fish tissue sampling event, free-swimming fish were caught at all five site-related locations and the upgradient background location. Bottom-dwelling fish were caught from three of the site-related locations and the background location. During the 2012 fish tissue sampling event, free-swimming fish were caught at all five site-related locations and the upgradient background location. Bottom-dwelling fish were caught from four of the site-related locations; however, bottom-dwelling fish were not caught at the background location. The bottom-dwelling fish samples from each event were analyzed by the laboratory for Target Compound List (TCL) volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs) and Target Analyte List (TAL) metals. The free-swimming fish samples were analyzed for TAL metals only. **Table F-1** includes the 2010 and 2012 fish tissue sample data.

Fish tissue data were screened against United States Environmental Protection Agency (USEPA) Region III fish ingestion screening levels (USEPA, 2012a) to identify the chemicals of potential concern (COPCs) for quantitative evaluation in the risk assessment. The purpose of the COPC screening was to focus the list of constituents detected in fish tissue to those of greatest potential concern for human health. The screening levels for non-carcinogenic constituents were divided by 10 (adjusted) to account for exposure to more than one non-carcinogenic constituent that affects the same target organ and reflect a hazard quotient (HQ) of 0.1. Screening levels based on carcinogenic effects were used as presented in the table, and these levels are based on a carcinogenic risk of $1x10^{-6}$. Constituents whose maximum detected concentration exceeded the adjusted fish ingestion screening level were identified as COPCs. Additionally, constituents that are essential human nutrients and do not have fish ingestion screening levels (calcium, magnesium, potassium, and sodium) were not considered COPCs. The COPC screening is presented in **Table F-2** (2010 data) and **Table F-3** (2012 data).

F.2 Exposure Assessment

The exposure assessment includes a determination of the exposed populations and scenarios, an estimate of the exposure point concentrations (EPCs), and an estimate of the daily intake (DI) of the COPCs.

F.2.1 Exposed Populations and Exposure Scenarios

It was assumed that the population that would ingest fish from the North Branch Potomac River near Site 1 is local residents (children and adults). It was conservatively assumed that fish from the North Branch Potomac River are the primary source of recreational fish that these local residents ingest.

F.2.2 Exposure Point Concentration

The EPCs for each COPC were calculated as the 95 percent upper confidence limit (UCL) of the mean concentration (**Tables F-4 and F-5**). The maximum detected concentration was used in place of the 95 percent UCL as the EPC when the calculated 95 percent UCL was greater than the maximum detected concentration or there were less than five samples in a data set. ProUCL Version 4.1.01(USEPA, 2011) was used to determine the data distribution and calculate the 95 percent UCLs following guidance in the ProUCL Version 4.1 users guide (USEPA, 2010).

F.2.3 Daily Intake of COPCs

Daily chemical intake is the amount of the chemical contaminant entering the receptor's body per day. The following equation was used to estimate daily intake (DI):

$$DI = \frac{FishC \text{ x } IngR \text{ x } EF \text{ x } ED}{BW \text{ x } AT \text{ x } 365 \text{ days/year x } 1000 \text{ g/kg}}$$

Where:

DI	=	average DI (milligrams per kilogram per day [mg/kg-day])
FishC	=	fish tissue concentration (milligrams per kilogram [mg/kg])
IngR	=	fish ingestion rate (grams per day [g/day])
EF	=	exposure frequency (days per year)
ED	=	exposure duration (years)
BW	=	body weight of exposed individual (kilograms [kg])
AT	=	averaging time, period over which exposure is average (years)

The values for the parameters used to estimate the intakes of the COPCs were obtained from USEPA risk assessment guidance documents and are included in **Tables F-6 through F-13**. The adult fish ingestion rate is the recommended recreational fisher ingestion rate found in USEPA's *Exposure Factors Handbook* (USEPA, 1997a). There is no value for ingestion of recreationally caught fish by children in USEPA guidance. Therefore, the ratio of total fish consumption by children (ages 0 to 9) to total fish consumption by adults (ages 20 to 70+), from Table 10-1 of the 1997 USEPA *Exposure Factors Handbook*, was calculated and multiplied by the adult recreational fish ingestion rate. The fish ingestion rates used in the risk assessment are equivalent to 29 fish meals weighing 0.25 of a pound (or 4 ounces) each per year for a child and 40 fish meals weighing 0.5 of a pound (or 8 ounces) per year for an adult from fish caught from the North Branch Potomac River near Site 1.

F.3 Toxicity Assessment

Toxicity assessment defines the relationship between the magnitude of exposure and possible severity of adverse effects, and weighs the quality of available toxicological evidence. Toxicity assessment generally consists of two steps: hazard identification and dose-response assessment. Hazard identification is the process of determining the potential adverse effects from exposure to the constituent along with the type of health effect involved. Dose-response assessment is the process of quantitatively evaluating the toxicity information and characterizing the relationship between the dose of the constituent administered or received and the incidence of adverse health effects in the exposed population. Toxicity criteria (such as reference doses [RfDs] and cancer slope factors [CSFs]) are derived from the dose-response relationship.

USEPA recommends that a tiered approach be used to obtain the toxicity values (RfDs and CSFs) that are used to estimate non-cancer and cancer risks (USEPA, 2003). The hierarchy of toxicity value sources is as follows:

- USEPA's Integrated Risk Information System (IRIS) database (USEPA, 2012b).
- The Provisional Peer Reviewed Toxicity Value (PPRTV) database maintained by the USEPA's National Center for Environmental Assessment (NCEA) and the Superfund Health Risk Technical Support Center.
- Other USEPA and non-USEPA sources including: NCEA, Agency for Toxic Substances and Disease Registry, Health Effects Assessment Summary Tables (USEPA, 1997b), the California Environmental Protection Agency (Cal EPA), USEPA's Office of Water, and the World Health Organization.

The use of provisional toxicity values, such as those from the PPRTV database, increases the uncertainty of the quantitative risk estimate. However, all toxicity values used in this assessment were from IRIS.

If no toxicity values were available for a detected constituent, surrogate constituents were selected and their Regional Screening Levels (RSLs) were used for the COPC selection process (such as use of the hexavalent chromium RSL for total chromium, and use of the methylmercury RSL for inorganic mercury). Surrogates were selected based on previous recommendations from USEPA.

F.3.1 Approach for Potential Mutagenic Effects

For COPCs that act via a mutagenic mode of action (MMOA), cancer risks were estimated using age-dependent adjustment factors (ADAFs), as is consistent with cancer guidelines and supplemental guidance (USEPA, 2005a, 2005b). Consistent with the Superfund guidance on MMOA (http://www.epa.gov/oswer/riskassessment/sghandbook/chemicals.htm), benzo(a)pyrene is considered to act via an MMOA. Additionally, chromium is also categorized as a chemical with an MMOA (McCarrol, et al., 2010). The calculation of cancer risk using ADAFs is presented in **Tables F-7, F-9, F-11, and F-13**. As chemical-specific data are not available for carcinogenic polycyclic aromatic hydrocarbons (PAHs) (benzo[a]pyrene) or chromium, default ADAFs, as included in the USEPA Region III memorandum, *Derivation of RBCs for Carcinogens That Act via a Mutagenic Mode of Action and Incorporate Default ADAFs* (USEPA, 2006), were used for the MMOA evaluation. The default ADAFs used to adjust the CSFs are 10 for 0 to 2 year olds and 3 for 2 to 6 year olds. The CSF was multiplied by the appropriate ADAF to derive the age-specific CSF for the child to calculate the total carcinogenic risk. Additionally, the exposure factors for children 0 to 2 years old and 2 to 6 years old were assumed to be the same as the parameters for a child 0 to 6 years old, with the exception of the exposure duration, which was instead 2 years and 4 years, respectively.

F.4 Risk Characterization

The risk characterization estimates the potential health risks associated with exposure to site chemicals. Risk characterization combines the results of the previous elements to evaluate the potential health risks of exposure to the COPCs.

F.4.1 Methods for Estimating Risks

The non-carcinogenic hazard for an individual constituent through an individual exposure pathway is termed the HQ. Non-carcinogenic HQs are calculated by dividing the average DI by the RfD:

$$HQ = DI/RfD$$

If exposure is equal to or less than the RfD, the HQ will be equal to or less than 1, and it is unlikely that there will be any adverse effect due to exposure to that constituent. If exposure exceeds the RfD, the HQ will exceed 1, and an unacceptable non-carcinogenic hazard may exist. An HQ is developed for each non-carcinogenic COPC. HQs for each COPC are then summed to derive the hazard index (HI). This approach assumes that non-carcinogenic hazards associated with exposure to more than one constituent are additive (HI = sum of the HQs). Synergistic or antagonistic interactions between constituents are not considered. The HI may exceed 1 even if all of the individual HQs are less than 1. If the HI is greater than 1, separate HIs are estimated for each target organ to assess whether the HI for a specific target organ is greater than 1. A target-organ-specific HI greater than 1

indicates that there is some potential for adverse non-carcinogenic health effects associated with exposure to the COPCs. If the HI for each target organ does not exceed 1, non-carcinogenic hazards are not expected. COPCs contributing to a target-organ-specific HI greater than 1 are considered chemicals of concern (COCs).

The potential for carcinogenic effects due to exposure to site-related contamination is evaluated by estimating excess lifetime cancer risk (ELCR). ELCR is the incremental increase in the probability of developing cancer during one's lifetime in addition to the probability of getting cancer associated with exposure to non-site-related sources of carcinogens.

Carcinogenic risk is calculated by multiplying the DI by the CSF.

$$ELCR = DI \times CSF$$

The combined risk from exposure to multiple constituents was evaluated by adding the risks from individual constituents. As required under the National Oil and Hazardous Substances Contingency Plan (NCP) (USEPA, 1994) "[f]or known or suspected carcinogens, acceptable exposure levels are generally concentration levels that represent an excess upper bound lifetime cancer risk to an individual of between 10^{-4} to 10^{-6} using information on the relationship between dose and response." When a cumulative carcinogenic risk to a receptor under the assumed reasonable maximum exposure (RME) exposure conditions exceeds 1 in 10 thousand (that is, 10^{-4} ELCR), the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) generally requires remedial action to reduce risks at the site.

COCs are identified for each receptor and each data grouping. COCs are those constituents that contribute an HQ above 0.1 to a target organ HI above 1, or a carcinogenic risk above 10^{-6} to a cumulative carcinogenic risk above 10^{-4}.

F.4.2 Risk Assessment Calculation Results

Non-carcinogenic hazards and carcinogenic risks were calculated using both site-related samples and the background samples for each fish tissue sampling event (2010 and 2012).

F.4.3 2010 Sample Event

Site-Related Samples

The calculation of site-related HQs (and HIs) for the 2010 data are presented in **Table F-6**. The HI for both the child and adult residential receptors who ingest free-swimming (child HI = 70, adult HI = 42) and bottom-dwelling fish (child HI = 4, adult HI = 3) from the North Branch Potomac River adjacent to and downstream of Site 1 exceed USEPA's threshold value of 1. An HI was calculated for each target organ/effect, separately for free-swimming and bottom-dwelling fish. For the child resident who ingests free-swimming fish, target organs/effects with HIs above 1 include skin, vascular, and hair, associated with ingestion of arsenic, thallium, and vanadium, which are considered COCs. Although vanadium alone does not contribute an HI above 1, vanadium was identified as a COC as it contributes an HQ above 0.1 to the same target organ as thallium. For the adult resident who ingests free-swimming fish, hair is the only target organ/effect with an HI exceeding 1, associated with ingestion of thallium, the only COC. There are no target organ/effects for the bottom-dwelling fish with HIs above 1. Therefore, there are no COCs for the bottom-dwelling fish based on non-carcinogenic hazards using the 2010 fish tissue data.

The calculation of site-related ELCRs for the 2010 data is presented in **Table F-7**. The child and adult residents who ingest free-swimming fish, and the child residents who ingest bottom-dwelling fish, would have ELCRs above the acceptable ELCR range. The ELCR from ingestion of free-swimming fish is associated with arsenic and chromium, the two carcinogenic COPCs. The ELCR from ingestion of bottom-dwelling fish is associated with chromium, with a smaller contribution from benzo(a)pyrene, the two carcinogenic COPCs for bottom-dwelling fish.

Background Samples

The non-carcinogenic hazards and carcinogenic risks associated with ingestion of free-swimming and bottom-dwelling fish from the upstream (background) sample location from 2010 were calculated for the child and adult receptors (**Tables F-8 and F-9**, respectively. The HI for the child receptor who ingests free-swimming (HI = 105) and bottom-dwelling fish (HI = 2) from upstream, and the adult receptor who ingests free-swimming fish (HI = 63) from upstream, are above USEPA's threshold HI value of 1. An HI was calculated for each target organ/effect, separately

for free-swimming and bottom-dwelling fish. For the child resident who ingests free-swimming fish, target organs/effects with HIs above 1 include skin, vascular, thyroid, and hair, associated with ingestion of arsenic, cobalt, thallium, and vanadium, which are considered COCs. Although vanadium alone does not contribute an HI above 1, vanadium was identified as a COC as it contributes an HQ above 0.1 to the same target organ as thallium. For the adult resident who ingests free-swimming fish, target organs/effects with HIs above 1 include skin, vascular, and hair, associated with ingestion of arsenic, thallium, and vanadium, which are considered COCs. There are no target organ/effects for the bottom-dwelling fish from the 2010 background sample with HIs above 1. Therefore, there are no COCs for non-carcinogenic effects for the background bottom-dwelling fish.

The ELCR for the adult resident who ingests free-swimming fish and the child who ingests free-swimming or bottom-dwelling fish exceeds the acceptable ELCR range. The ELCR from ingestion of free-swimming fish from upstream is associated with arsenic and chromium (the only carcinogenic COPCs), and the ELCR from ingestion of bottom-dwelling fish (child only) is chromium.

F.4.4 2012 Sample Event

Site-Related Samples

The calculation of site-related HQs (and HIs) for the 2012 data are presented in **Table F-10**. The HI for both the child and adult residential receptors who ingest free-swimming (child HI = 5, adult HI = 3) and the child who ingests bottom-dwelling fish (HI = 2) from the North Branch Potomac River adjacent to and downstream of Site 1 exceed USEPA's threshold value of 1. An HI was calculated for each target organ/effect, separately for free-swimming and bottom-dwelling fish. There were no target organ/effect HIs that exceeded USEPA’s threshold value of 1. Therefore, there were no non-carcinogenic COCs identified for the free-swimming or bottom-dwelling fish, based on the 2012 fish tissue data.

The calculation of site-related ELCRs for the 2012 data is presented in **Table F-11**. The calculated ELCR for both the child and adults who ingest either free-swimming or bottom-dwelling fish from the North Branch Potomac River adjacent to and downstream of Site 1 are within acceptable risk levels. Therefore, there are no carcinogenic COCs for either free-swimming or bottom-dwelling fish based on 2012 fish tissue data.

Background Samples

The non-carcinogenic hazards and carcinogenic risks associated with ingestion of free-swimming fish from the upstream (background) sample location from 2012 were calculated for the child and adult residential receptors. Bottom-dwelling fish were not caught during the 2012 sampling event and are therefore not evaluated. The calculation of HQs (and HIs) for the 2012 free-swimming fish from the upstream (background) location are presented in **Table F-12**. The HI for receptors who ingest free-swimming fish from the upstream (background) sample is below USEPA’s threshold HI value of 1; therefore, there are no non-carcinogenic COCs.

The calculation of ELCRs for the 2012 free-swimming fish from the upstream (background) sample is presented in **Table F-13**. The calculated potential ELCRs for both the child and adult resident are within acceptable risk levels. Therefore, there are no carcinogenic COCs for free-swimming fish based on 2012 fish tissue data.

F.5 Human Health Risk Summary

The risk assessment calculations indicate that ingestion of fish collected in 2010 from the North Branch Potomac River upstream (background), and adjacent to and downstream (site-related) of the site, may result in unacceptable non-carcinogenic hazards and carcinogenic risks for local residents who use the North Branch Potomac River near Site 1 as their only recreational fishing area. The COCs associated with the site-related free-swimming fish samples are arsenic, chromium, thallium, and vanadium. The COCs associated with the site-related bottom-dwelling fish samples are chromium and benzo(a)pyrene. The COCs associated with the background free-swimming fish are arsenic, cobalt, thallium, vanadium, and chromium. The COC associated with the background bottom-dwelling fish is chromium. It should be noted that the hazards and risks associated with total chromium were calculated assuming all of the chromium is present as hexavalent chromium, which is a very conservative estimate for fish tissue. Assuming the majority of the chromium is present as trivalent chromium, which is a more likely scenario, chromium would not be a COC for any of the 2012 fish groupings. Additionally, if chromium was

not a COC, there would be no unacceptable carcinogenic risk associated with site-related bottom-dwelling fish (carcinogenic risk would be within acceptable levels, and benzo[a]pyrene would no longer be considered a COC) or background bottom-dwelling fish.

As previously shown, ingestion of fish from both the site-related sample locations and the upstream (background) sample location collected in 2010 may result in an unacceptable non-carcinogenic hazards or cancer risks. Therefore, risks associated with fish ingestion may not be due to releases from Site 1; rather, they may be associated with background conditions of the river. Additionally, there is a state-wide fish advisory for West Virginia, associated with polychlorinated biphenyls (PCBs), mercury, and dioxin (http://www.wvdhhr.org/fish/current.asp).

The risk assessment calculations indicate that ingestion of fish collected in 2012 from the North Branch Potomac River upstream (background), and adjacent to and downstream (site-related) of the site, would not result in unacceptable non-carcinogenic hazards or cancer risks for local residents who use the North Branch Potomac River near Site 1 as their only recreational fishing area.

F.6 Human Health Risk Comparison - 2010 and 2012 Results

Arsenic, chromium, thallium, and vanadium were identified as COCs associated with ingestion of the 2010 free-swimming fish samples, and chromium and benzo(a)pyrene were identified as COCs for the bottom-dwelling fish samples. No COCs were identified from the 2012 sampling event.

Arsenic was detected in one of the free-swimming site related fish tissue samples in 2010 at a concentration of 1 J microgram per liter [µg/L] (the J qualifier indicating that the sample is below the sample detection limit and the concentration is estimated). Arsenic was not detected in any of the 2012 free-swimming site-related fish tissue samples. However, the detection limit, which was similar in both the 2010 and 2012 samples, exceeds the fish tissue RSL. Thallium was detected in one of the free-swimming site-related fish tissue samples in 2010 at a concentration of 1.1 J µg/L. Thallium was not detected in any of the 2012 free-swimming site-related fish tissue samples. However, the detection limit, which was similar in both the 2010 and 2012 samples, exceeds the fish tissue RSL. Chromium was detected in both 2010 and 2012 free-swimming site-related fish tissue samples; however, the concentrations in 2010 were higher than the concentrations in 2012.

Benzo(a)pyrene was detected in the 2010 bottom-dwelling site-related fish tissue samples, but was not detected in the 2012 samples. Chromium concentrations in the 2010 bottom-dwelling site-related fish tissue samples were slightly higher than the concentrations in the 2012 bottom-dwelling site-related fish tissue samples.

F.7 Comparison to Previous Human Health Risk Assessments

The 2010 and 2012 evaluations were compared with the results of the 2008 evaluation (Table F-14). The previous fish tissue HHRAs did not include the identification of COCs based on target organ totals; only the COPCs contributing the greatest to total non-carcinogenic hazards above 1 or carcinogenic risks above 10^{-4} were identified.

The constituents retained as COPCs for the 2008 sampling event differ from those retained as COPCs during the 2010 or 2012 sampling rounds. Aluminum, iron, manganese, selenium, and zinc were retained as COPCs in 2008 for free-swimming fish, but were not retained as COPCs for the 2010 free-swimming fish sampling round. Aluminum and arsenic were not detected in the 2012 free-swimming fish sampling round.

Cyanide was retained as a COPC in 2008 for bottom-dwelling fish, but not detected in either the 2010 or 2012 bottom-dwelling fish samples.

The difference in the COPCs between the 2008, 2010, and 2012 sampling result in a difference in the calculated non-carcinogenic hazards and carcinogenic risks between the events. The non-carcinogenic hazards calculated for the free-swimming fish in 2008 were lower than those calculated for 2010 and 2012 free-swimming fish. The non-carcinogenic hazards calculated for the bottom-dwelling fish in 2008 were similar to those calculated in 2010 and 2012. Carcinogenic risks calculated for the 2008 free-swimming fish were similar to those in 2010 and 2012. Carcinogenic risks were not calculated for bottom-dwelling fish in 2008, as there were no carcinogenic COPCs.

F.8 References

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Table F-14
Summary of 2008, 2010, and 2012 Cancer Risks and Hazard Indices
Site 1 - North Branch Potomac River
Five-Year ROD Review Report
Allegany Ballistics Laboratory
Rocket Center, West Virginia

Receptor	Media		Exposure Route	Cancer Risk	Chemicals with Cancer Risks >10^{-6}	Hazard Index	Chemicals with HI>1	COCs
2008*								
Future Adult Resident	Fish Tissue	Free Swimming	Ingestion	3E-04	Arsenic	6	Antimony, Arsenic	Antimony, Arsenic
		Bottom Dwelling		NE		2		None
Future Child Resident	Fish Tissue	Free Swimming	Ingestion	1E-04	Arsenic	9	Antimony, Arsenic	Antimony, Arsenic, Zinc
		Bottom Dwelling		NE		3		None
2010**								
Future Adult Resident	Fish Tissue	Free Swimming	Ingestion	3E-04	Arsenic, Chromium	42	Thallium	Arsenic, Chromium, Thallium, Vanadium
		Bottom Dwelling		1E-04	Benzo(a)pyrene, Chromium	3		None
Future Child Resident	Fish Tissue	Free Swimming	Ingestion	3E-04	Arsenic, Chromium	70	Arsenic, Thallium	Arsenic, Chromium, Thallium, Vanadium
		Bottom Dwelling		2E-04	Benzo(a)pyrene, Chromium	4		Benzo(a)pyrene, Chromium
2012**								
Future Adult Resident	Fish Tissue	Free Swimming	Ingestion	3.0E-05	Chromium	3		None
		Bottom Dwelling		3.0E-05	Chromium	1		None
Future Child Resident	Fish Tissue	Free Swimming	Ingestion	8.0E-05	Chromium	5		None
		Bottom Dwelling		8.0E-05	Chromium	2		None

NE - not evaluated, no carcinogenic COPCs identified
COCs - chemicals of concern; COC is a COPC that contributes hazard index > 0.1 to cumulative target organ hazard index > 1, or cancer risk >10^{-6} to a cumulative cancer risk >10^{-4}.

Note:
*No cancer slope factor for chromium in 2008; therefore cancer risks associated with chromium not included in calculation
**Chromium risks calculated assuming all chromium is hexavalent chromium

Appendix G
Benthic Evaluation

APPENDIX G

Benthic Evaluation

G.1 Biota Sampling Methodology

Biota samples were originally included in the long-term monitoring (LTM) program to evaluate whether the biota inhabiting the North Branch Potomac River in the vicinity of Site 1 (**Figure 4-1**) were being affected by the capture of contaminated groundwater at Site 1 (thereby preventing its discharge to the river). In order to determine if changes in the biota inhabiting the river can be attributed to the groundwater extraction and treatment system, data were needed to describe the conditions of the biotic communities in the river prior to (1998 sampling event) and following (2000 through 2012 sampling events) implementation of the groundwater extraction and treatment system.

Based on the results of ecological risk assessments (ERAs) conducted for source areas within the river floodplain adjacent to Site 1 (soil ERA) and for the North Branch Potomac River (river ERA), modifications were made to the LTM program in 2006 (addition of additional benthic macroinvertebrate sampling methodologies) and 2008 (the addition of two new biota sampling locations). The expanded LTM program also has an additional objective, to assess the need for remedial actions within the river once remedial actions to address floodplain soils have been completed (in addition to continuing to evaluate the effectiveness of the existing remedy at Site 1 [groundwater extraction and treatment], the original objective of the LTM program). The 2008 LTM event will provide baseline data prior to the implementation of remedial actions for floodplain soils to help determine if impacts in the river are occurring, and thus need to be addressed, or if remedial actions for the floodplain soils and source areas are also sufficient to address any ecological risks in the river.

The biota portion of the LTM program consists of fish tissue sampling (for human health evaluation) and benthic macroinvertebrate sampling (for ecological evaluation). Fish tissue samples are collected at six locations (BIOTA 1 through 6) in the river upstream, adjacent to, and downstream of Site 1. These fish tissue data are described and evaluated in Appendix F.

LTM of benthic macroinvertebrates is also being conducted as part of the existing remedy at Site 1. The primary purpose of this biomonitoring is to assess the health of the aquatic community (represented by benthic macroinvertebrates) present in the river near Site 1. The 1998 baseline survey was completed prior to the start-up of the groundwater capture and treatment system. Seven post-remedy surveys (in 2000, 2002, 2004, 2006, 2008, 2010, and 2012) have been conducted to date. Because contaminants may be concentrated during periods of low flow, the biomonitoring program was set up to sample during the time period with the lowest typical flows (June through September). However, the available data indicate that surface water concentrations within a sampling event tend to track together among stations for some constituents, but not others, and relation to flow conditions are not always clear, likely because surface water samples reflect a short-term point estimate of concentration.

Macroinvertebrates are currently sampled in the North Branch Potomac River at 10 stations (BIOTA 1 through BIOTA 6, BIOTA 1B, BIOTA 3A, BIOTA 4A, and BIOTA 4B[1]; **Figure 4-5**) using Hester-Dendy (HD) plate samplers, which are left in place for a 6-week period. To date, eight sampling events (July through August 1998, June through July 2000, June through July 2002, June through July 2004, June through August 2006, August through September 2008, June through July 2010, and June through July 2012) have occurred using HD samplers. In 2006, biologists also began sampling benthic macroinvertebrates using kick nets and dip nets to supplement the HD samplers.

[1] BIOTA 1B and BIOTA 4B were first sampled in 2004 and were added to further delineate areas of potential concern identified in the 2002 sampling event. BIOTA 3A and BIOTA 4A were first sampled in 2008 based upon the results of the ERA for the river (CH2M HILL, 2008).

As shown on **Figure 4-5**, biota sampling is performed at the following North Branch Potomac River stations:

- Station 1 (BIOTA 1) – located approximately 3,000 feet upstream of the State Route 956 bridge and upstream of Site 5. This station is located above all known influences from the Allegany Ballistics Laboratory (ABL) facility, and serves as the reference (background) condition for the samples collected adjacent to, and downstream of, Site 1. Co-located with surface water and sediment sampling location 1SW-0/1SD-0.
- Station 1B (BIOTA 1B) - located approximately 225 feet downstream of the State Route 956 bridge, near the right bank of the river (looking downstream), just above a riffle that extends the width of the river at the approximate boundary between ABL Plants 1 and 2. This is a benthic macroinvertebrate sampling location only.
- Station 2 (BIOTA 2) - located approximately 300 feet downstream of the old railroad bridge, United States Geological Survey (USGS) gauge 01600000, right bank of river. Co-located with surface water and sediment sampling location 1SW-1/1SD-1.
- Station 3 (BIOTA 3) - located east of Gate 26 and due north of the western end of the extraction well alignment. Co-located with surface water and sediment sampling location 1SW-2/1SD-2.
- Station 3A (BIOTA 3A) – located approximately 400 feet downstream of Station 3. Co-located with surface water and sediment sampling location 1SW-7/1SD-7. This is a benthic macroinvertebrate sampling location only.
- Station 4 (BIOTA 4) - located approximately 600 feet downstream of Station 3, right bank of river, directly adjacent to where the highest volatile organic compound (VOC) concentrations in the alluvial and bedrock aquifers have historically been detected. Co-located with surface water and sediment sampling location 1SW-3/1SD-3.
- Station 4A (BIOTA 4A) - located approximately 800 feet downstream of Station 4. Co-located with surface water and sediment sampling location 1SW-4/1SD-4. This is a benthic macroinvertebrate sampling location only.
- Station 4B (BIOTA 4B) – located approximately 30 feet upstream of the old railroad bridge, and 15 feet downstream of the discharge point for the groundwater treatment plant, right bank of river. Co-located with surface water and sediment sampling location 1SW-9/1SD-9. This is a benthic macroinvertebrate sampling location only.
- Station 5 (BIOTA 5) - located approximately 150 feet downstream of the old railroad bridge and on the west bank side of the island, just downstream of the treated groundwater discharge point. Co-located with surface water and sediment sampling location 1SW-5/1SD-5.
- Station 6 (BIOTA 6) - located approximately 150 feet downstream of the island adjacent to the west bank of the river.

The sampling procedures used for the benthic macroinvertebrate bioassessment are described in the following subsection. **Table G-1** summarizes the sampling methods used at each station.

G.1.1 Benthic Macroinvertebrate Sampling

Benthic macroinvertebrates are sampled using two methods, HD samplers and kick/dip nets, described as follows.

Hester-Dendy Sampling

Benthic macroinvertebrate samples are collected during the summer index period (June through September) to target the low-flow period of the river where minimal dilution of potential contaminants would occur. The stations shown on **Figure 4-5** are sampled using HD multi-plate samplers to allow quantitative evaluation of the benthic macroinvertebrate community. Each station consists of three HD samplers (total area 0.348 square meter) placed on an HD sampling rig in the river. HD samplers are left in the river for approximately 6 weeks before being retrieved. Upon retrieval, the contents of the samplers are transferred to a labeled sample container and fixed

with either alcohol or a formalin solution. The HD samplers are then processed in a taxonomic laboratory for species identification and quantification.

Concurrent with the collection of benthic macroinvertebrates, selected physical, chemical and habitat information are obtained at the time of HD placement at each of the stations to assist in the interpretation of the biological data. Although the sampling substrate (HD samplers) is the same at each station, physical factors (such as water depth and flow rate) present at each station may also influence the biota that colonize the samplers. Stream velocity measurements are made at each sample point at the time of HD installation to assist in sampler placement.

Jab and Kick Sampling

In addition to the HD sampling, dip- and/or kick-net sampling is conducted in riffle and pool areas at each of the biota stations except Station 1B (**Table G-1**). Kick-net sampling is conducted in riffle areas, while 20 jabs with a D-frame (dip) net are conducted in pool areas in proportion to the available in-pool habitats. If both pool and riffle habitat types are present at a station, separate samples are collected using each of the different methodologies. Kick-net samples are considered semi-quantitative in nature (that is, the sample area is well defined [1 square meter]). The method of using 20 jabs with a D-frame net is considered qualitative in nature because the area sampled is not well defined and is based solely upon proportion of available habitat present.

Riffle habitat is sampled with a composite of two kick-net samples, one in a faster flowing area and one from a slower flowing area. Where pools are the more dominant physical characteristic, an area of 100 meters is selected for 20 jab samples. The available habitat types (such as banks, snags, or sediment deposits) are identified in the 100-meter reach and the percentage of each habitat determined. The number of jabs is then allocated to each habitat type based upon the determined percentages. Sampling in pool areas is confined to the ABL side of the river and does not extend beyond the center of the stream reach.

Each sample type is consolidated, placed in bottles or plastic bags, labeled, preserved as appropriate, and sent to the laboratory (along with the HD samplers) for taxonomic identification to the lowest practical taxon. Kick-net and dip-net data are qualitatively evaluated using metrics selected from Blocksom and Flotemersch (2005).

G.2 Benthic Macroinvertebrate Sampling Results

This subsection summarizes the benthic macroinvertebrate data collected at locations adjacent to Site 1 during the current reporting period, which encompasses the 2010 and 2012 sampling events, as well as data from previous sampling events (1998 through 2008).

Hester-Dendy Sampling

Tables G-2 through G-9 summarize the benthic macroinvertebrate and habitat data collected during the 2010 and 2012 sampling events. Benthic macroinvertebrate samples collected in the field were processed and identified to the lowest practical taxonomic unit (LPTU). Upon completion of all field and laboratory activities, the HD data were analyzed using Rapid Bioassessment Protocol (RBP) III methods and metrics (Plafkin et al., 1989). The RBP metrics used in the analysis were selected prior to the 1998 sampling event and have been used in each succeeding sampling event since 1998 to lend consistency to the project data. The following metrics were used:

- Taxa Richness - total number of genera and/or species present (will decrease with increasing perturbation).
- Modified Hilsenhoff Biotic Index (HBI) - measured using tolerance values (ranging from 0 to 10), which increase as water quality decreases (and tolerance increases).
- Ratio of Scrapers and Filtering Collectors - this ratio reflects the riffle/run community food base.
- Ephemeroptera, Plecoptera, and Trichoptera (EPT) Index - the total number of distinct taxa within the orders Ephemeroptera, Plecoptera, and Trichoptera. This index generally increases with increasing water quality.
- EPT Abundance - relative abundance of EPT taxa.

- Ratio of EPT to Chironomid Abundance - a measure of community balance among the more sensitive taxa (EPT) and the more tolerant taxa (Chironomidae).
- Percent Contribution of Dominant Taxon - the percent contribution of the numerically dominant taxon to the total number of organisms, a measure of community balance and stress.

A biological score was developed for each of the stations using the RBP III scoring criteria (Plafkin et al., 1989), which assigns a numerical score to each metric based upon the value of the metric at each station. Scoring for most metrics is relative to a reference (background) station, which in theory reflects conditions absent of site influence. The reference site selected for this study was Station 1, which is located upstream of all known influences from the ABL facility. Thus, all of the biological metric values at downstream stations (2 through 6, 3A, 4A, and 4B) were compared to Station 1, as were those from Station 1B, which is located upstream of Site 1 but downstream of Site 5 and Plant 2.

Habitat features present at each station were also assessed using a number of habitat metrics to evaluate habitat quality and comparability to reference conditions. These qualitative habitat assessment scores for each metric at each station are presented in **Table G-2** (2010) and **Table G-3** (2012). Although the substrate material for the assessment of benthic macroinvertebrates was held constant (since the HD samplers provide the substrate and identical samplers were used at each station), the habitat scores allow for an evaluation of general physical characteristics that may influence community structure and function (such as water depth and flow rate) irrespective of the presence of stressors (such as chemical contaminants). The habitat assessment is important because habitat is a major influence on biological community structure. If the habitat can be eliminated as an influencing factor, then impairment of biological community integrity would most likely be attributable to water quality factors. Based upon the habitat scores, habitat characteristics at each of the downstream stations were either comparable or supporting when compared to the reference station during both 2010 and 2012 (**Tables G-2 and G-3**).

The physical and general chemical characteristics at each station were also evaluated to assist in interpretation of the biological information. Physical and chemical conditions such as river discharge, bottom substrate size, amount of overhead cover, dissolved oxygen concentration, and pH assist in interpretation of the biological information (**Tables G-4 and G-5**).

The raw results of the HD macroinvertebrate sampling are provided in **Table G-6** (2010) and **Table G-7** (2012) for each station (composite of three HD samplers placed at each station). **Tables G-6 and G-7** also provide the tolerance values and functional feeding groups for each of the observed taxa (where available), which are used to develop some of the metrics. Each metric represents a slightly different component of community structure and function, and provides a measure of biotic integrity.

In June through July 2010, the number of taxa was highest at Stations 3A and 6 and lowest at Stations 4 and 5. The density of organisms was highest at Station 1B and lowest at Stations 4B and 5. Chironomids were the dominant taxa at all stations except Stations 2, 3A, and 6, where insects from the order Ephemeroptera were the dominant taxa. In June through July 2012, the number of taxa was highest at Stations 3A, 4A, 5, and 6 and lowest at Stations 1B and 4B (data were unavailable from Station 2 due to the loss of the samplers). The density of organisms was highest at Station 4 and lowest at Stations 1B and 4B. Chironomids were the dominant taxa at all stations except Stations 1B, 5, and 6. Insects from the order Ephemeroptera were the dominant taxa at Stations 1B and 6, while insects from the order Trichoptera and chironomids were the dominant taxa at Station 5.

For perspective, a summary of the previous sampling events (1998 through 2008) is also provided, as follows. The number of organisms and taxa were relatively consistent among stations during the July 1998 sampling event. Organisms from the family Chironomidae were numerically dominant at all stations. The density of organisms at the most downstream station (Station 6) was low relative to the other stations in July 2000, although the number of taxa was relatively consistent among stations. Chironomids and oligochaetes dominated at most stations, although insects from the two orders Ephemeroptera and Trichoptera were relatively common at all stations except Station 5. In July 2002, the number of taxa was highest at Stations 1, 2, and 6 and lowest at Station 4. The

density of organisms was highest at Station 1 and lowest at Station 5. Chironomids were the dominant taxon at all six stations, although insects from the two orders Ephemeroptera and Trichoptera occurred at all stations. In July through August 2004, the number of taxa was highest at Station 6 and lowest at Station 5. The density of organisms was highest at Station 1 and lowest at Station 5. Chironomids were the dominant taxon at all eight stations. In June through August 2006, the number of taxa was highest at Stations 2 and 4B, and lowest at Stations 4 and 1B. The density of organisms was highest at Station 3 and lowest at Stations 1B, 4B, 5, and 6. Chironomids were the dominant taxon at all stations except Stations 3 and 4, where oligochaetes were the dominant taxon. In August through September 2008, the number of taxa was highest at Station 6 and lowest at Station 2. The density of organisms was highest at Station 6 and lowest at Station 3A. Chironomids were the dominant taxon at all stations except Station 3.

The results of the 2010 and 2012 bioassessments (scores) are summarized in **Tables G-8 and G-9**, respectively. These results are discussed in Section G.3.1.

Jab and Kick Sampling

Benthic macroinvertebrate samples collected in the field were processed and identified to the LPTU. Upon completion of all field and laboratory activities, the kick-jab data were qualitatively evaluated using selected metrics from Blocksom and Flotemersch (2005), as follows:

- Taxa Richness - total number of genera and/or species present (will decrease with increasing perturbation) (both kick and jab data).
- EPT Taxa - the total number of distinct taxa within the orders EPT. This index generally increases with increasing water quality (jab data only).
- Ephemeroptera Taxa - the total number of distinct taxa within the order Ephemeroptera (jab data only).
- Percent Ephemeroptera - the total number of individuals within the order Ephemeroptera relative to the total number of organisms (jab data only).
- Diptera Taxa - the total number of distinct taxa within the order Diptera (jab data only).
- Intolerant Taxa - the total number of distinct taxa with a tolerance value less than 6, which generally indicates organisms relatively intolerant to pollution (jab data only).
- Percent Tolerant - the total number of individuals within taxa with a tolerance value greater than or equal to 6, which generally indicates organisms relatively tolerant of pollution, relative to the total number of organisms (jab data only).
- Percent Collectors - the total number of individuals within taxa with a functional feeding group designation of “Collector” relative to the total number of organisms (jab data only).
- Modified HBI - measured using tolerance values (ranging from 0 to 10), which increase as water quality decreases (and tolerance increases) (kick data only).
- Ratio of Scrapers and Filtering Collectors - this ratio reflects the riffle/run community food base (kick data only).
- Ratio of EPT to Chironomid Abundance - a measure of community balance among the more sensitive taxa (EPT) and the more tolerant taxa (Chironomidae) (kick data only).
- Percent Contribution of Dominant Taxon - the percent contribution of the numerically dominant taxon to the total number of organisms, a measure of community balance and stress (kick data only).
- Community Loss Index – measures the degree of similarity in taxonomic composition between a station and a reference station in terms of taxon presence or absence (kick data only).
- Ratio of Shredders - the total number of individuals within taxa with a functional feeding group designation of “Shredder” relative to the total number of organisms (kick data only).

The raw results of the jab and kick macroinvertebrate sampling are provided in **Table G-10** (2010) and **Table G-11** (2012) for each station. **Tables G-10 and G-11** also provide the tolerance values and functional feeding groups for each of the observed taxa (where available), which are used to develop some of the metrics. Each metric represents a slightly different component of community structure and function, and provides a measure of biotic integrity.

In June 2010, the number of organisms and the number of taxa in kick-net samples were generally similar among the three site stations (Stations 2, 4B, and 5) where this method was employed, but were lower than at the reference Station 1. Chironomids and insects from the two orders Ephemeroptera and Trichoptera were the dominant taxa at all four stations (**Table G-10**). The number of organisms in jab samples was highest at Stations 1 and 4, and lowest at Stations 3, 4A, and 6. The number of taxa in jab samples was highest at Stations 3 and 6 and lowest at Station 4A. Chironomids were the dominant taxon at all stations except Station 4, where oligochaetes were dominant (although chironomids were also a significant component at this station). Oligochaetes were also significant components at Stations 1 and 3A, and amphipods were significant components at Stations 3 and 4A (**Table G-10**).

In June 2012, the number of organisms in kick-net samples was similar among Stations 1, 2, 4B, and 5, the four stations where this sampling method was employed. The total number of taxa, however, was lower at Station 2. Chironomids and insects from the two orders Ephemeroptera and Trichoptera were the dominant taxa at Station 4B; chironomids and insects from the order Ephemeroptera were the dominant taxa at Station 1; chironomids and insects from the order Trichoptera were the dominant taxa at Station 5; and insects from the orders Ephemeroptera and Trichoptera were the dominant taxa at Station 2 (**Table G-11**). The number of organisms in jab samples was similar among all stations sampled. The number of taxa was highest at Stations 3A and lowest at Station 4. Chironomids were the dominant taxon at all stations, although oligochaetes were co-dominant at Stations 3, 4, and 6. Amphipods were a significant component of the community at Station 6 (**Table G-11**).

For perspective, a summary of the previous sampling events (2006 and 2008) is also provided, as follows. In August 2006, the number of organisms and the number of taxa in kick-net samples were similar among Stations 1, 2, and 4B, the three stations where this sampling method was employed. Chironomids were the dominant taxon at all three stations, although insects from the two orders Ephemeroptera and Trichoptera occurred at all three stations. The number of organisms and the number of taxa in jab samples were similar among Stations 1, 3, and 4, the three stations where this sampling method was employed. Chironomids were the dominant taxon at all three stations, although insects from the two orders Ephemeroptera and Trichoptera occurred at all three stations. In August 2008, the number of organisms in kick-net samples was similar among Stations 1, 2, 4B, and 5, the four stations where this sampling method was employed. The total number of taxa, however, was lower at Station 2. Chironomids were the dominant taxon at Station 4B. Insects from the two orders Ephemeroptera and Trichoptera were the dominant taxa at the remaining three stations, and also composed approximately 20 percent of the community at Station 4B. The number of organisms in jab samples was similar (and highest) among Stations 1, 3A, and 6, and similar (but lower) among Stations 3, 4, and 4A. Chironomids were the dominant taxon at all stations, except Station 3, where insects from the two orders Ephemeroptera and Trichoptera were dominant. Amphipods were a significant component of the community at Station 6, and insects from the two orders Ephemeroptera and Trichoptera were a significant component of the community at Station 1.

G.3 Benthic Macroinvertebrate Data Evaluation

This section presents the evaluation of biota data collected from the North Branch Potomac River with respect to the relative health of the benthic macroinvertebrate community along this reach of the river. The objectives of the benthic macroinvertebrate portion of the LTM program are to: (1) continue evaluating the effectiveness of the existing groundwater remedy (groundwater extraction and treatment) at Site 1, and (2) assess the need for remedial actions within the river once remedial actions to address Site 1 floodplain soils have been completed. The primary role of the benthic invertebrate bioassessment was to assess the current health (aquatic life use

attainment) by aquatic receptors (represented by benthic macroinvertebrates) present in the section of the North Branch Potomac River adjacent to Site 1.

G.3.1 Hester-Dendy Sampling

The HD data were used to compare the current (2010 and 2012 sampling events) stream health to the 1998 baseline assessment. The RBP III methodology (Plafkin et al., 1989) was used to measure habitat and stream biology, and to evaluate current use attainment relative to an upstream reference location (spatial evaluation). The same RBP methodology was used in the 1998 (baseline) survey and in the 2000, 2002, 2004, 2006, and 2008 assessments, allowing for a temporal evaluation as well.

Habitat scores at each of the downstream stations were classified as comparable or supporting when equated to the reference station in both 2010 and 2012 (**Tables G-2 and G-3**). Physically, bottom substrate material at Stations 1B, 2, 3A, 4B, and 5 were similar to the reference station (**Tables G-4 and G-5**). Station 3 had more silt; Station 4A had more cobble; and Stations 4 and 6 had more sand and less gravel, cobble, and boulders. Physicochemical parameters (dissolved oxygen, pH, and temperature) were within Maryland Water Quality Standards (COMAR, 2012 [Title 26]). Maryland standards are applicable because the Maryland-West Virginia border is at the West Virginia bank of the river; thus, the entire river is within the State of Maryland. Stream discharge as measured at USGS gauge 01600000 (Pinto, Maryland) is not currently available on-line for either the 2010 or 2012 deployment periods. One set of HD samplers was lost in 2012 at Station 2. The reason for this loss is not known.

The results of the 2010 bioassessment are summarized in **Table G-8**. Based upon the metrics evaluated, Stations 2, 3, 3A, 4B, and 6 were rated as non-impaired relative to the reference station (Station 1). Stations 1B and 4A were rated as slightly impaired. Lower scores for EPT to Chironomid ratio and EPT index were the main contributors to the overall lower score for these two stations. Stations 4 and 5 were rated as moderately impaired. Lower scores for the EPT-related metrics, scraper and collector ratio, and percent dominant taxon were the main contributors to the overall lower score for these two stations. Thus, only Stations 4 and 5 were notably impaired relative to the reference station in 2010. A comparison of habitat suitability scores (**Table G-2**, percent of reference) to bioassessment scores (**Table G-8**, percent of reference) suggests that the habitat within the study area was supportive of the biology (**Figure G-1**). The physical nature of the river segment between Stations 3 and 5 is more pool-like than reaches upstream and downstream of this area, which may influence benthic community structure and function. The HD substrates and the matching of flow velocities between each station appeared to dampen this influence.

The results of the 2012 bioassessment are summarized in **Table G-9**. Based upon the metrics evaluated, Stations 1B, 3, 4B, 5, and 6 were rated as non-impaired relative to the reference station (Station 1); Station 2 could not be evaluated because the samplers were lost sometime during the deployment period. Station 4 was rated as slightly impaired but was at the upper end of this category. Lower scores for EPT to Chironomid ratio and percent dominant taxon at Station 4 were the main contributors to its overall lower score. The score for Station 4A was on the border between the slightly impaired and moderately impaired categories. The main differences between Station 4A and the reference station were a lower EPT to Chironomid ratio, a higher value for percent dominant taxon, and a lower scraper and collector ratio. Station 3A was rated as moderately impaired. Lower scores for EPT to Chironomid ratio, percent dominant taxon, EPT abundance, and scraper and collector ratio at Station 3A were the main contributors to its overall lower score. Thus, only Stations 3A and 4A were notably impaired relative to the reference station in 2012. A comparison of habitat suitability scores (**Table G-3**, percent of reference) to bioassessment scores (**Table G-9**, percent of reference) suggests that the habitat within the study area was supportive of the biology (**Figure G-1**). The physical nature of the river segment between Stations 3 and 5 is more pool-like than reaches upstream and downstream of this area, which may influence benthic community structure and function. The HD substrates and the matching of flow velocities between each station appeared to dampen this influence.

All downstream stations were compared to the average bioscore achieved at the reference station (Station 1) since these surveys began in 1998 (**Figure G-2**). During the baseline (1998) bioassessment, slight impairment in

benthic macroinvertebrate communities was noted at two locations (relative to the reference station), one at the upstream end of Site 1 (Station 2) and the other (Station 4) directly adjacent to Site 1 (**Table G-10**). The 2000 bioassessment indicated slight impairment in benthic macroinvertebrate communities at all stations relative to the reference station, with bioassessment scores lowest at Station 2 and at the two most downgradient stations (Stations 5 and 6). The 2002 bioassessment indicated slight impairment at Stations 2, 3, and 6, and moderate impairment at Stations 4 and 5. The 2004 bioassessment indicated slight impairment at Stations 2 and 3, and moderate impairment at Station 4B. There was no observed impairment at any of the stations during the 2006 bioassessment. In 2008, Station 4A was on the border between the non-impaired and slightly impaired categories but was comparable to the average reference bioscore (**Figure G-2**) and so is considered non-impaired. Stations 2 and 4 were rated as slightly impaired. However, the bioscore at Station 2 was at the upper end of the category, which suggests a relatively low impact, while the bioscore at Station 4 was at the lower end of the category, which suggests a moderate impact. The 2010 bioassessment indicated slight impairment at Stations 1B and 4A, and moderate impairment at Stations 4 and 5. The 2012 bioassessment indicated slight impairment at Station 4 and moderate impairment at Station 3A. In 2012, Station 4A was on the border between the slightly impaired and moderately impaired categories, while Station 2 could not be evaluated due to the loss of the samplers.

A comparison of the 1998 and 2000 through 2012 data indicates increased impairment in 2000 and 2002 relative to 1998, with decreased impairment in 2004, no impairment in 2006, and, except at Station 4, minimal impairment in 2008. Impairment increased slightly in 2010 and 2012 relative to both 1998 and 2008 but was still focused mostly on the center of the site (Stations 3A through 4A), particularly in 2012 (note that Stations 3A and 4A were not sampled until 2008). As previously noted, the physical nature of the river segment between Stations 3 and 5 is more pool-like than reaches upstream and downstream of this area, which may influence benthic community structure and function.

Relative to 1998 and 2000, the 2002 bioassessment scores at Station 1 (reference) and Station 2 remained essentially unchanged, decreased at Stations 3, 4, and 5, and remained stable relative to 2000 (after decreasing from 1998) at Station 6. These changes are not thought to be related to habitat or physical factors based upon a comparison of habitat suitability scores to bioassessment scores, although low flows and scouring may have been contributing factors in some years. A comparison of the 2004 bioassessment scores to the scores from the baseline (1998), 2000, and 2002 studies indicates that, relative to 1998, bioscores at downstream stations were generally lower (bioscores at the reference station were generally consistent among the sampling events). However, most of these stations were considered only slightly impaired. There was an improvement in bioscores at Stations 2, 4, 5, and 6 in 2004, with bioscores exceeding (Stations 2 and 4), equaling (Station 6), or approaching (Station 5) baseline (1998) levels. Station 3 still exhibited a slight decrease in biological condition (relative to 1998 levels) but the 2004 bioscore was improved relative to 2002. The two new 2004 stations indicted no impairment (Station 1B) and moderate impairment (Station 4B). The latter station was immediately downstream of the treated effluent discharge. In 2006, bioscores improved at all stations relative to 2004 and equaled or exceeded baseline (1998) levels. In 2008, bioscores improved slightly at Stations 1B and 6 relative to 2004 and 2006, and were similar at Stations 3 and 5. While the bioscore at Station 2 decreased in 2008 relative to 2006, it was comparable to 2004 levels and was still above baseline (1998) levels. The bioscore at Station 4B also decreased slightly in 2008 relative to 2006 but was much higher compared to 2004 levels (it was not sampled in 1998) and was not considered impaired in 2008. The two new 2008 stations (Stations 3A and 4A) were not impaired. Only the bioscore at Station 4 dropped markedly from 2004 and 2006 levels in 2008 and was also below baseline (1998) levels (**Figure G-2**). In 2010 and 2012, the bioscore at the reference location (Station 1) reached its maximum possible value and was higher than during any of the previous events (including the 1998 baseline event). The bioscore at Stations 1B and 5 dropped in 2010 relative to 2008 but recovered in 2012 to its highest value since the sampling began. At Station 2, the bioscore improved in 2010 relative to 2008; there were no available data at this location in 2012 due to the loss of the samplers. Bioscores at Stations 3, 4B, and 6 remained uniformly high in 2010 and 2012 (relative to 2008). At Station 3A, the bioscore increased slightly in 2010 relative to 2008 but decreased markedly in 2012. At Station 4A, the bioscore dropped (from 2008 levels) in 2010 and dropped further in 2012. In 2010, the bioscore at Station 4 decreased from 2008 levels but recovered in 2012 to a value that exceeded 1998 levels.

G.3.2 Jab and Kick Sampling

In 2006, additional sampling of the benthic macroinvertebrate community was conducted at Stations 1 (reference), 2, 3, 4, and 4B using kick-nets and dip-nets. In 2008, this sampling was extended to encompass two new stations (Stations 3A and 4A), as well as existing Stations 5 and 6. These methods tend to be less influenced by changes in flow (and other) conditions relative to the HD samplers used as part of the LTM sampling, resulting in more representative samples of the benthic infauna. The results of these surveys are summarized in **Tables G-11 through G-14**, and metric scores are plotted on **Figure G-3** (kick data) and **Figure G-4** (jab data).

For kick-net samples, total organisms and number of taxa were similar among stations within each sampling event, and were similar between 2006, 2008, and 2010 but uniformly higher in 2012 (**Figure G-3**). The modified HBI, a general indicator of community health, was similar among stations and years. The EPT to Chironomid ratio (an indicator of a community that is more intolerant of pollution) was consistent with, or higher than, reference levels in both 2010 and 2012; Station 4B showed a depressed value for this metric in 2008 (but not 2006). Percent dominance (higher values are typically consistent with a more impacted community) was consistent with, or lower than, reference levels in all years.

For dip-net samples, total organisms were similar among stations within each sampling event, and were similar between 2006, 2008, and 2010 but uniformly higher in 2012 (**Figure G-4**). Total taxa were generally higher in 2008 and 2012 relative to 2006 and 2010 in jab samples, and tended to be lower at Stations 4 and 4A. Metrics that relate to tolerant versus intolerant taxa showed some variability. EPT taxa and Ephemoptera taxa (generally pollution intolerant) were generally higher in 2008 and 2012 relative to 2006 and 2010 (within a station), and tended to be lower at Stations 4 and 4A. The number of intolerant taxa was typically lowest at Stations 3A, 4, and 4A (recovering to Station 3 levels at Station 6) within each sampling event but the percent tolerant metric was much more uniform among stations and years (**Figure G-4**).

In summary, the kick-net data do not indicate an impact to the benthic invertebrate community in the vicinity of Site 1. The dip-net data suggest a possible slight impact, reflected in lower numbers and diversity of pollution intolerant taxa, at locations adjacent to Site 1, particularly Stations 4 and 4A. However, no consistent impacts were evident at Stations 3 and 3A, adjacent to and downgradient of the most contaminated source area in the Site 1 floodplain. These results were also generally consistent with the HD data, which generally showed consistent slight impairment at Stations 4 and 4A (**Table G-10**).

G.3.3 Ecological Characterization

The North Branch Potomac River is a highly dynamic system in the vicinity of the ABL facility. It is characterized by periods of very high flow at irregular intervals throughout the year as demonstrated by the historical flow data. This impacts the biota that inhabits the river and the spatial and temporal aspects of the benthic invertebrate community, as measured by the metrics used in the study. Many benthic invertebrate species, especially those that belong to the EPT complex, are flow-dependent, and their numbers will decrease under low-flow conditions. This can result in changes to the composition of the overall benthic invertebrate community. There are major shifts in flow throughout the study area based upon habitat and topography. The upper reaches of the river, especially Stations 1through 3 (as well as Station 6), are in areas where elevation changes quickly and typically have faster flows. Station 4, and to a lesser extent Station 5, are more lentic (pool) habitats, with lower typical flow rates.

Station 1 (reference) does appear to exhibit more variability for some metrics (such as the EPT-based metrics), making it more difficult to determine what the “typical” reference condition is. Changes in the values of these EPT-based metrics at Station 1 was a major influence on the conclusions related to possible impairment at the three most downgradient stations (Stations 4, 4A, and 4B) located adjacent to Site 1 because these stations are compared with Station 1 (reference) and do not show the same level of variability (although they do tend to show the same general temporal trends in the values for these metrics). Station 3 (at the upgradient end of Site 1) showed more variability (but not as much as at Station 1) for these metrics. In 2006, EPT to Chironomidae ratio and EPT index were not impacted relative to Station 1 at any of the stations located adjacent to Site 1. EPT abundance was still suppressed at Stations 2, 4B, 5, and 6, but not at Stations 3 and 4. Station 2 is upstream of

Site 1 (at SW/SD Transect 1) and Stations 3 and 4 (corresponding to SW/SD Transects 2 and 3, respectively) were in the area that contained the highest chemical concentrations in sediment (but were not impacted). In addition, the results of kick and jab sampling showed no impacts to EPT-related metrics at Stations 3 and 4 in 2006. The EPT to Chironomidae ratio in kick samples was lower at Station 2 (upstream of Site 1) but approximately twice the reference level at Station 4B in 2006. Thus, while the 2006 HD and kick and jab data suggest that the benthic invertebrate community is not impacted relative to upstream (reference) conditions, there is some uncertainty associated with this conclusion given the variability present in the benthic invertebrate data set (especially related to the EPT-based metrics at the reference station) and in flow conditions within this reach of the river. This is further substantiated by the 2008, 2010, and 2012 data, which reflected the variability in the EPT metrics and suggested a possible slight impairment at Stations 4 and 4A.

Analytical results, as evaluated in the river ERA (CH2M HILL, 2008) indicate that there is no clear correlation with constituent concentrations in sediment, although the biological and sediment sampling stations are not optimally located for such a comparison. For example, Transect 2, with some of the highest constituent concentrations in sediment, has not significantly impacted the biota at Station 3 (including the 2010 and 2012 data), located just downstream; Station 3 consistently had among the highest scores of the non-reference stations for the HD samples. The lack of correlations may also be due to temporal factors since the sediment samples represent point estimates of exposure (in both time and space) while invertebrate samples represent integrated exposures over long periods of time.

G.4 References

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TABLE G-1

Biota Sampling Method Summary

Site 1 - North Branch Potomac River

Five-Year ROD Review Report

Allegany Ballistics Laboratory

Rocket Center, West Virginia

Station	Benthic Invertebrates		
	Hester-Dendy	Kick	Jab
Biota 1	1998 - 2012	2006 - 2012	2006 - 2012
Biota 1B	2004 - 2012	--	--
Biota 2	1998 - 2012[a]	2006 - 2012	--
Biota 3	1998 - 2012	--	2006 - 2012
Biota 3A	2008 - 2012	--	2008 - 2012
Biota 4	1998 - 2012	--	2006 - 2012
Biota 4A	2008 - 2012	--	2008 - 2012
Biota 4B	2004 - 2012	2006 - 2012	--
Biota 5	1998 - 2012	2008 - 2012	--
Biota 6	1998 - 2012	--	2008 - 2012

a - Data unavailable for 2012 due to loss of the samplers during the deployment period

TABLE G-2

Summary of Habitat Scoring for Each Station - June 2010

Site 1 - North Branch Potomac River

Five-Year ROD Review Report

Allegany Ballistics Laboratory

Rocket Center, West Virginia

Habitat Category	Station 1 (Reference)	Station 1B	Station 2	Station 3	Station 3A	Station 4	Station 4A	Station 4B	Station 5	Station 6
Substrate and Instream Cover										
Epifaunal Substrate/Available Cover	18	18	18	18	16	14	18	16	18	16
Embeddedness	13	12	13	13	14	9	16	14	16	14
Velocity/Depth Regime	17	11	14	9	5	12	5	10	16	14
Channel Morphology										
Sediment Deposition	14	12	13	9	13	10	12	12	16	12
Channel Flow Status	17	16	14	14	15	16	14	16	13	15
Channel Alteration	18	17	18	17	17	16	18	18	18	18
Frequency of Riffles/Bends	13	11	16	10	11	6	5	11	13	10
Riparian and Bank Structure										
Bank Vegetative Protection										
Left Bank	7	7	6	7	8	7	8	7	7	6
Right Bank	7	7	7	7	8	7	8	7	3	7
Bank Stability										
Left Bank	7	8	7	7	7	6	6	4	6	7
Right Bank	6	7	6	7	6	6	7	3	3	7
Riparian Vegetative Zone Width										
Left Bank	9	6	8	9	7	5	8	9	8	5
Right Bank	9	9	6	9	5	6	5	5	3	6
Total Score	155	141	146	136	132	120	130	132	140	137
Percent of Reference	100	91	94	88	85	77	84	85	90	88
Resulting Habitat Suitability	--	Comparable	Comparable	Supporting	Supporting	Supporting	Supporting	Supporting	Comparable	Supporting

Criteria for Habitat Suitability (percent of reference):

≥ 90% = comparable to reference

75% - 89% = supporting

60% - 74% = partially supporting

≤ 59% = nonsupporting

TABLE G-3

Summary of Habitat Scoring for Each Station - June 2012

Site 1 - North Branch Potomac River

Five-Year ROD Review Report

Allegany Ballistics Laboratory

Rocket Center, West Virginia

Habitat Category	Station 1 (Reference)	Station 1B	Station 2	Station 3	Station 3A	Station 4	Station 4A	Station 4B	Station 5	Station 6
Substrate and Instream Cover										
Epifaunal Substrate/Available Cover	16	18	17	13	18	17	18	18	16	16
Embeddedness	13	14	12	17	13	9	12	16	12	14
Velocity/Depth Regime	18	13	19	6	7	8	5	7	8	14
Channel Morphology										
Sediment Deposition	13	16	13	13	16	8	13	13	13	12
Channel Flow Status	15	15	13	15	13	13	13	13	5	15
Channel Alteration	18	18	18	19	18	17	18	15	18	13
Frequency of Riffles/Bends	13	18	18	9	10	3	5	5	3	13
Riparian and Bank Structure										
Bank Vegetative Protection										
Left Bank	8	8	9	8	9	7	9	8	7	10
Right Bank	8	6	7	8	9	7	9	7	7	9
Bank Stability										
Left Bank	7	8	8	8	9	7	7	7	7	10
Right Bank	7	6	8	8	9	7	7	8	6	10
Riparian Vegetative Zone Width										
Left Bank	7	4	7	5	7	4	7	7	9	7
Right Bank	7	7	5	5	4	4	5	5	4	4
Total Score	150	151	154	134	142	111	128	129	115	147
Percent of Reference	100	101	103	89	95	74	85	86	77	98
Resulting Habitat Suitability	--	Comparable	Comparable	Supporting	Comparable	Partially Supporting	Supporting	Supporting	Supporting	Comparable

Criteria for Habitat Suitability (percent of reference):

≥ 90% = comparable to reference

75% - 89% = supporting

60% - 74% = partially supporting

≤ 59% = nonsupporting

TABLE G-4

Water Quality and Physical Characteristics at Bioassessment Stations - June 2010

Site 1 - North Branch Potomac River

Five-Year ROD Review Report

Allegany Ballistics Laboratory

Rocket Center, West Virginia

Parameter	Units	Station 1 (Reference)	Station 1B	Station 2	Station 3	Station 3A	Station 4	Station 4A	Station 4B	Station 5	Station 6
Date (Time)		6/24/2010 (1541)	6/25/2010 (0857)	6/24/2010 (1104)	6/23/2010 (1516)	6/25/2010 (1112)	6/23/2010 (1214)	6/25/2010 (1346)	6/25/2010 (1450)	6/22/2010 (1655)	6/22/2010 (1356)
Dissolved oxygen	mg/L	11.13	--	10.00	10.94	14.77	10.00	16.19	13.98	11.17	10.89
Temperature	°C	23.48	--	23.14	24.51	21.52	22.30	22.50	22.89	23.74	22.61
pH	units	7.67	--	6.81	7.72	6.91	6.70	7.45	7.56	7.72	7.74
Conductivity	µmhos/cm	511	--	500	493	524	481	500	525	528	485
Canopy cover	--	Partly shaded	Partly shaded	Partly shaded	Partly shaded	Partly shaded	Partly shaded	Partly shaded	Partly shaded	Shaded	Partly shaded
Local Erosion	--	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Heavy	Moderate	Moderate
Velocity	feet/second	0.75	0.74	0.77	0.77	0.78	0.44	0.75	0.81	0.73	0.78
Predominant land use	--	Forest & Ag & Ind	Ag & Ind	Forest & Ind	Forest & Ind	Forest & Ind	Forest & Ind	Forest & Ind	Ag & Ind	Forest & Ag & Ind	Forest & Ag & Ind
High water mark	meters	1.0	2.0	2.0	3.0	4.0	3.0	3.0	2.0	4.0	2.0
Percentage of Inorganic Substrate											
Boulder	--	20	10	10	20	10	5	10	10	10	10
Cobble	--	35	50	40	20	50	10	60	50	40	5
Gravel	--	30	30	40	20	20	15	15	20	30	20
Sand	--	10	10	10	20	20	60	15	20	20	60
Silt	--	5	0	0	20	0	10	0	0	0	5
Clay	--	0	0	0	0	0	0	0	0	0	0
Percentage of Organic Substrate											
Detritus	--	100	100	100	100	100	100	100	100	100	100
Muck-mud	--	0	0	0	0	0	0	0	0	0	0
Marl	--	0	0	0	0	0	0	0	0	0	0

#/# = value at time of Hester-Dendy installation (dissolved oxygen, temperature, pH, conductivity, velocity

°C - degrees Celsius

µmhos/cm - micromhos per centimeter

mg/L = milligrams per liter (parts per million)

Land use: Ag = Agricultural; Comm = Commercial; Ind = Industrial

TABLE G-5

Water Quality and Physical Characteristics at Bioassessment Stations - June 2012

Site 1 - North Branch Potomac River

Five-Year ROD Review Report

Allegany Ballistics Laboratory

Rocket Center, West Virginia

Parameter	Units	Station 1 (Reference)	Station 1B	Station 2	Station 3	Station 3A	Station 4	Station 4A	Station 4B	Station 5	Station 6
Date (Time)		6/27/2012 (1421)	6/28/2012 (0901)	6/27/2012 (1008)	6/26/2012 (1040)	6/28/2012 (1043)	6/26/2012 (1501)	6/29/2012 (0833)	6/28/2012 (1153)	6/25/2012 (1622)	6/25/2012 (1350)
Dissolved oxygen	mg/L	9.29	7.64	9.55	7.77	8.23	8.29	8.61	8.75	8.31	7.83
Temperature	°C	21.76	20.88	19.53	20.64	21.24	22.24	23.93	22.09	23.74	22.86
pH	units	7.52	7.50	7.44	7.46	7.64	7.58	7.41	7.62	7.60	7.56
Conductivity	µmhos/cm	622	661	599	629	655	631	573	659	588	565
Canopy cover	--	Partly open	Partly shaded	Partly shaded	Partly shaded	Partly shaded	Partly shaded	Partly shaded	Partly shaded	Shaded	Partly shaded
Local Erosion	--	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Heavy	Moderate	Moderate
Velocity	feet/second	1.07	0.42	1.02	0.40	0.54	0.44	--	0.43	1.40	0.69
Predominant land use	--	Ag & Ind	Ag & Ind	Forest & Ind	Forest & Ind	Forest & Ind	Forest & Ind	Forest & Ind	Ag & Ind	Forest & Ag & Ind	Forest & Ag & Ind
High water mark	meters	1.0	2.0	2.0	2.0	1.0	2.0	3.0	2.0	2.0	2.0
Percentage of Inorganic Substrate											
Boulder	--	20	10	10	20	10	5	10	10	10	10
Cobble	--	35	50	40	20	50	10	60	50	40	5
Gravel	--	30	30	40	20	20	15	15	20	30	20
Sand	--	10	10	10	20	20	60	15	20	20	60
Silt	--	5	0	0	20	0	10	0	0	0	5
Clay	--	0	0	0	0	0	0	0	0	0	0
Percentage of Organic Substrate											
Detritus	--	100	100	100	100	100	100	100	100	100	100
Muck-mud	--	0	0	0	0	0	0	0	0	0	0
Marl	--	0	0	0	0	0	0	0	0	0	0

#/# = value at time of Hester-Dendy installation (dissolved oxygen, temperature, pH, conductivity, velocity

°C - degrees Celsius

µmhos/cm - micromhos per centimeter

mg/L - milligrams per liter (parts per million)

Land use: Ag = Agricultural; Comm = Commercial; Ind = Industrial

TABLE G-6

Benthic Macroinvertebrates Collected Using Hester-Dendy Samplers - June-July 2010

Site 1 - North Branch Potomac River

Five-Year ROD Review Report

Allegany Ballistics Laboratory

Rocket Center, West Virginia

SPECIES	T.V.	F.F.G.	Station									
			1	1B	2	3	3A	4	4A	4B	5	6
PLATYHELMINTHES												
Turbellaria												
Tricladida												
Dugesiidae												
Girardia (Dugesia) tigrina	**7.2**											
NEMERTEA												
Enopla												
Tertastemmatidae												
Prostoma sp.												
NEMATODA												
MOLLUSCA												
Bivalvia												
Veneroida												
Sphaeriidae	***8**	**FC**										
Pisidium sp.	**6.5**	**FC**										
Gastropoda												
Basommatophora												
Ancylidae		**SC**										
Ferrissia rivularis	***6**	**SC**		60			13					
Physidae												
Physella sp.	**8.8**	**CG**										
ANNELIDA												
Oligochaeta	***10**	**CG**										
Tubificida												
Naididae	***8**	**CG**		70								
Dero sp.	**10**	**CG**						20				
Nais sp.	**8.9**	**CG**		10					10			
Pristina sp.	**9.6**	**CG**		10								

TABLE G-6

Benthic Macroinvertebrates Collected Using Hester-Dendy Samplers - June-July 2010

Site 1 - North Branch Potomac River

Five-Year ROD Review Report

Allegany Ballistics Laboratory

Rocket Center, West Virginia

SPECIES	T.V.	F.F.G.	Station									
			1	1B	2	3	3A	4	4A	4B	5	6
Slavina appendiculata	**7.1**	**CG**		40								
Tubificidae w.h.c.	**7.1**	**CG**										
Tubificidae w.o.h.c.	**7.1**	**CG**										
Limnodrilus hoffmeisteri	**9.5**	**CG**										
Lumbriculida												
Lumbriculidae	**7**	**CG**										
ARTHROPODA												
Crustacea												
Isopoda												
Asellidae		**SH**										
Caecidotea sp.	**9.1**	**CG**										
Amphipoda		**CG**										
Crangonyctidae												
Crangonyx sp.	**7.9**	**CG**										
Gammaridae												
Gammarus sp.	**9.1**	**SH**										
Hyalellidae												
Hyalella azteca	**7.8**	**CG**										
Decapoda												
Cambaridae	**7.5**											
Cambarus sp.	**7.6**	**CG**										
Orconectes sp.	**2.6**	**SH**		1								
Collembola												
Insecta												
Ephemeroptera												
Baetidae	***4**	**CG**	40		45		13		5		1	
Acentrella sp.	**4**											
Baetis flavistriga	**7**	**CG**										

TABLE G-6

Benthic Macroinvertebrates Collected Using Hester-Dendy Samplers - June-July 2010

Site 1 - North Branch Potomac River

Five-Year ROD Review Report

Allegany Ballistics Laboratory

Rocket Center, West Virginia

SPECIES	T.V.	F.F.G.	Station									
			1	1B	2	3	3A	4	4A	4B	5	6
Baetis intercalaris	7	CG	14		60	3	7			20		45
Baetis sp.	*4	CG		20								
Centroptilum sp.	6.6	CG										
Plauditus sp.	*4	CG										
Pseudocloeon sp.	4	CG									2	10
Caenidae		CG										
Caenis sp.	7.4	CG				3						
Ephemerellidae	*1	SC										
Heptageniidae	*4	SC					153					
Leucrocuta sp.	2.4	SC										
Maccaffertium mediopunctatum	3.8	SC	92	10	217	144	103	17	51	78	2	1
Maccaffertium sp.	*4	SC					103		5			410
Stenacron interpunctatum	6.9	SC	7			3	14					10
Isonychiidae		FC										
Isonychia sp.	3.5	FC				3	4			1		26
Leptophlebiidae		CG										
Paraleptophlebia sp.	0.9	CG										
Odonata												
Aeshnidae	*3	P										
Calopterygidae		P										
Hetaerina sp.	5.6	P		1								
Gomphidae		P										
Ophiogomphus sp.	5.5	P										
Stylogomphus albistylus	4.7	P										
Stylurus spiniceps		P										
Plecoptera												
Leuctridae		SH										
Leuctra sp.	2.5	SH										

TABLE G-6

Benthic Macroinvertebrates Collected Using Hester-Dendy Samplers - June-July 2010

Site 1 - North Branch Potomac River

Five-Year ROD Review Report

Allegany Ballistics Laboratory

Rocket Center, West Virginia

SPECIES	T.V.	F.F.G.	Station									
			1	1B	2	3	3A	4	4A	4B	5	6
Peltoperlidae		SH										
Tallaperla sp.	1.2	SH										
Perlidae	*1	P										
Perlesta sp.	4.7	P										
Hemiptera												
Gerridae		P										
Rheumatobates sp.		P										
Trepobates sp.		P										
Veliidae		P										
Microvelia sp.		P						5			8	
Rhagovelia obesa		P									1	10
Megaloptera												
Corydalidae		P										
Corydalus cornutus	5.2	P			10							
Nigronia serricornis	5	P							1			
Sialidae		P										
Sialis sp.	7.2	P										
Trichoptera												
Brachycentridae		SH										
Brachycentrus sp.	*2	FC				10	3				1	
Micrasema sp.	*2	SH										
Glossosomatidae		SC										
Glossosoma sp.	1.6	SC										
Protoptila sp.	2.6	SC										
Hydropsychidae	*4	FC	50	10	55	30	50			30		20
Ceratopsyche bronta	5.3	FC										
Ceratopsyche morosa	2.6	FC	3		25	7	20			3		35
Ceratopsyche sparna	2.7	FC										

TABLE G-6

Benthic Macroinvertebrates Collected Using Hester-Dendy Samplers - June-July 2010

Site 1 - North Branch Potomac River

Five-Year ROD Review Report

Allegany Ballistics Laboratory

Rocket Center, West Virginia

SPECIES	T.V.	F.F.G.	Station									
			1	1B	2	3	3A	4	4A	4B	5	6
Cheumatopsyche sp.	**6.2**	**FC**	33	20	65	20	33		15	7		85
Hydropsyche betteni gp.	**7.8**	**FC**								7		26
Hydropsyche sp.	***5**	**FC**	10		5	7	40			3		1
Hydropsyche simulians			3									15
Hydroptilidae		**PI**										
Hydroptila sp.	**6.2**	**PI**		30								5
Leucotrichia pictipes	**4.1**											
Leptoceridae		**CG**										
Mystacides sepulchralis	**2.7**	**CG**										
Oecetis sp.	**4.7**	**P**										
Philopotamidae		**FC**										
Chimarra sp.	**2.8**	**FC**										
Polycentropodidae		**FC**		20								
Neureclipsis sp.	**4.2**	**FC**	3	40	35	61	18		45	10	1	25
Polycentropus sp.	**3.5**	**FC**	99	71	62	61	10	46	65	61	19	30
Psychomyiidae		**CG**										
Lype diversa	**4.1**	**SC**				3						
Psychomyia flavida	**2.9**	**CG**										
Rhyacophilidae		**P**										
Rhyacophila sp.	***1**	**P**	3									
Coleoptera												
Dytiscidae	***5**	**P**										
Elmidae		**CG**										
Ancyronyx variegata	**6.5**	**SC**							5			
Dubiraphia sp.	**5.9**	**SC**										
Dubiraphia quadrinotata												
Optioservus sp.	**2.4**	**SC**										
Optioservus trivittatus	**2.4**	**SC**										

TABLE G-6

Benthic Macroinvertebrates Collected Using Hester-Dendy Samplers - June-July 2010

Site 1 - North Branch Potomac River

Five-Year ROD Review Report

Allegany Ballistics Laboratory

Rocket Center, West Virginia

SPECIES	T.V.	F.F.G.	Station									
			1	1B	2	3	3A	4	4A	4B	5	6
Oulimnius latiusculus	**1.8**	**CG**										
Macronychus glabratus	**4.6**	**SH**	3			13	8				1	
Stenelmis sp.	**5.1**	**SC**										
Gyrinidae		**P**										
Dineutus sp.	**5.5**	**P**	8				1			1		
Hydrophilidae		**P**										
Berosus sp.	**8.4**	**CG**						5			3	
Psephenidae		**SC**										
Psephenus herricki	**2.4**	**SC**										
Staphylinidae		**P**										
Diptera												
Athericidae												
Atherix lantha	**2.1**	**P**			5							
Ceratopogonidae		**P**						15				
Chironomidae												
Ablabesmyia mallochi	**7.2**	**P**		40	5			45	30		15	10
Ablabesmyia rhamphe gp.	**7.2**	**P**										
Brillia flavifrons	**5.2**	**SH**										5
Cardiocladius obscurus	**5.9**	**P**										
Chironomus sp.	**9.6**	**CG**	3			3						10
Clinotanypus sp.	***6**	**P**										
Conchapelopia sp.	**8.4**	**P**	57	131	10	64	41	60	46	14	12	55
Corynoneura sp.	**6**	**CG**	3	10	5	3	10		5			
Cricotopus sp.	***7**	**CG**										
Cricotopus bicinctus	**8.5**	**CG**	7									
Cricotopus (I.) sp. "Ozarks"												
Cricotopus trifascia	**2.8**	**CG**										
Cryptochironomus sp.	**6.4**	**P**										

TABLE G-6

Benthic Macroinvertebrates Collected Using Hester-Dendy Samplers - June-July 2010

Site 1 - North Branch Potomac River

Five-Year ROD Review Report

Allegany Ballistics Laboratory

Rocket Center, West Virginia

SPECIES	T.V.	F.F.G.	Station									
			1	1B	2	3	3A	4	4A	4B	5	6
Diamesa sp.	**8.1**	**CG**										
Dicrotendipes neomodestus	**8.1**	**CG**	3					5				5
Micropsectra sp.	**1.5**	**CG**										
Microtendipes pedellus gp.	**5.5**	**CG**	3	10	10	10	3	55	20	10	10	10
Nanocladius distinctus	**7.1**	**CG**										
Natarsia sp.	**10**											
Nilotanypus fimbraitus	**3.9**	**P**	10	50	25	28	23		20	10		25
Pagastia orthogonia	**1.8**	**CG**										
Paracladopelma sp.	**5.5**	**CG**										
Parakiefferiella sp.	**5.4**	**CG**							5			
Parametriocnemus sp.	**3.7**	**CG**										
Paratendipes sp.	**5.1**	**CG**									2	
Phaenopsectra punctipes gp.			3			3	3					
Polypedilum fallax	**6.4**	**SH**	17	100		57	57	15	60	41	12	20
Polypedilum flavum (convictum)	**4.9**	**SH**	90	130	130	83	40	40	35	57	40	55
Polypedilum halterale gp.	**7.3**	**SH**		100		23	3	181	45	10	7	
Polypedilum illinoense	**9**	**SH**	7	240	15	33	3	395	240	107	96	65
Polypedilum laetum	**1.4**											
Potthastia cf. gaedii												
Procladius sp.	**9.1**	**P**										
Rheocricotopus robacki	**7.3**	**CG**	77		15	13	3	5		27		25
Rheotanytartsus exiguus gp.	**5.9**		23	10	20	10	7		5	57	2	5
Stenochironomus sp.	**6.5**	**SH**					3					
Synorthocladius semivirens	***6**	**CG**										
Tanytarsus sp.	**6.8**	**FC**	83	320	15	73	3	140	171	10	20	85
Thienemanniella xena	**5.9**	**CG**	3	20	5					7		
Tribelos fuscicorne								25				
Tribelos jucundum	**6.3**								45	3	2	

TABLE G-6

Benthic Macroinvertebrates Collected Using Hester-Dendy Samplers - June-July 2010

Site 1 - North Branch Potomac River

Five-Year ROD Review Report

Allegany Ballistics Laboratory

Rocket Center, West Virginia

SPECIES	T.V.	F.F.G.	Station									
			1	1B	2	3	3A	4	4A	4B	5	6
Tvetenia paucunca	3.7	CG										
Tvetenia vitracies	3.6	CG					7					
Zavrelimyia sp.	9.1	P							5			5
Culicidae	*8	FC										
Empididae	7.6	P										
Hemerodromia sp.	*6	P			5							
Tabanidae	*7	PI						1				
Psychodidae		CG										
Psychoda sp.	9.6	CG										
Simuliidae		FC										
Simulium sp.	6	FC			1	3	13					
Tipulidae		SH										
Antocha sp.	4.3	CG										
No. of Organisms			757	1574	845	774	812	1075	934	574	257	1134
Taxa Richness			29	27	24	28	32	18	23	23	21	30

TV - Tolerance Values

FFG - Functional Feeding Group

TABLE G-7

Benthic Macroinvertebrates Collected Using Hester-Dendy Samplers - June-July 2012

Site 1 - North Branch Potomac River

Five-Year ROD Review Report

Allegany Ballistics Laboratory

Rocket Center, West Virginia

SPECIES	T.V.	F.F.G.	Station									
			1	1B	2	3	3A	4	4A	4B	5	6
PLATYHELMINTHES												
Turbellaria												
Tricladida												
Dugesiidae												
Girardia (Dugesia) tigrina	**7.2**											3
NEMERTEA												
Enopla												
Tertastemmatidae												
Prostoma sp.									3	3		
NEMATODA												
MOLLUSCA												
Bivalvia												
Veneroida												
Corbiculidae												
Corbicula fluminea	**6.1**	**FC**				5	18	20				
Sphaeriidae	***8**	**FC**		7				1				
Pisidium sp.	**6.5**	**FC**										
Gastropoda												
Basommatophora												
Ancylidae		**SC**										
Ferrissia rivularis	***6**	**SC**	5	37			20	55	18	11	14	10
Physidae												
Physella sp.	**8.8**	**CG**				1	10					
Planorbidae	***6**	**SC**										
Menetus dilatatus	**8.2**	**SC**										
ANNELIDA												
Oligochaeta	***10**	**CG**										
Tubificida												

TABLE G-7

Benthic Macroinvertebrates Collected Using Hester-Dendy Samplers - June-July 2012

Site 1 - North Branch Potomac River

Five-Year ROD Review Report

Allegany Ballistics Laboratory

Rocket Center, West Virginia

SPECIES	T.V.	F.F.G.	Station									
			1	1B	2	3	3A	4	4A	4B	5	6
Enchytraeidae	9.8	CG										
Lumbricidae		SC										
Naididae	*8	CG	10	3		20	10	20	3			
Dero sp.	10	CG					23			3		
Nais behningi	8.9	CG		3								
Nais bretscheri	*6	CG										
Nais communis	8.8	CG										
Nais pardalis												
Nais sp.	8.9	CG	15					5	17	5	3	
Pristina sp.	9.6	CG										
Pristina leidyi	9.6	CG	10			10	17					
Pristinella osborni												
Pristinella sp.	7.7	CG							3			
Slavina appendiculata	7.1	CG					3		7	3		
Tubificidae w.h.c.	7.1	CG										
Aulodrilus limnobius	5.5	CG										
Aulodrilus pigueti	5.5	CG										
Branchiura sowerbyi	8.3	CG										
Tubificidae w.o.h.c.	7.1	CG										
Limnodrilus hoffmeisteri	9.5	CG										
Lumbriculida												
Lumbriculidae	7	CG										
ARTHROPODA												
Arachnoidea												
Acariformes	5.5											
Hygrobatidae	5.5											
Atractides sp.	5.5											
Lebertiidae	5.5											

TABLE G-7

Benthic Macroinvertebrates Collected Using Hester-Dendy Samplers - June-July 2012

Site 1 - North Branch Potomac River

Five-Year ROD Review Report

Allegany Ballistics Laboratory

Rocket Center, West Virginia

SPECIES	T.V.	F.F.G.	Station									
			1	1B	2	3	3A	4	4A	4B	5	6
Lebertia sp.	**5.5**											
Pionidae	**5.5**						3					
Crustacea												
Copepoda												
Cyclopoida								10				
Cyclopidae												
Euryclops agilis												
Macrocyclops albidus							3					
Harpacticoda												
Canthocamptidae												
Attheyella sp.												
Ostracoda								15				
Cladocera												
Chydoridae												
Alona sp.							3	45	3			3
Isopoda												
Asellidae		**SH**										
Caecidotea sp.	**9.1**	**CG**										
Amphipoda		**CG**										
Crangonyctidae												
Crangonyx sp.	**7.9**	**CG**										
Gammaridae												
Gammarus sp.	**9.1**	**SH**										
Hyalellidae												
Hyalella azteca	**7.8**	**CG**							7			
Decapoda												
Cambaridae	**7.5**											
Orconectes sp.	**2.6**	**SH**										

TABLE G-7

Benthic Macroinvertebrates Collected Using Hester-Dendy Samplers - June-July 2012

Site 1 - North Branch Potomac River

Five-Year ROD Review Report

Allegany Ballistics Laboratory

Rocket Center, West Virginia

SPECIES	T.V.	F.F.G.	Station									
			1	1B	2	3	3A	4	4A	4B	5	6
Collembola												
Isotomidae			10						3			
Insecta												
Ephemeroptera												
Baetidae	***4**	**CG**	20	33		10	7	5		43	20	
Acerpenna pygmaeus	**3.9**											
Acerpenna sp.												
Baetis flavistriga	**7**	**CG**										
Baetis intercalaris	**7**	**CG**	66	27		5		5	10	3	31	
Baetis sp.	***4**	**CG**						5		3		10
Callibaetis sp.	***4**	**CG**										
Centroptilum sp.	**6.6**	**CG**										
Plauditus sp.	***4**	**CG**										
Procloeon sp.	**5**											
Pseudocloeon sp.	**4**	**CG**		20		35			13	28	7	34
Caenidae		**CG**										
Caenis sp.	**7.4**	**CG**										
Ephemerellidae	***1**	**SC**										
Eurylophella sp.	**4.3**	**SC**										
Heptageniidae	***4**	**SC**	90	57		70		80	20	63	27	87
Leucrocuta sp.	**2.4**	**SC**						5				13
Maccaffertium mediopunctatum	**3.8**	**SC**	26	51		21	1	17	2	11	24	62
Maccaffertium sp.	***4**	**SC**	25	3			3	15	10	3	20	30
Rhithrogena sp.	**0.3**	**CG**										
Stenacron interpunctatum	**6.9**	**SC**	16	24		15	4	25	10	8	8	29
Stenacron sp.		**SC**	5									
Stenonema femoratum	**7.2**	**SC**										
Isonychiidae		**FC**										

TABLE G-7

Benthic Macroinvertebrates Collected Using Hester-Dendy Samplers - June-July 2012

Site 1 - North Branch Potomac River

Five-Year ROD Review Report

Allegany Ballistics Laboratory

Rocket Center, West Virginia

SPECIES	T.V.	F.F.G.	Station									
			1	1B	2	3	3A	4	4A	4B	5	6
Isonychia sp.	**3.5**	**FC**				1						
Tricorythidae		**CG**										
Tricorythodes sp.	**5.1**	**CG**		3		10	3					
Odonata												
Aeshnidae	***3**	**P**										
Boyeria vinosa	**5.9**	**P**										
Boyeria sp.		**P**				5						
Calopterygidae		**P**										
Calopteryx sp.	**7.8**	**P**										
Hetaerina titia												
Coenagrionidae		**P**										
Argia sp.	**8.2**	**P**		3			17					
Ischnura sp.	**9.5**						3					
Gomphidae		**P**										
Dromogomphus sp.	**5.9**	**P**										
Gomphus sp.	**5.8**	**P**										
Hagenius brevistylus	**4**	**P**										
Ophiogomphus sp.	**5.5**	**P**										
Stylogomphus sp.												
Libellulidae		**P**										
Macromia illinoiensis						1						
Macromia sp.	**6.2**	**P**							1			1
Plecoptera												
Perlidae	***1**	**P**										
Agnetina sp.	**0**	**P**										3
Pteronarcidae	**1.6**	**SH**										
Pteronarcys (Allonarcys) sp.	**1.7**	**SH**					1				1	
Hemiptera												

TABLE G-7

Benthic Macroinvertebrates Collected Using Hester-Dendy Samplers - June-July 2012

Site 1 - North Branch Potomac River

Five-Year ROD Review Report

Allegany Ballistics Laboratory

Rocket Center, West Virginia

SPECIES	T.V.	F.F.G.	Station									
			1	1B	2	3	3A	4	4A	4B	5	6
Gerridae		P										
Rheumatobates sp.		P							3		3	7
Trepobates sp.		P										
Nepidae		-										
Ranatra sp.	**7.8**	P										
Veliidae		P										
Rhagovelia obesa		P										
Megaloptera												
Corydalidae		P										
Corydalus cornutus	**5.2**	P	2							4	28	
Nigronia fasciatus	**5.6**	P										
Nigronia serricornis	**5**	P							1	9		
Sialidae		P										
Sialis sp.	**7.2**	P					1		1			
Trichoptera												
Brachycentridae		SH										
Brachycentrus sp.	***2**	FC									4	
Glossosomatidae		SC										
Protoptila sp.	**2.6**	SC										
Hydropsychidae	***4**	FC	80	3		15	7				67	3
Ceratopsyche morosa	**2.6**	FC	6	8				5			7	4
Ceratopsyche sparna	**2.7**	FC										
Ceratopsyche sp.		FC		3							17	
Cheumatopsyche sp.	**6.2**	FC		3							20	
Hydropsyche betteni gp.	**7.8**	FC	45			5					10	
Hydropsyche phalerata	**3.6**					10		20	3	1	13	7
Hydropsyche sp.	***5**	FC	20	13							38	
Potamyia flava							3					

TABLE G-7

Benthic Macroinvertebrates Collected Using Hester-Dendy Samplers - June-July 2012

Site 1 - North Branch Potomac River

Five-Year ROD Review Report

Allegany Ballistics Laboratory

Rocket Center, West Virginia

SPECIES	T.V.	F.F.G.	Station									
			1	1B	2	3	3A	4	4A	4B	5	6
Hydroptilidae		PI		3								
Dibusa angata											3	
Hydroptila sp.	6.2	PI	30						3		3	3
Mayatrichia sp.								5				
Lepidostomatidae		SH										
Lepidostoma sp.	0.9	FC										
Leptoceridae		CG					3					
Mystacides sepulchralis	2.7	CG										
Oecetis sp.	4.7	P				5			1			
Limnephilidae												
Pycnopsyche sp.	2.5	SH					1					
Philopotamidae		FC	10									
Chimarra sp.	2.8	FC									28	3
Polycentropodidae		FC							17			3
Neureclipsis sp.	4.2	FC	11	7		61	1	26	41	8	1	82
Nyctiophylax sp.	0.9	FC					3					
Polycentropus sp.	3.5	FC	10	21		22	28	49	39	34		12
Psychomyiidae		CG										
Lype diversa	4.1	SC										
Psychomyia flavida	2.9	CG										
Coleoptera												
Dytiscidae	*5	P										
Elmidae		CG										
Ancyronyx variegata	6.5	SC										
Dubiraphia sp.	5.9	SC										
Dubiraphia vittata	4.1	SC										
Optioservus sp.	2.4	SC										
Optioservus ovalis	2.4	SC										

TABLE G-7

Benthic Macroinvertebrates Collected Using Hester-Dendy Samplers - June-July 2012

Site 1 - North Branch Potomac River

Five-Year ROD Review Report

Allegany Ballistics Laboratory

Rocket Center, West Virginia

SPECIES	T.V.	F.F.G.	Station									
			1	1B	2	3	3A	4	4A	4B	5	6
Optioservus trivittatus	**2.4**	**SC**										
Macronychus glabratus	**4.6**	**SH**	10	7		65		26	15	5	30	64
Microcylloepus pusillus	**2.1**	**SC**										
Stenelmis sp.	**5.1**	**SC**									3	
Gyrinidae		**P**										
Dineutus sp.	**5.5**	**P**	1									8
Hydrophilidae		**P**										
Berosus sp.	**8.4**	**CG**										
Sperchopsis sp.												
Psephenidae		**SC**										
Psephenus herricki	**2.4**	**SC**	5							3		
Diptera												
Athericidae												
Atherix lantha	**2.1**	**P**										
Ceratopogonidae		**P**				5	3					
Atrichopogon sp.	**6.5**	**P**										
Bezzia/Palpomyia gp.	**6.9**	**P**										
Chironomidae												
Chironominae											3	
Ablabesmyia annulata	**2**											
Ablabesmyia mallochi	**7.2**	**P**		20		5	43	200	37	14		13
Ablabesmyia rhamphe gp.	**7.2**	**P**	10			10	18		13	8		
Brillia flavifrons	**5.2**	**SH**										
Chironomus sp.	**9.6**	**CG**										
Cladopelma sp.	**3.5**	**CG**					3					
Clinotanypus sp.	***6**	**P**										
Conchapelopia sp.	**8.4**	**P**	30	30		105	3	50	13	16	13	20
Corynoneura sp.	**6**	**CG**	45					75	13	3		3

TABLE G-7

Benthic Macroinvertebrates Collected Using Hester-Dendy Samplers - June-July 2012

Site 1 - North Branch Potomac River

Five-Year ROD Review Report

Allegany Ballistics Laboratory

Rocket Center, West Virginia

SPECIES	T.V.	F.F.G.	Station									
			1	1B	2	3	3A	4	4A	4B	5	6
Cricotopus sp.	***7**	**CG**							7		3	
Cricotopus bicinctus	**8.5**	**CG**								3		
Cryptochironomus sp.	**6.4**	**P**										
Dicrotendipes neomodestus	**8.1**	**CG**				5	10	50	7			3
Dicrotendipes simpsoni	**10**											
Dicrotendipes sp.	**8.1**	**CG**					3					
Limnophyes sp.	**7.4**	**CG**										
Microtendipes pedellus gp.	**5.5**	**CG**					7				3	
Nanocladius distinctus	**7.1**	**CG**										
Natarsia sp.	**10**											
Nilotanypus sp.	**3.9**	**P**										
Nilothauma sp.	**5**	**CG**										3
Orthocladiinae												
Orthocladius sp.		**CG**							7			3
Pagastia orthogonia	**1.8**	**CG**										
Paracladopelma sp.	**5.5**	**CG**										
Parakiefferiella sp.	**5.4**	**CG**						5				
Parametriocnemus sp.	**3.7**	**CG**										
Paratendipes albimanus												
Paratendipes sp.	**5.1**	**CG**										
Pentaneura inconspicua								5				
Phaenopsectra obediens gp.						5	7		17			3
Phaenopsectra punctipes gp.									7			
Polypedilum fallax	**6.4**	**SH**	5	8		30		20	7	5	7	13
Polypedilum flavum (convictum)	**4.9**	**SH**	95	10		35		75		10	20	7
Polypedilum halterale gp.	**7.3**	**SH**						20				
Polypedilum illinoense	**9**	**SH**		17		35	33	21	83	65	33	17
Polypedilum scalaenum gp.	**8.4**			3		5	3					

TABLE G-7

Benthic Macroinvertebrates Collected Using Hester-Dendy Samplers - June-July 2012

Site 1 - North Branch Potomac River

Five-Year ROD Review Report

Allegany Ballistics Laboratory

Rocket Center, West Virginia

SPECIES	T.V.	F.F.G.	Station									
			1	1B	2	3	3A	4	4A	4B	5	6
Polypedilum sp.							3					
Potthastia longimana	**6.5**	**CG**										
Procladius sp.	**9.1**	**P**				5	19					
Psectrocladius sp.	**3.6**	**SH**										
Pseudochironomus sp.	**5.4**	**CG**						5				
Rheocricotopus robacki	**7.3**	**CG**	170	7		25		10	7	20	27	3
Rheotanytartsus exiguus gp.	**5.9**		145	13		10		20	7	38	87	13
Rheotanytarsus pellucidus												
Stenochironomus sp.	**6.5**	**SH**				5		60			7	3
Sublettea coffmani	**1.6**											
Synorthocladius semivirens	***6**	**CG**										
Tanypodinae												
Tanypus sp.	**9.2**	**P**					3					
Tanytarsus sp.	**6.8**	**FC**	30	60		265	270	605	393	101	7	93
Thienemanniella xena	**5.9**	**CG**	15									
Tribelos fuscicorne						10	20	21		3		3
Tribelos jucundum	**6.3**											
Tvetenia paucunca	**3.7**	**CG**										
Tvetenia vitracies	**3.6**	**CG**	15								23	
Tvetenia sp.			5									
Zavrelimyia sp.	**9.1**	**P**										3
Culicidae	***8**	**FC**										
Empididae	**7.6**	**P**										
Hemerodromia sp.	***6**	**P**							3		3	3
Simuliidae		**FC**										
Simulium sp.	**6**	**FC**	20	17			3			5	13	
Stratiomyidae		**CG**										
Caloparyphus sp.												

TABLE G-7

Benthic Macroinvertebrates Collected Using Hester-Dendy Samplers - June-July 2012

Site 1 - North Branch Potomac River

Five-Year ROD Review Report

Allegany Ballistics Laboratory

Rocket Center, West Virginia

SPECIES	T.V.	F.F.G.	Station									
			1	1B	2	3	3A	4	4A	4B	5	6
Tabanidae		PI										
Tipulidae		SH										
Antocha sp.	4.3	CG										
Tipula sp.	7.3	SH										
No. of Organisms			1113	524	NA	952	647	1701	875	542	679	687
Taxa Richness			36	32	NA	37	43	38	41	33	40	40

TV - Tolerance Values

FFG - Functional Feeding Group

TABLE G-8

Metric Values, Percent Comparison, and Bioassessment Scores - Hester-Dendy - June-July 2010

Site 1 - North Branch Potomac River

Five-Year ROD Review Report

Allegany Ballistics Laboratory

Rocket Center, West Virginia

Metrics	Station 1 (Reference)	Station 1B	Station 2	Station 3	Station 3A	Station 4	Station 4A	Station 4B	Station 5	Station 6
Metric Values										
Taxa Richness	29	27	24	28	32	18	23	23	21	30
HBI	5.45	6.76	4.77	5.36	4.76	7.58	6.73	5.91	7.03	5.39
EPT/Chironomidae	0.92	0.19	2.23	0.88	2.77	0.07	0.26	0.62	0.12	1.98
% Dominant Taxon	13.08	20.33	25.68	18.60	18.84	36.74	25.70	18.64	37.35	36.16
EPT Index	12	8	9	13	14	2	6	10	6	15
EPT Abundance	357	221	569	355	571	63	186	220	26	744
Scraper/Filtering Collector Ratio	0.35	0.15	0.83	0.55	1.99	0.09	0.21	0.59	0.05	1.26
Percent Comparison with Reference Station										
Taxa Richness[a]	100	93.1	82.8	96.6	110	62.1	79.3	79.3	72.4	103
HBI[b]	100	124	87.5	98.3	87.2	139	123	108	129	98.7
EPT/Chironomidae[c]	100	20.7	243	96.0	302	7.11	27.9	67.9	13.0	216
% Dominant Taxon[d]	13.1	20.3	25.7	18.6	18.8	36.7	25.7	18.6	37.4	36.2
EPT Index[e]	100	66.7	75.0	108	117	16.7	50.0	83.3	50.0	125
EPT Abundance[f]	100	61.9	159	99.4	160	17.6	52.1	61.6	7.28	208
Scraper/Filtering Collector Ratio[g]	100	41.3	234	155	565	25.9	58.5	168	13.8	359
Bioassessment Score										
Taxa Richness	6	6	6	6	6	4	4	4	4	6
HBI	6	6	6	6	6	6	6	6	6	6
EPT/Chironomidae	6	0	6	6	6	0	2	4	0	6
% Dominant Taxon	6	4	4	6	6	2	4	6	2	2
EPT Index	6	0	2	6	6	0	0	4	0	6
EPT Abundance	6	6	6	6	6	0	6	6	0	6
Scraper/Filtering Collector Ratio	6	4	6	6	6	2	6	6	0	6
Total Score	42	26	36	42	42	14	28	36	12	38
Percent of Reference Station	100	62	86	100	100	33	67	86	29	90
Biological Condition[h]	--	Slightly Impaired	Nonimpaired	Nonimpaired	Nonimpaired	Moderately Impaired	Slightly Impaired	Nonimpaired	Moderately Impaired	Nonimpaired

[a] Score is a ratio of study site metric value to reference site metric value x 100

[b] Score is a ratio of reference site to study site x 100.

[c] Ratio of EPT to Chironomidae abundance. Score is a ratio of study site to reference site x 100

[d] Scoring criteria evaluate actual percent contribution, not percent comparability to reference site

[e] Number of distinct taxa within the order Ephemeroptera, Plecoptera, and Trichoptera. Score is a ratio of study site to reference site x 100

[f] Score is a ratio of study site to reference site X 100.

[g] Score is a ratio of study site to reference site X 100.

[h]

Percent of Reference Station	Biological Condition Category
> 83%	Nonimpaired
54 -79%	Slightly Impaired
21 - 50%	Moderately Impaired
< 17%	Severely Impaired

EPT - Ephemeroptera, Plecoptera, Trichoptera

HBI - Hilsenhoff Biotic Index

TABLE G-9

Metric Values, Percent Comparison, and Bioassessment Scores - Hester-Dendy - June-July 2012

Site 1 - North Branch Potomac River

Five-Year ROD Review Report

Allegany Ballistics Laboratory

Rocket Center, West Virginia

Metrics	Station 1 (Reference)	Station 1B	Station 2	Station 3	Station 3A	Station 4	Station 4A	Station 4B	Station 5	Station 6
Metric Values										
Taxa Richness	36	32	NA	37	43	38	41	33	40	40
HBI	5.85	5.66	NA	6.15	7.02	6.34	6.61	5.94	5.32	5.11
EPT/Chironomidae	0.81	1.66	NA	0.51	0.15	0.21	0.27	0.72	1.50	1.90
% Dominant Taxon	15.27	11.45	NA	27.84	41.73	35.57	44.91	18.63	12.81	13.54
EPT Index	15	16	NA	14	13	13	12	11	20	16
EPT Abundance	460	279	NA	285	65	262	169	205	349	385
Scraper/Filtering Collector Ratio	0.74	1.21	NA	0.28	0.08	0.28	0.12	0.67	0.45	1.16
Percent Comparison with Reference Station										
Taxa Richness[a]	100	88.9	NA	103	119	106	114	91.7	111	111
HBI[b]	100	96.8	NA	105	120	108	113	101	91.0	87.4
EPT/Chironomidae[c]	100	204	NA	63.1	17.9	25.9	33.6	88.0	184	233
% Dominant Taxon[d]	15.3	11.5	NA	27.8	41.7	35.6	44.9	18.6	12.8	13.5
EPT Index[e]	100	107	NA	93.3	86.7	86.7	80.0	73.3	133	107
EPT Abundance[f]	100	60.7	NA	62.0	14.1	57.0	36.7	44.6	75.9	83.7
Scraper/Filtering Collector Ratio[g]	100	163	NA	38.2	11.4	37.6	16.5	90.2	61.1	156
Bioassessment Score										
Taxa Richness	6	6	NA	6	6	6	6	6	6	6
HBI	6	6	NA	6	6	6	6	6	6	6
EPT/Chironomidae	6	6	NA	4	0	2	2	6	6	6
% Dominant Taxon	6	6	NA	4	0	2	0	6	6	6
EPT Index	6	6	NA	6	4	4	4	2	6	6
EPT Abundance	6	6	NA	6	0	6	4	6	6	6
Scraper/Filtering Collector Ratio	6	6	NA	4	0	4	0	6	6	6
Total Score	42	42	NA	36	16	30	22	38	42	42
Percent of Reference Station	100	100	NA	86	38	71	52	90	100	100
Biological Condition[h]	--	Nonimpaired	NA	Nonimpaired	Moderately Impaired	Slightly Impaired	Slightly to Moderately Impaired	Nonimpaired	Nonimpaired	Nonimpaired

[a] Score is a ratio of study site metric value to reference site metric value x 100

[b] Score is a ratio of reference site to study site x 100.

[c] Ratio of EPT to Chironomidae abundance. Score is a ratio of study site to reference site x 100

[d] Scoring criteria evaluate actual percent contribution, not percent comparability to reference site

[e] Number of distinct taxa within the order Ephemeroptera, Plecoptera, and Trichoptera. Score is a ratio of study site to reference site x 100

[f] Score is a ratio of study site to reference site X 100.

[g] Score is a ratio of study site to reference site X 100.

[h]

Percent of Reference Station	Biological Condition Category
> 83%	Nonimpaired
54 -79%	Slightly Impaired
21 - 50%	Moderately Impaired
< 17%	Severely Impaired

EPT - Ephemeroptera, Plecoptera, Trichoptera

HBI - Hilsenhoff Biotic Index

TABLE G-10

Summary of Bioassessment Scores - Hester-Dendy

Site 1 - North Branch Potomac River

Five-Year ROD Review Report

Allegany Ballistics Laboratory

Rocket Center, West Virginia

Sampling Event	Station 1 (Reference)	Station 1B	Station 2	Station 3	Station 3A	Station 4	Station 4A	Station 4B	Station 5	Station 6
2012	NA	Nonimpaired	Data Unavailable	Nonimpaired	Moderately Impaired	Slightly Impaired	Slightly to Moderately Impaired	Nonimpaired	Nonimpaired	Nonimpaired
2010	NA	Slightly Impaired	Nonimpaired	Nonimpaired	Nonimpaired	Moderately Impaired	Slightly Impaired	Nonimpaired	Moderately Impaired	Nonimpaired
2008	NA	Nonimpaired	Slightly Impaired	Nonimpaired	Nonimpaired	Slightly Impaired	Nonimpaired to Slightly Impaired	Nonimpaired	Nonimpaired	Nonimpaired
2006	NA	Nonimpaired	Nonimpaired	Nonimpaired	--	Nonimpaired	--	Nonimpaired	Nonimpaired	Nonimpaired
2004	NA	Nonimpaired	Slightly Impaired	Slightly Impaired	--	Nonimpaired	--	Moderately Impaired	Nonimpaired	Nonimpaired
2002	NA	--	Slightly Impaired	Slightly Impaired	--	Moderately Impaired	--	--	Moderately Impaired	Slightly Impaired
2000	NA	--	Slightly Impaired	Slightly Impaired	--	Slightly Impaired	--	--	Slightly Impaired	Slightly Impaired
1998	NA	--	Slightly Impaired	Nonimpaired	--	Slightly Impaired	--	--	Nonimpaired	Nonimpaired

TABLE G-11

Benthic Macroinvertebrates Collected Using Kick and Dip Nets - June 2010

Site 1 - North Branch Potomac River

Five-Year ROD Review

Allegany Ballistics Laboratory

Rocket Center, West Virginia

			Station									
			1	1	2	3	3A	4	4A	4B	5	6
SPECIES	**T.V.**	**F.F.G.**	**Kick**	**Jab**	**Kick**	**Jab**	**Jab**	**Jab**	**Jab**	**Kick**	**Kick**	**Jab**
PLATYHELMINTHES												
Turbellaria												
Tricladida												
Dugesiidae												
Girardia (Dugesia) tigrina	**7.2**						1	2				1
NEMERTEA												
Enopla												
Tertastemmatidae												
Prostoma sp.											1	
NEMATODA							1					
MOLLUSCA												
Bivalvia												
Veneroida												
Sphaeriidae	***8**	**FC**										1
Pisidium sp.	**6.5**	**FC**		18		3	10	10	3			
Gastropoda												
Basommatophora												
Ancylidae		**SC**										
Ferrissia rivularis	***6**	**SC**				1				4		1
Physidae												
Physella sp.	**8.8**	**CG**				1						
ANNELIDA												
Oligochaeta	***10**	**CG**										
Tubificida												
Naididae	***8**	**CG**	8							2	2	
Dero sp.	**10**	**CG**										
Nais sp.	**8.9**	**CG**	10							2	2	1

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Benthic Macroinvertebrates Collected Using Kick and Dip Nets - June 2010

Site 1 - North Branch Potomac River

Five-Year ROD Review

Allegany Ballistics Laboratory

Rocket Center, West Virginia

			Station									
			1	**1**	**2**	**3**	**3A**	**4**	**4A**	**4B**	**5**	**6**
SPECIES	**T.V.**	**F.F.G.**	**Kick**	**Jab**	**Kick**	**Jab**	**Jab**	**Jab**	**Jab**	**Kick**	**Kick**	**Jab**
Pristina sp.	**9.6**	**CG**									2	
Slavina appendiculata	**7.1**	**CG**								2		
Tubificidae w.h.c.	**7.1**	**CG**		9		2	8	50	9			3
Tubificidae w.o.h.c.	**7.1**	**CG**		103		1	40	116	4	9	1	5
Limnodrilus hoffmeisteri	**9.5**	**CG**					5					1
Lumbriculida												
Lumbriculidae	**7**	**CG**	2		1	1			1		1	1
ARTHROPODA												
Crustacea												
Isopoda												
Asellidae		**SH**										
Caecidotea sp.	**9.1**	**CG**				2						
Amphipoda		**CG**										
Crangonyctidae												
Crangonyx sp.	**7.9**	**CG**	2			38	7	8	35			24
Gammaridae												
Gammarus sp.	**9.1**	**SH**	2	5					1			
Hyalellidae												
Hyalella azteca	**7.8**	**CG**							6			
Decapoda												
Cambaridae	**7.5**											
Cambarus sp.	**7.6**	**CG**						2				
Orconectes sp.	**2.6**	**SH**		2		5	6		1	2		2
Collembola									1			
Insecta												
Ephemeroptera												
Baetidae	***4**	**CG**		1								

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Site 1 - North Branch Potomac River

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Allegany Ballistics Laboratory

Rocket Center, West Virginia

			Station									
			1	**1**	**2**	**3**	**3A**	**4**	**4A**	**4B**	**5**	**6**
SPECIES	**T.V.**	**F.F.G.**	**Kick**	**Jab**	**Kick**	**Jab**	**Jab**	**Jab**	**Jab**	**Kick**	**Kick**	**Jab**
Acentrella sp.	**4**		4		21				1			2
Baetis flavistriga	**7**	**CG**	16	7	11	1				17	3	1
Baetis intercalaris	**7**	**CG**	12	4	8	1		1		8	6	8
Baetis sp.	***4**	**CG**										
Centroptilum sp.	**6.6**	**CG**										1
Plauditus sp.	***4**	**CG**	4	2	16	2	1	1		6		1
Pseudocloeon sp.	**4**	**CG**				1						1
Caenidae		**CG**										
Caenis sp.	**7.4**	**CG**	1				1			2		
Ephemerellidae	***1**	**SC**								1		
Heptageniidae	***4**	**SC**										
Leucrocuta sp.	**2.4**	**SC**			1						1	
Maccaffertium mediopunctatum	**3.8**	**SC**										
Maccaffertium sp.	***4**	**SC**	3		1					2	2	
Stenacron interpunctatum	**6.9**	**SC**				4	1		2	3		
Isonychiidae		**FC**										
Isonychia sp.	**3.5**	**FC**										
Leptophlebiidae		**CG**										
Paraleptophlebia sp.	**0.9**	**CG**				1						
Odonata												
Aeshnidae	***3**	**P**							1			
Calopterygidae		**P**										
Hetaerina sp.	**5.6**	**P**										
Gomphidae		**P**										
Ophiogomphus sp.	**5.5**	**P**									1	
Stylogomphus albistylus	**4.7**	**P**								1		
Stylurus spiniceps		**P**		1								

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Site 1 - North Branch Potomac River

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Allegany Ballistics Laboratory

Rocket Center, West Virginia

SPECIES	T.V.	F.F.G.	Station									
			1	1	2	3	3A	4	4A	4B	5	6
			Kick	Jab	Kick	Jab	Jab	Jab	Jab	Kick	Kick	Jab
Plecoptera												
Leuctridae		**SH**										
Leuctra sp.	**2.5**	**SH**	8								2	1
Peltoperlidae		**SH**										
Tallaperla sp.	**1.2**	**SH**									1	
Perlidae	***1**	**P**	1									
Perlesta sp.	**4.7**	**P**				1		2				2
Hemiptera												
Gerridae		**P**										
Rheumatobates sp.		**P**				1						
Trepobates sp.		**P**					1					
Veliidae		**P**							1			
Microvelia sp.		**P**										
Rhagovelia obesa		**P**				5	1					
Megaloptera												
Corydalidae		**P**										
Corydalus cornutus	**5.2**	**P**										
Nigronia serricornis	**5**	**P**	3		2	3	1			6		
Sialidae		**P**										
Sialis sp.	**7.2**	**P**	2	5		1	6	2		5		3
Trichoptera												
Brachycentridae		**SH**										
Brachycentrus sp.	***2**	**FC**	1		6	1					6	4
Micrasema sp.	***2**	**SH**								1		
Glossosomatidae		**SC**									2	
Glossosoma sp.	**1.6**	**SC**	1									
Protoptila sp.	**2.6**	**SC**									3	

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Allegany Ballistics Laboratory

Rocket Center, West Virginia

			Station									
			1	**1**	**2**	**3**	**3A**	**4**	**4A**	**4B**	**5**	**6**
SPECIES	**T.V.**	**F.F.G.**	**Kick**	**Jab**	**Kick**	**Jab**	**Jab**	**Jab**	**Jab**	**Kick**	**Kick**	**Jab**
Hydropsychidae	***4**	**FC**	34		7	2			1	6	35	
Ceratopsyche bronta	**5.3**	**FC**									1	
Ceratopsyche morosa	**2.6**	**FC**	7		16	1				2	15	
Ceratopsyche sparna	**2.7**	**FC**	3	1	1						1	2
Cheumatopsyche sp.	**6.2**	**FC**	21	7	2	4		1		16	34	4
Hydropsyche betteni gp.	**7.8**	**FC**										
Hydropsyche sp.	***5**	**FC**	2								3	3
Hydropsyche simulians												
Hydroptilidae		**PI**										
Hydroptila sp.	**6.2**	**PI**			1					8		
Leucotrichia pictipes	**4.1**				2					1		1
Leptoceridae		**CG**					1					
Mystacides sepulchralis	**2.7**	**CG**				1						
Oecetis sp.	**4.7**	**P**										1
Philopotamidae		**FC**										
Chimarra sp.	**2.8**	**FC**	1									
Polycentropodidae		**FC**								6		
Neureclipsis sp.	**4.2**	**FC**		1		2	2	5				
Polycentropus sp.	**3.5**	**FC**	1	3		6	6	1	6			
Psychomyiidae		**CG**										
Lype diversa	**4.1**	**SC**					3		4			
Psychomyia flavida	**2.9**	**CG**			11	1		1		11		8
Rhyacophilidae		**P**										
Rhyacophila sp.	***1**	**P**										
Coleoptera												
Dytiscidae	***5**	**P**		1								
Elmidae		**CG**										

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Rocket Center, West Virginia

			Station									
			1	**1**	**2**	**3**	**3A**	**4**	**4A**	**4B**	**5**	**6**
SPECIES	**T.V.**	**F.F.G.**	**Kick**	**Jab**	**Kick**	**Jab**	**Jab**	**Jab**	**Jab**	**Kick**	**Kick**	**Jab**
Ancyronyx variegata	**6.5**	**SC**										
Dubiraphia sp.	**5.9**	**SC**		3		3	4		2			3
Dubiraphia quadrinotata								2				1
Optioservus sp.	**2.4**	**SC**	5							1	1	1
Optioservus trivittatus	**2.4**	**SC**	1									
Oulimnius latiusculus	**1.8**	**CG**	1		1							
Macronychus glabratus	**4.6**	**SH**					1		1			
Stenelmis sp.	**5.1**	**SC**	5								4	2
Gyrinidae		**P**										
Dineutus sp.	**5.5**	**P**	2			1	1	1		4	4	1
Hydrophilidae		**P**										
Berosus sp.	**8.4**	**CG**										
Psephenidae		**SC**										
Psephenus herricki	**2.4**	**SC**	2		2						2	
Staphylinidae		**P**				1						
Diptera												
Athericidae												
Atherix lantha	**2.1**	**P**	1			1					1	
Ceratopogonidae		**P**					2					
Chironomidae												
Ablabesmyia mallochi	**7.2**	**P**		1		6	3	1	2			2
Ablabesmyia rhamphe gp.	**7.2**	**P**							1			
Brillia flavifrons	**5.2**	**SH**										
Cardiocladius obscurus	**5.9**	**P**						1				
Chironomus sp.	**9.6**	**CG**		21		2	7	8	5			1
Clinotanypus sp.	***6**	**P**					1					4
Conchapelopia sp.	**8.4**	**P**	3	20		5	20	6	10	8	6	10

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Allegany Ballistics Laboratory

Rocket Center, West Virginia

			Station									
			1	**1**	**2**	**3**	**3A**	**4**	**4A**	**4B**	**5**	**6**
SPECIES	**T.V.**	**F.F.G.**	**Kick**	**Jab**	**Kick**	**Jab**	**Jab**	**Jab**	**Jab**	**Kick**	**Kick**	**Jab**
Corynoneura sp.	**6**	**CG**										
Cricotopus sp.	***7**	**CG**		1	2			1		2		
Cricotopus bicinctus	**8.5**	**CG**	1	5		1	1	1		1		
Cricotopus (I.) sp. "Ozarks"					2							
Cricotopus trifascia	**2.8**	**CG**	1									1
Cryptochironomus sp.	**6.4**	**P**		5		2	2	3				1
Diamesa sp.	**8.1**	**CG**	1									
Dicrotendipes neomodestus	**8.1**	**CG**							3			
Micropsectra sp.	**1.5**	**CG**					1		1			
Microtendipes pedellus gp.	**5.5**	**CG**										
Nanocladius distinctus	**7.1**	**CG**	1				1	1				4
Natarsia sp.	**10**			1				1				
Nilotanypus fimbraitus	**3.9**	**P**			1							
Pagastia orthogonia	**1.8**	**CG**		1								
Paracladopelma sp.	**5.5**	**CG**		1								
Parakiefferiella sp.	**5.4**	**CG**										
Parametriocnemus sp.	**3.7**	**CG**	5	2								
Paratendipes sp.	**5.1**	**CG**		1								
Phaenopsectra punctipes gp.								1				
Polypedilum fallax	**6.4**	**SH**					2					1
Polypedilum flavum (convictum)	**4.9**	**SH**	4	2	6	10	6	4	5	2	17	1
Polypedilum halterale gp.	**7.3**	**SH**		22		7	9	27	2	3		1
Polypedilum illinoense	**9**	**SH**	2	1		16	8	1	8			
Polypedilum laetum	**1.4**							1				
Potthastia cf. gaedii									1			
Procladius sp.	**9.1**	**P**		21			2	1	2			
Rheocricotopus robacki	**7.3**	**CG**	22		5	1		1	1	18	10	1

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Allegany Ballistics Laboratory

Rocket Center, West Virginia

			Station									
			1	**1**	**2**	**3**	**3A**	**4**	**4A**	**4B**	**5**	**6**
SPECIES	**T.V.**	**F.F.G.**	**Kick**	**Jab**	**Kick**	**Jab**	**Jab**	**Jab**	**Jab**	**Kick**	**Kick**	**Jab**
Rheotanytartsus exiguus gp.	**5.9**		8	9	8	2		4		4	7	2
Stenochironomus sp.	**6.5**	**SH**		1								
Synorthocladius semivirens	***6**	**CG**								3		
Tanytarsus sp.	**6.8**	**FC**	16	45		50	70	54	63	16	1	63
Thienemanniella xena	**5.9**	**CG**	4		2				1			
Tribelos fuscicorne								1				
Tribelos jucundum	**6.3**			3			2	7	2	3		
Tvetenia paucunca	**3.7**	**CG**			5					1	3	
Tvetenia vitracies	**3.6**	**CG**	10	3	15	1		4			17	3
Zavrelimyia sp.	**9.1**	**P**										
Culicidae	***8**	**FC**							1			
Empididae	**7.6**	**P**										
Hemerodromia sp.	***6**	**P**			1					1		1
Tabanidae	***7**	**PI**										
Psychodidae		**CG**										
Psychoda sp.	**9.6**	**CG**					1					
Simuliidae		**FC**										
Simulium sp.	**6**	**FC**	3	1	12					1	7	
Tipulidae		**SH**										
Antocha sp.	**4.3**	**CG**	1	1	15					10	1	7
No. of Organisms			**248**	**341**	**184**	**202**	**246**	**334**	**188**	**201**	**206**	**194**
Taxa Richness			**46**	**39**	**30**	**44**	**39**	**37**	**34**	**40**	**36**	**47**

TV - Tolerance Values

FFG - Functional Feeding Group

TABLE G-12

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Site 1 - North Branch Potomac River

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Allegany Ballistics Laboratory

Rocket Center, West Virginia

SPECIES	T.V.	F.F.G.	Station									
			1	1	2	3	3A	4	4A	4B	5	6
			Kick	Jab	Kick	Jab	Jab	Jab	Jab	Kick	Kick	Jab
PLATYHELMINTHES			1									
Turbellaria												
Tricladida												
Dugesiidae												
Girardia (Dugesia) tigrina	**7.2**					1						
NEMERTEA												
Enopla												
Tertastemmatidae												
Prostoma sp.			5		2		2	10				
NEMATODA			1				1			1		
MOLLUSCA												
Bivalvia												
Veneroida												
Corbiculidae												
Corbicula fluminea	**6.1**	**FC**	4	2		3	1		1	1		6
Sphaeriidae	***8**	**FC**	1									
Pisidium sp.	**6.5**	**FC**		20		6	2	25	11			20
Gastropoda												
Basommatophora												
Ancylidae		**SC**										
Ferrissia rivularis	***6**	**SC**	6	2	5	7	14	2	6	10		12
Physidae												
Physella sp.	**8.8**	**CG**		1		3	2					
Planorbidae	***6**	**SC**										
Menetus dilatatus	**8.2**	**SC**										5
ANNELIDA												
Oligochaeta	***10**	**CG**										

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SPECIES	T.V.	F.F.G.	Station									
			1	1	2	3	3A	4	4A	4B	5	6
			Kick	Jab	Kick	Jab	Jab	Jab	Jab	Kick	Kick	Jab
Tubificida												
Enchytraeidae	**9.8**	**CG**					1					
Lumbricidae		**SC**	1		1		1					
Naididae	***8**	**CG**	4	6	1		1			12	6	
Dero sp.	**10**	**CG**										
Nais behningi	**8.9**	**CG**	1	6	1		3					
Nais bretscheri	***6**	**CG**								1		
Nais communis	**8.8**	**CG**	1		15	7	1			4	6	
Nais pardalis							1					
Nais sp.	**8.9**	**CG**	1		1					2		
Pristina sp.	**9.6**	**CG**									7	
Pristina leidyi	**9.6**	**CG**	1									
Pristinella osborni										2	1	
Pristinella sp.	**7.7**	**CG**										
Slavina appendiculata	**7.1**	**CG**	6		4			10		9	4	
Tubificidae w.h.c.	**7.1**	**CG**		28		7	8	10	8			18
Aulodrilus limnobius	**5.5**	**CG**	1	11			6	78	8	1	1	
Aulodrilus pigueti	**5.5**	**CG**		17			3					
Branchiura sowerbyi	**8.3**	**CG**							2			
Tubificidae w.o.h.c.	**7.1**	**CG**	2	47	1	109	16	89	4	5		78
Limnodrilus hoffmeisteri	**9.5**	**CG**				14						24
Lumbriculida												
Lumbriculidae	**7**	**CG**	1				1					6
ARTHROPODA												
Arachnoidea												
Acariformes	**5.5**			4					4			
Hygrobatidae	**5.5**											

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SPECIES	T.V.	F.F.G.	Station									
			1	1	2	3	3A	4	4A	4B	5	6
			Kick	Jab	Kick	Jab	Jab	Jab	Jab	Kick	Kick	Jab
Atractides sp.	**5.5**		2									
Lebertiidae	**5.5**											
Lebertia sp.	**5.5**				1	3	16			3	5	
Pionidae	**5.5**											
Crustacea												
Copepoda												
Cyclopoida												
Cyclopidae												
Euryclops agilis								1	10			
Macrocyclops albidus			1	5		1	2					9
Harpacticoda												
Canthocamptidae												
Attheyella sp.										1		
Ostracoda			1							1		3
Cladocera												
Chydoridae												
Alona sp.												1
Isopoda												
Asellidae		**SH**										
Caecidotea sp.	**9.1**	**CG**										15
Amphipoda		**CG**										
Crangonyctidae												
Crangonyx sp.	**7.9**	**CG**		17		33	39	48	9	1		58
Gammaridae												
Gammarus sp.	**9.1**	**SH**	21									
Hyalellidae												
Hyalella azteca	**7.8**	**CG**					2		5	1		9

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Site 1 - North Branch Potomac River

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Allegany Ballistics Laboratory

Rocket Center, West Virginia

			Station									
			1	**1**	**2**	**3**	**3A**	**4**	**4A**	**4B**	**5**	**6**
SPECIES	**T.V.**	**F.F.G.**	**Kick**	**Jab**	**Kick**	**Jab**	**Jab**	**Jab**	**Jab**	**Kick**	**Kick**	**Jab**
Decapoda												
Cambaridae	**7.5**											
Orconectes sp.	**2.6**	**SH**	1	2	1	1	2	1	2			3
Collembola												
Isotomidae						1						
Insecta												
Ephemeroptera												
Baetidae	***4**	**CG**	7	1	5	3	1			5	8	1
Acerpenna pygmaeus	**3.9**					1				1		
Acerpenna sp.				1								
Baetis flavistriga	**7**	**CG**	2	2	15	2	1			6	2	1
Baetis intercalaris	**7**	**CG**	34	2	84	13	7			60	20	6
Baetis sp.	***4**	**CG**			3				1			
Callibaetis sp.	***4**	**CG**				1						
Centroptilum sp.	**6.6**	**CG**		5					2			1
Plauditus sp.	***4**	**CG**		1	9		1		1	4	1	
Procloeon sp.	**5**					1						
Pseudocloeon sp.	**4**	**CG**	2	3		2				1		3
Caenidae		**CG**										
Caenis sp.	**7.4**	**CG**	1						2			
Ephemerellidae	***1**	**SC**										
Eurylophella sp.	**4.3**	**SC**		2			1					
Heptageniidae	***4**	**SC**	60	1	19		7		3		27	3
Leucrocuta sp.	**2.4**	**SC**	4	1	9	3	2			3	3	
Maccaffertium mediopunctatum	**3.8**	**SC**	5	1	17		2				15	1
Maccaffertium sp.	***4**	**SC**	22	2	14	17	28	3	1	53	21	5
Rhithrogena sp.	**0.3**	**CG**			1							

TABLE G-12

Benthic Macroinvertebrates Collected Using Kick and Dip Nets - June 2012

Site 1 - North Branch Potomac River

Five-Year ROD Review

Allegany Ballistics Laboratory

Rocket Center, West Virginia

			Station									
			1	**1**	**2**	**3**	**3A**	**4**	**4A**	**4B**	**5**	**6**
SPECIES	**T.V.**	**F.F.G.**	**Kick**	**Jab**	**Kick**	**Jab**	**Jab**	**Jab**	**Jab**	**Kick**	**Kick**	**Jab**
Stenacron interpunctatum	**6.9**	**SC**	4	1		4	8		5	6		
Stenacron sp.		**SC**										1
Stenonema femoratum	**7.2**	**SC**							1			
Isonychiidae		**FC**										
Isonychia sp.	**3.5**	**FC**								1	1	
Tricorythidae		**CG**										
Tricorythodes sp.	**5.1**	**CG**				1		1				2
Odonata												
Aeshnidae	***3**	**P**										
Boyeria vinosa	**5.9**	**P**				4		1				1
Boyeria sp.		**P**										
Calopterygidae		**P**										
Calopteryx sp.	**7.8**	**P**				1						
Hetaerina titia										1		
Coenagrionidae		**P**						1				
Argia sp.	**8.2**	**P**										1
Ischnura sp.	**9.5**											
Gomphidae		**P**					2					
Dromogomphus sp.	**5.9**	**P**		3								
Gomphus sp.	**5.8**	**P**				1						
Hagenius brevistylus	**4**	**P**								1		
Ophiogomphus sp.	**5.5**	**P**				1						
Stylogomphus sp.			1									
Libellulidae		**P**		1			1					
Macromia illinoiensis												1
Macromia sp.	**6.2**	**P**		1			3	1				
Plecoptera												

TABLE G-12

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Site 1 - North Branch Potomac River

Five-Year ROD Review

Allegany Ballistics Laboratory

Rocket Center, West Virginia

			Station									
			1	1	2	3	3A	4	4A	4B	5	6
SPECIES	**T.V.**	**F.F.G.**	**Kick**	**Jab**	**Kick**	**Jab**	**Jab**	**Jab**	**Jab**	**Kick**	**Kick**	**Jab**
Perlidae	***1**	**P**									1	
Agnetina sp.	**0**	**P**										
Pteronarcidae	**1.6**	**SH**										
Pteronarcys (Allonarcys) sp.	**1.7**	**SH**										
Hemiptera												
Gerridae		**P**										
Rheumatobates sp.		**P**		1		2	1		1			3
Trepobates sp.		**P**							3			
Nepidae		**-**										
Ranatra sp.	**7.8**	**P**					1					
Veliidae		**P**										
Rhagovelia obesa		**P**				1						
Megaloptera												
Corydalidae		**P**										
Corydalus cornutus	**5.2**	**P**			1						2	
Nigronia fasciatus	**5.6**	**P**	1									
Nigronia serricornis	**5**	**P**	3	2	3	2	1			18	14	2
Sialidae		**P**										
Sialis sp.	**7.2**	**P**	2	4		2		1	5		1	7
Trichoptera												
Brachycentridae		**SH**										
Brachycentrus sp.	***2**	**FC**	2		4	5	5			4		2
Glossosomatidae		**SC**								4		
Protoptila sp.	**2.6**	**SC**	2		2	6	20			7	1	3
Hydropsychidae	***4**	**FC**	27	3	27	8	6			32	77	
Ceratopsyche morosa	**2.6**	**FC**			63	34	13			21	32	1
Ceratopsyche sparna	**2.7**	**FC**			6						6	

TABLE G-12

Benthic Macroinvertebrates Collected Using Kick and Dip Nets - June 2012

Site 1 - North Branch Potomac River

Five-Year ROD Review

Allegany Ballistics Laboratory

Rocket Center, West Virginia

			Station									
			1	**1**	**2**	**3**	**3A**	**4**	**4A**	**4B**	**5**	**6**
SPECIES	**T.V.**	**F.F.G.**	**Kick**	**Jab**	**Kick**	**Jab**	**Jab**	**Jab**	**Jab**	**Kick**	**Kick**	**Jab**
Ceratopsyche sp.		**FC**	5							7	3	
Cheumatopsyche sp.	**6.2**	**FC**	9		4					5	6	1
Hydropsyche betteni gp.	**7.8**	**FC**								3		
Hydropsyche phalerata	**3.6**			1	6	3	1		1	18		
Hydropsyche sp.	***5**	**FC**	8			6				7	14	2
Potamyia flava												
Hydroptilidae		**PI**	2	1						8		3
Dibusa angata					44							
Hydroptila sp.	**6.2**	**PI**	3	6		2	5		4	10	2	
Mayatrichia sp.						**0**						
Lepidostomatidae		**SH**										
Lepidostoma sp.	**0.9**	**FC**						1		1		
Leptoceridae		**CG**										3
Mystacides sepulchralis	**2.7**	**CG**				1			2			7
Oecetis sp.	**4.7**	**P**	13	1		4	4	4		1		1
Limnephilidae												
Pycnopsyche sp.	**2.5**	**SH**		2								
Philopotamidae		**FC**										
Chimarra sp.	**2.8**	**FC**			1						12	
Polycentropodidae		**FC**	6			1				2		
Neureclipsis sp.	**4.2**	**FC**	2	16		1	4	3	1	5		
Nyctiophylax sp.	**0.9**	**FC**										
Polycentropus sp.	**3.5**	**FC**	2	20		10	11	11	5	5	1	7
Psychomyiidae		**CG**				2						
Lype diversa	**4.1**	**SC**		3			3	1	6			4
Psychomyia flavida	**2.9**	**CG**	1								1	
Coleoptera												

TABLE G-12

Benthic Macroinvertebrates Collected Using Kick and Dip Nets - June 2012

Site 1 - North Branch Potomac River

Five-Year ROD Review

Allegany Ballistics Laboratory

Rocket Center, West Virginia

			Station									
			1	**1**	**2**	**3**	**3A**	**4**	**4A**	**4B**	**5**	**6**
SPECIES	**T.V.**	**F.F.G.**	**Kick**	**Jab**	**Kick**	**Jab**	**Jab**	**Jab**	**Jab**	**Kick**	**Kick**	**Jab**
Dytiscidae	***5**	**P**					1	1				
Elmidae		**CG**	8								1	
Ancyronyx variegata	**6.5**	**SC**		2					1			1
Dubiraphia sp.	**5.9**	**SC**		3		5		1	4			6
Dubiraphia vittata	**4.1**	**SC**					2					1
Optioservus sp.	**2.4**	**SC**	1			1				3	3	
Optioservus ovalis	**2.4**	**SC**									1	
Optioservus trivittatus	**2.4**	**SC**									2	
Macronychus glabratus	**4.6**	**SH**		4		2	6	2	3			4
Microcylloepus pusillus	**2.1**	**SC**									1	
Stenelmis sp.	**5.1**	**SC**	4							1	14	2
Gyrinidae		**P**										
Dineutus sp.	**5.5**	**P**	5	1	2		4			2		
Hydrophilidae		**P**				1			2			
Berosus sp.	**8.4**	**CG**										1
Sperchopsis sp.				1								
Psephenidae		**SC**										
Psephenus herricki	**2.4**	**SC**			1				1	1	2	
Diptera												
Athericidae												
Atherix lantha	**2.1**	**P**									1	
Ceratopogonidae		**P**							2			
Atrichopogon sp.	**6.5**	**P**					1				1	
Bezzia/Palpomyia gp.	**6.9**	**P**					2					
Chironomidae												
Chironominae							4					
Ablabesmyia annulata	**2**							1				

TABLE G-12

Benthic Macroinvertebrates Collected Using Kick and Dip Nets - June 2012

Site 1 - North Branch Potomac River

Five-Year ROD Review

Allegany Ballistics Laboratory

Rocket Center, West Virginia

			Station									
			1	**1**	**2**	**3**	**3A**	**4**	**4A**	**4B**	**5**	**6**
SPECIES	**T.V.**	**F.F.G.**	**Kick**	**Jab**	**Kick**	**Jab**	**Jab**	**Jab**	**Jab**	**Kick**	**Kick**	**Jab**
Ablabesmyia mallochi	**7.2**	**P**	1	6		11	2	24	22			13
Ablabesmyia rhamphe gp.	**7.2**	**P**		3		2	5	6				8
Brillia flavifrons	**5.2**	**SH**		1								1
Chironomus sp.	**9.6**	**CG**		10				9	4			
Cladopelma sp.	**3.5**	**CG**							2			
Clinotanypus sp.	***6**	**P**				4		3				
Conchapelopia sp.	**8.4**	**P**	16	7	3	14	12	5	4	4	21	8
Corynoneura sp.	**6**	**CG**	1								2	
Cricotopus sp.	***7**	**CG**		1			2	1	9			1
Cricotopus bicinctus	**8.5**	**CG**					5	1	7	5		
Cryptochironomus sp.	**6.4**	**P**		1		6	1	2	1			7
Dicrotendipes neomodestus	**8.1**	**CG**		17			1	9	28			1
Dicrotendipes simpsoni	**10**						1		1			1
Dicrotendipes sp.	**8.1**	**CG**										
Limnophyes sp.	**7.4**	**CG**					1					
Microtendipes pedellus gp.	**5.5**	**CG**	1	1		7	2	1	3	3		
Nanocladius distinctus	**7.1**	**CG**	1									1
Natarsia sp.	**10**		1	1				2	2			
Nilotanypus sp.	**3.9**	**P**			1						1	
Nilothauma sp.	**5**	**CG**										
Orthocladiinae				3								
Orthocladius sp.		**CG**										
Pagastia orthogonia	**1.8**	**CG**								1		
Paracladopelma sp.	**5.5**	**CG**		4				2	1			
Parakiefferiella sp.	**5.4**	**CG**		1			1	1				
Parametriocnemus sp.	**3.7**	**CG**			2	2					2	
Paratendipes albimanus				1		1	1	4				1

TABLE G-12

Benthic Macroinvertebrates Collected Using Kick and Dip Nets - June 2012

Site 1 - North Branch Potomac River

Five-Year ROD Review

Allegany Ballistics Laboratory

Rocket Center, West Virginia

			Station									
			1	**1**	**2**	**3**	**3A**	**4**	**4A**	**4B**	**5**	**6**
SPECIES	**T.V.**	**F.F.G.**	**Kick**	**Jab**	**Kick**	**Jab**	**Jab**	**Jab**	**Jab**	**Kick**	**Kick**	**Jab**
Paratendipes sp.	**5.1**	**CG**							1			
Pentaneura inconspicua												
Phaenopsectra obediens gp.												
Phaenopsectra punctipes gp.				1			2		2			4
Polypedilum fallax	**6.4**	**SH**										
Polypedilum flavum (convictum)	**4.9**	**SH**	3		6	2	12	2	1		19	3
Polypedilum halterale gp.	**7.3**	**SH**				2	1	9				
Polypedilum illinoense	**9**	**SH**	5	39	3	33	62	50	17	1	10	29
Polypedilum scalaenum gp.	**8.4**											
Polypedilum sp.												
Potthastia longimana	**6.5**	**CG**		1								
Procladius sp.	**9.1**	**P**		42		4	9	5	121		1	8
Psectrocladius sp.	**3.6**	**SH**							3			
Pseudochironomus sp.	**5.4**	**CG**										
Rheocricotopus robacki	**7.3**	**CG**	64	5	1	1	1	1		12	104	2
Rheotanytartsus exiguus gp.	**5.9**		15		11	8	2		1	27	12	1
Rheotanytarsus pellucidus									1			
Stenochironomus sp.	**6.5**	**SH**		2		1	1		2			2
Sublettea coffmani	**1.6**								1			
Synorthocladius semivirens	***6**	**CG**			1					4		
Tanypodinae							1					
Tanypus sp.	**9.2**	**P**										
Tanytarsus sp.	**6.8**	**FC**	6	89	2	41	73	58	200	28	5	57
Thienemanniella xena	**5.9**	**CG**					1					
Tribelos fuscicorne												
Tribelos jucundum	**6.3**		5	3			1	5		1		3
Tvetenia paucunca	**3.7**	**CG**			1	4						

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Benthic Macroinvertebrates Collected Using Kick and Dip Nets - June 2012

Site 1 - North Branch Potomac River

Five-Year ROD Review

Allegany Ballistics Laboratory

Rocket Center, West Virginia

			Station									
			1	**1**	**2**	**3**	**3A**	**4**	**4A**	**4B**	**5**	**6**
SPECIES	**T.V.**	**F.F.G.**	**Kick**	**Jab**	**Kick**	**Jab**	**Jab**	**Jab**	**Jab**	**Kick**	**Kick**	**Jab**
Tvetenia vitracies	**3.6**	**CG**	12		40	1	5			30	10	1
Tvetenia sp.												
Zavrelimyia sp.	**9.1**	**P**										
Culicidae	***8**	**FC**								1		
Empididae	**7.6**	**P**									1	
Hemerodromia sp.	***6**	**P**	6	1			4			7	7	
Simuliidae		**FC**										
Simulium sp.	**6**	**FC**	5		22	2				2	1	
Stratiomyidae		**CG**										
Caloparyphus sp.						1						
Tabanidae		**PI**					2					
Tipulidae		**SH**			1							
Antocha sp.	**4.3**	**CG**			7	1	3			15		
Tipula sp.	**7.3**	**SH**					1		1		1	
No. of Organisms			**453**	**507**	**474**	**498**	**499**	**507**	**562**	**503**	**524**	**507**
Taxa Richness			**67**	**70**	**48**	**72**	**84**	**46**	**59**	**65**	**55**	**68**

TV - Tolerance Values

FFG - Functional Feeding Group

TABLE G-13

Metrics for Kick/Jab Samples - June 2010

Site 1 - North Branch Potomac River

Five-Year ROD Review Report

Allegany Ballistics Laboratory

Rocket Center, West Virginia

Metric	BIOTA 1 Kick	BIOTA 2 Kick	BIOTA 4B Kick	BIOTA 5 Kick	BIOTA 1 Jab	BIOTA 3 Jab	BIOTA 3A Jab	BIOTA 4 Jab	BIOTA 4A Jab	BIOTA 6 Jab
Total Number of Organisms	248	184	201	206	341	202	246	334	188	194
Total Number of Taxa	46	30	40	36	39	44	39	37	34	47
JABS ONLY										
EPT Taxa	--	--	--	--	8	15	7	7	5	15
Ephemoroptera Taxa	--	--	--	--	4	6	3	2	2	6
Percent Ephemeroptera	--	--	--	--	4.11	4.95	1.22	0.60	1.60	7.22
Diptera Taxa	--	--	--	--	22	13	17	21	16	16
Intolerant Taxa	--	--	--	--	16	19	11	11	11	21
Percent Tolerant	--	--	--	--	89.7	74.3	84.6	91.3	85.6	74.2
Percent Collectors	--	--	--	--	47.5	28.7	30.1	58.4	35.1	37.1
KICKS ONLY										
HBI (modified)	5.55	4.41	5.85	4.90	--	--	--	--	--	--
Scrapers/Filterers-Collectors	0.19	0.09	0.23	0.15	--	--	--	--	--	--
Ratio EPT/Chironomidae	1.54	2.26	1.48	1.89	--	--	--	--	--	--
Percent Contribution	13.7	11.4	8.96	17.0	--	--	--	--	--	--
Community Loss (Biota 1 = Referenc	--	0.83	0.60	0.56	--	--	--	--	--	--
Ratio of Shredder/Total	0.065	0.033	0.040	0.097	--	--	--	--	--	--

EPT - Ephemeroptera, Plecoptera, Trichoptera

HBI - Hilsenhoff Biotic Index

TABLE G-14

Metrics for Kick/Jab Samples - June 2012

Site 1 - North Branch Potomac River

Five-Year ROD Review Report

Allegany Ballistics Laboratory

Rocket Center, West Virginia

Metric	BIOTA 1 Kick	BIOTA 2 Kick	BIOTA 4B Kick	BIOTA 5 Kick	BIOTA 1 Jab	BIOTA 3 Jab	BIOTA 3A Jab	BIOTA 4 Jab	BIOTA 4A Jab	BIOTA 6 Jab
Total Number of Organisms	453	474	503	524	507	498	499	507	562	507
Total Number of Taxa	67	48	65	55	70	72	84	46	59	68
JABS ONLY										
EPT Taxa	--	--	--	--	22	24	20	7	14	21
Ephemoroptera Taxa	--	--	--	--	13	11	10	2	8	10
Percent Ephemeroptera	--	--	--	--	4.54	9.64	11.6	0.79	2.85	4.73
Diptera Taxa	--	--	--	--	23	21	32	22	25	20
Intolerant Taxa	--	--	--	--	28	34	32	18	23	25
Percent Tolerant	--	--	--	--	75.0	67.3	60.5	74.2	86.3	81.1
Percent Collectors	--	--	--	--	36.9	43.0	23.0	51.5	17.6	47.1
KICKS ONLY										
HBI (modified)	5.42	4.41	5.01	5.33	--	--	--	--	--	--
Scrapers/Filterers-Collectors	1.42	0.53	0.70	0.57	--	--	--	--	--	--
Ratio EPT/Chironomidae	1.70	4.69	2.41	1.36	--	--	--	--	--	--
Percent Contribution	14.1	17.7	11.9	19.8	--	--	--	--	--	--
Community Loss (Biota 1 = Referenc	--	0.75	0.37	0.60	--	--	--	--	--	--
Ratio of Shredder/Total	0.066	0.023	0.002	0.057	--	--	--	--	--	--

EPT - Ephemeroptera, Plecoptera, Trichoptera

HBI - Hilsenhoff Biotic Index

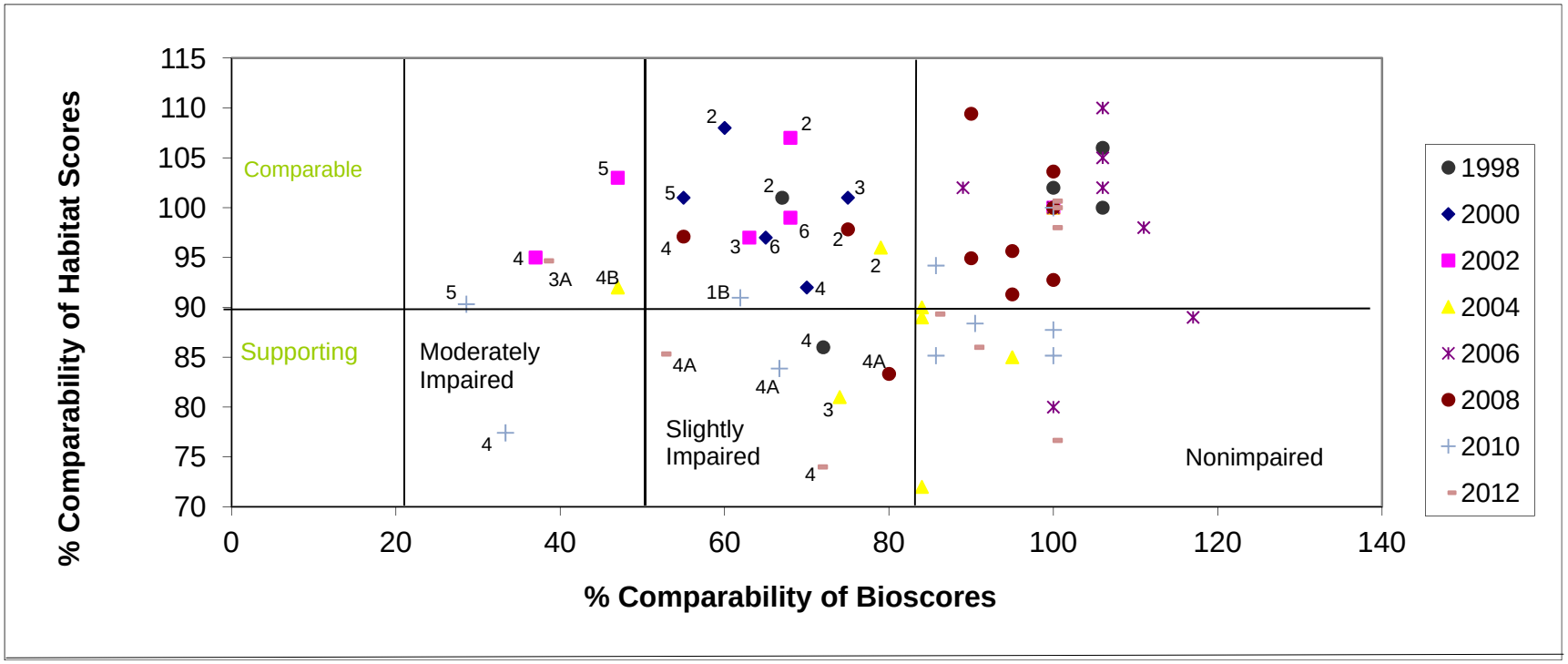


FIGURE G-1
Comparison of Habitat Scores and Bioscores for Hester-Dendy Sampling - 1998 through 2012

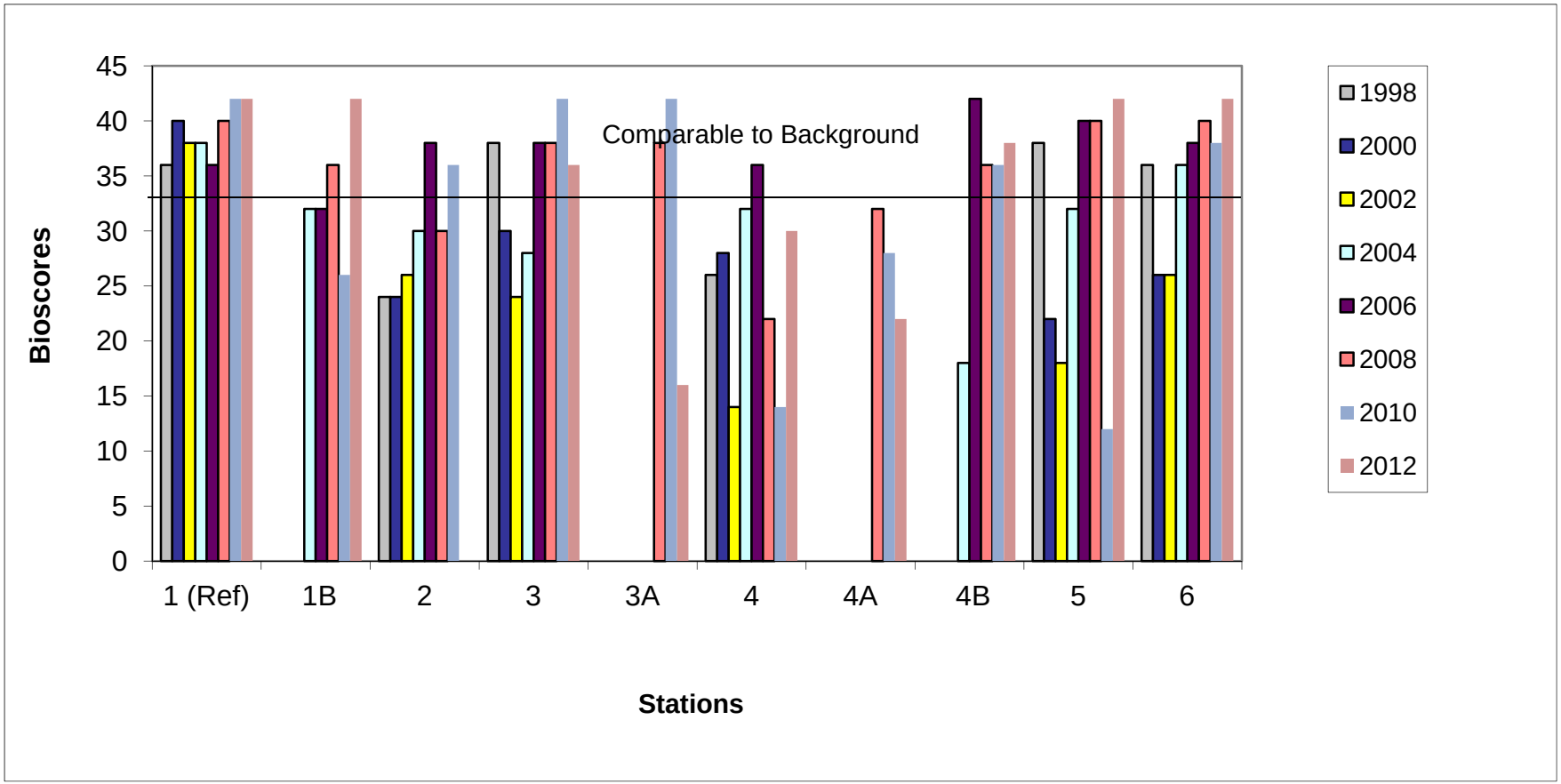
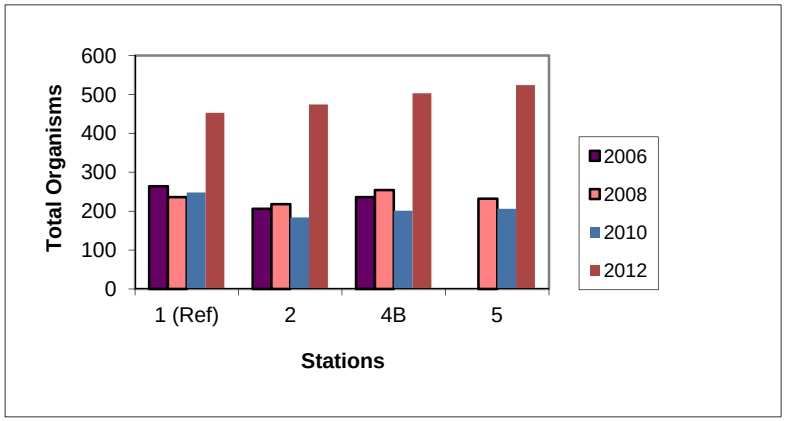
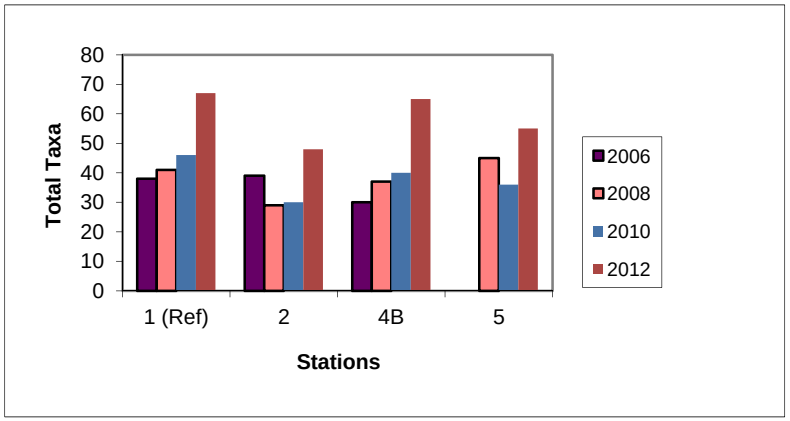
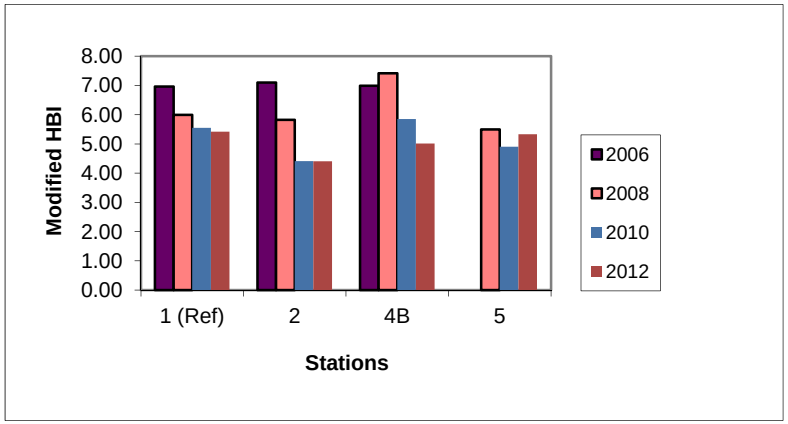


FIGURE G-2
Station Comparisons Against Average Attainable Bioscore (39.0 for Reference Station) – Hester-Dendy Samples
Line Represents 83 Percent of Average Attainable Score of the Reference Station







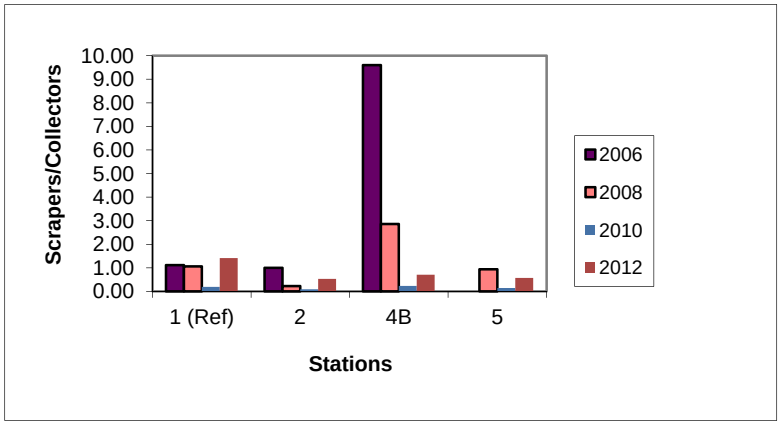
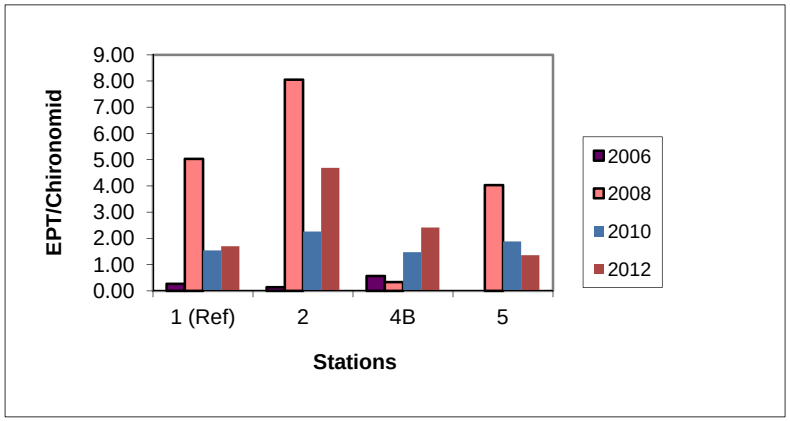
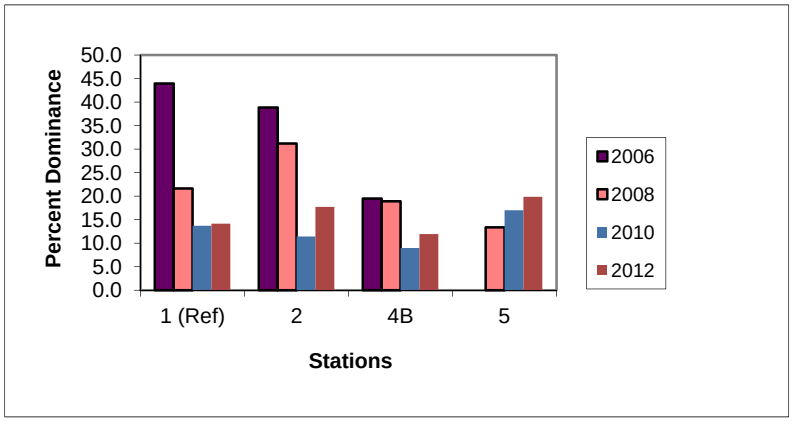
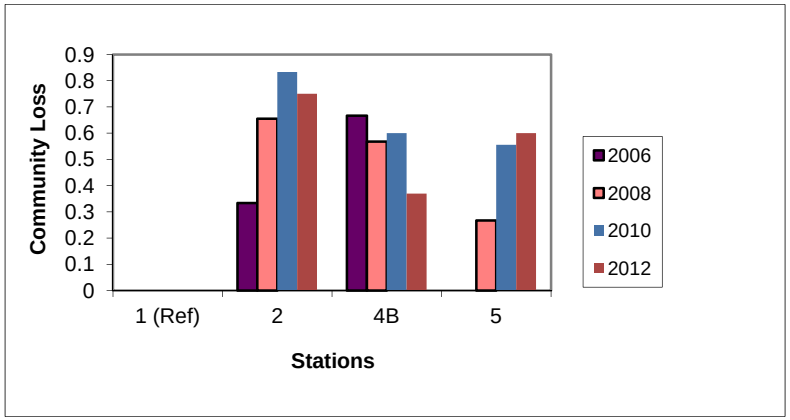


FIGURE G-3
Metrics for Kick Samples – 2006 through 2012







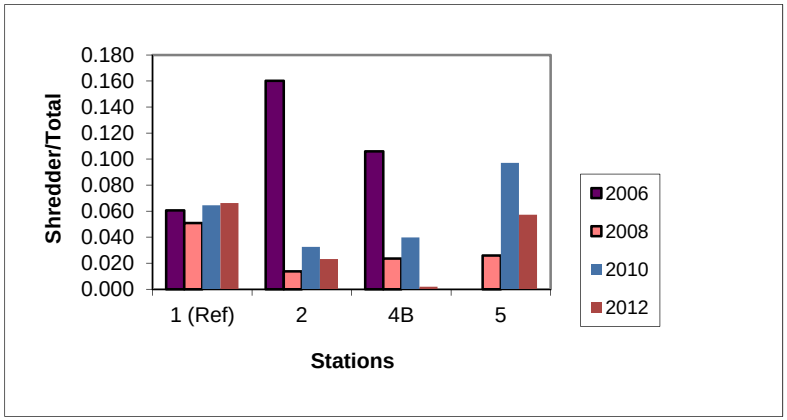
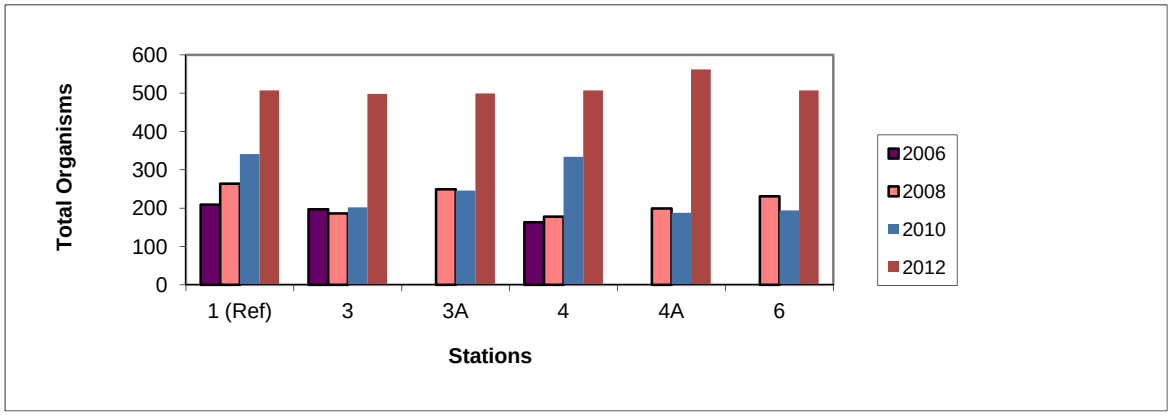


FIGURE G-3
Metrics for Kick Samples – 2006 through 2012



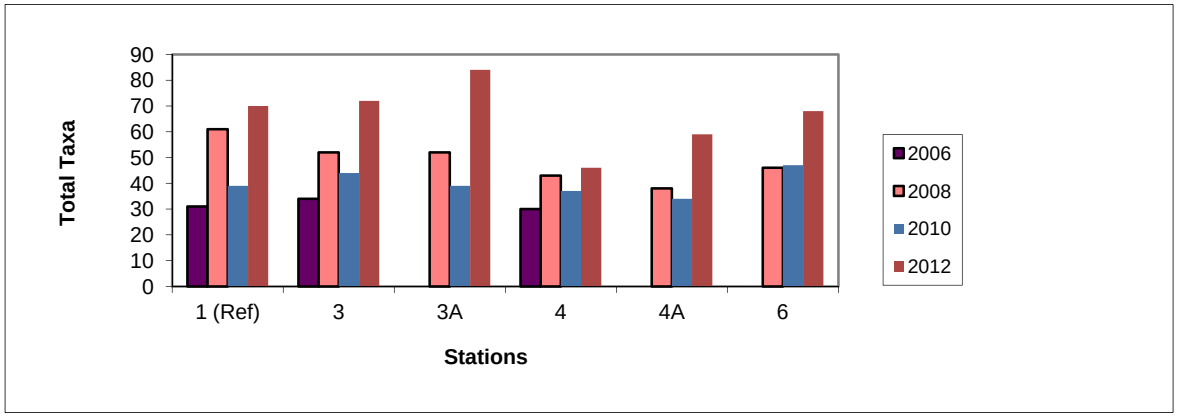
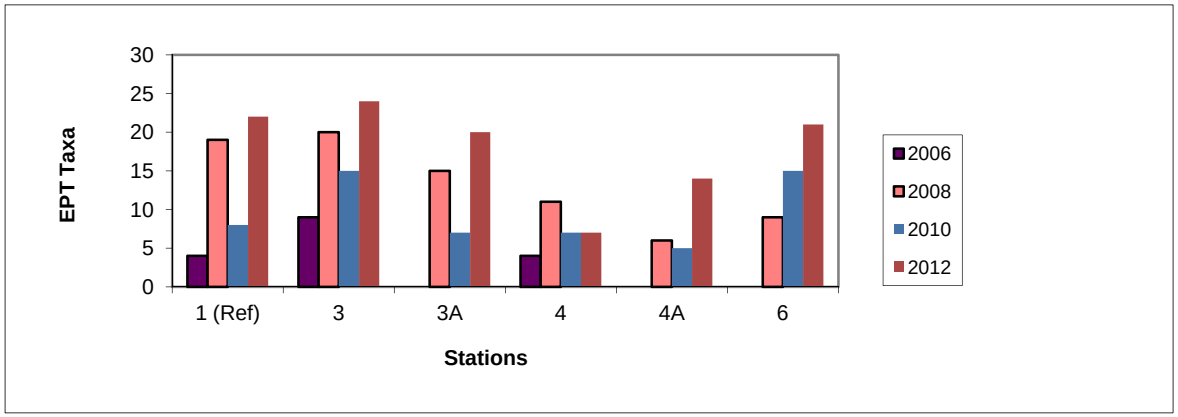


FIGURE G-4
Metrics for Jab Samples – 2006 through 2012



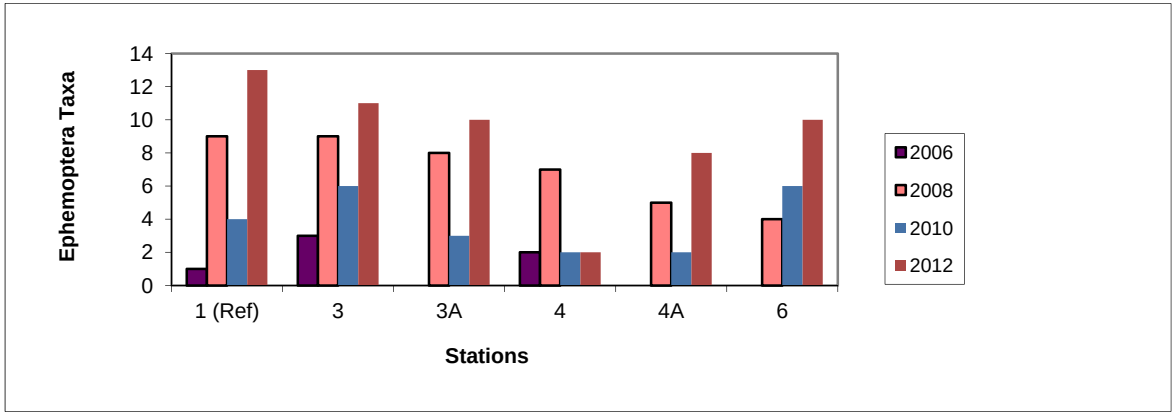
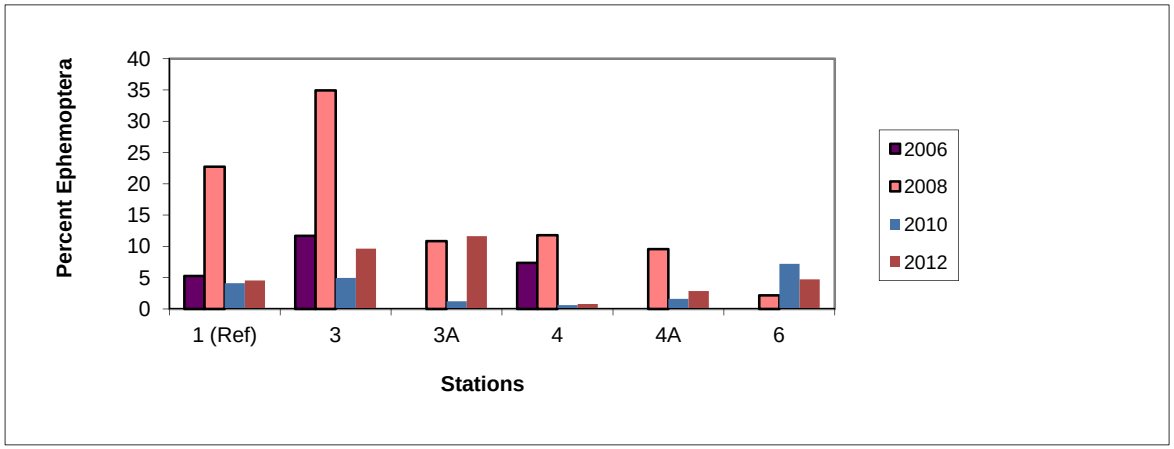


FIGURE G-4
Metrics for Jab Samples – 2006 through 2012



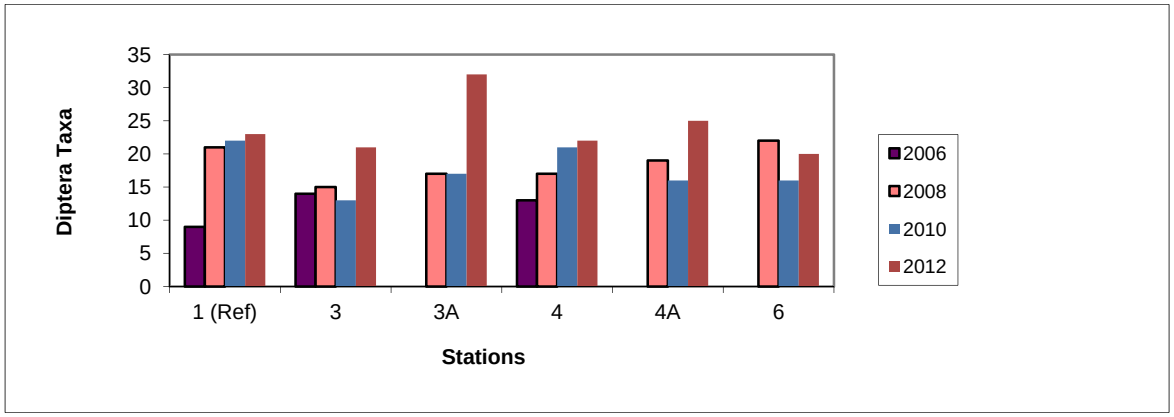
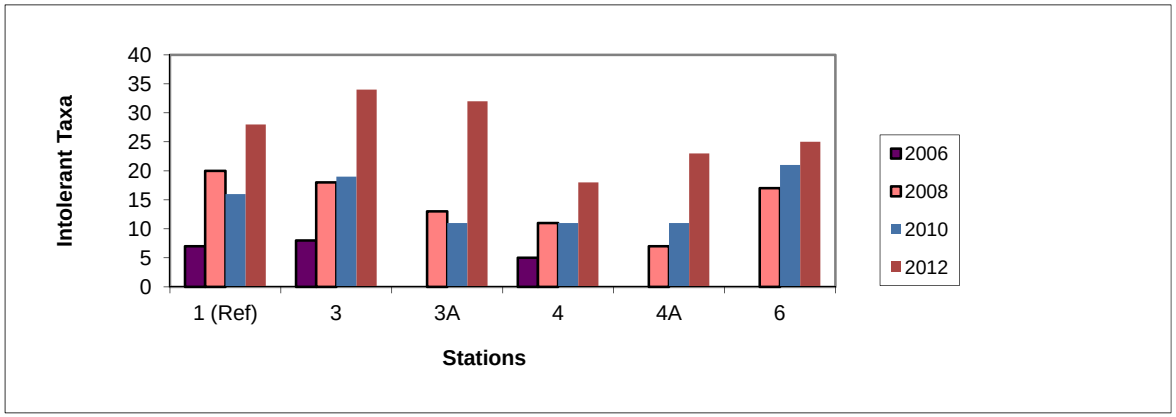


FIGURE G-4
Metrics for Jab Samples – 2006 through 2012



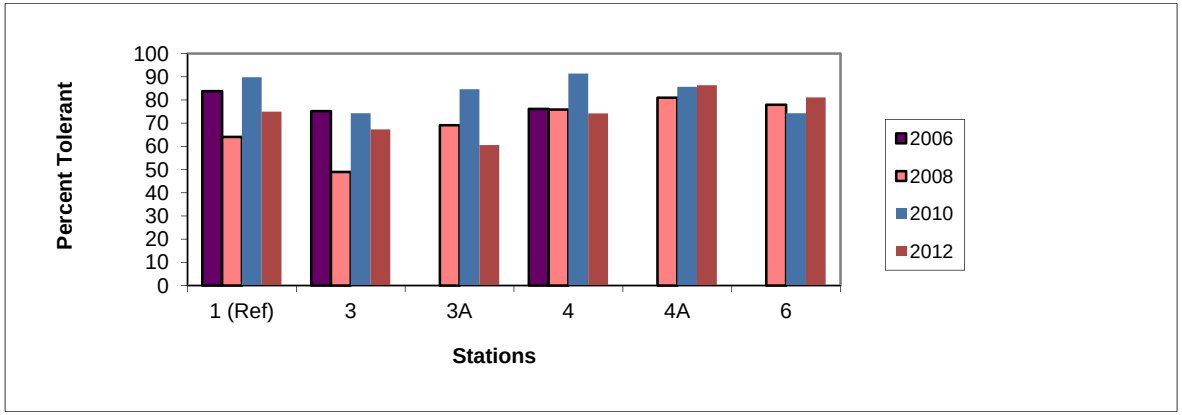


FIGURE G-4
Metrics for Jab Samples – 2006 through 2012

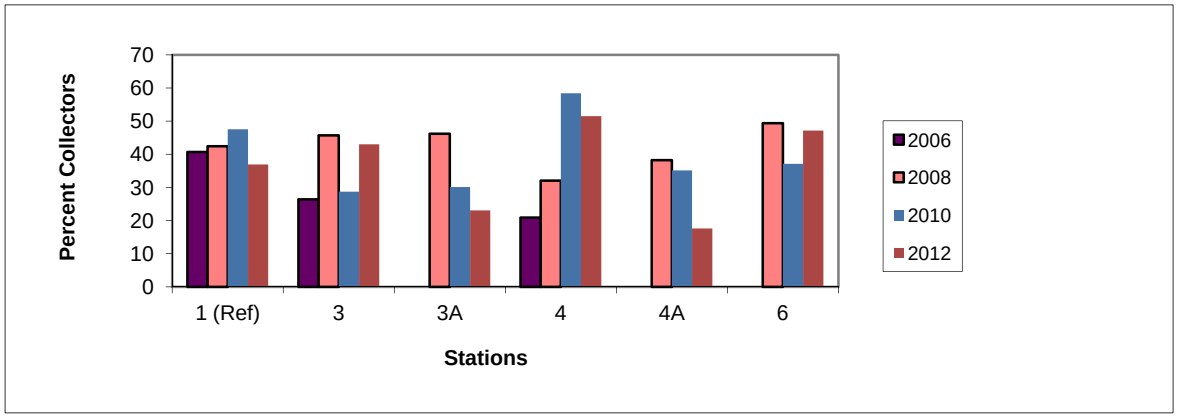


FIGURE G-4
Metrics for Jab Samples – 2006 through 2012

Appendix H
Human Health Risk Tables for Explosives in Groundwater

Table 2

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

ABL Site 1 Groundwater (Explosives)

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Groundwater	2691-41-0	HMX	5.1E-01 J	9.3E+00	UG/L	AS01-1EW16-CM20	15/18	1 - 1.05	9.3E+00	N/A	7.8E+01 N	N/A		NO	BSL
	14797-73-0	**Perchlorate**	**1.3E+01**	**2.0E+03**	**UG/L**	**AS01-1EW16-CM20**	**18/18**	**2 - 200**	**2.0E+03**	N/A	**1.1E+00 N**	N/A		**YES**	**ASL**
	121-82-4	**RDX**	**7.7E-01 J**	**1.9E+02**	**UG/L**	**AS01-1EW16-CM20**	**17/18**	**1 - 20.8**	**1.9E+02**	N/A	**6.1E-01 C**	N/A		**YES**	**ASL**

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening.

[3] Background values not available.

[4] Oak Ridge National Laboratory (ORNL). November, 2012. Regional Screening Levels for Chemical Contaminants at Superfund Sites. Tap Water RSL, Noncancer based RSLs divided by 10. [Online]. Available: http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/index.htm

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)

Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

COPC = Chemical of Potential Concern

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered

J = Estimated Value

C = Carcinogenic

N = Noncarcinogenic

UG/L = micrograms per liter

N/A = Not applicable or not available

Created by: Roni Warren/WDC (1/10/2013)

Checked by: Geanine Howard-Peebles/DAY (1/14/2013)

Table 3.1.RME
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
ABL Site 1 Groundwater (Explosives)

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)		Maximum Concentration (Qualifier)	Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Tap Water and Water in Excavation Trench	Perchlorate	ug/L	4.0E+02	7.7E+02	G	2.0E+03	7.7E+02	ug/L	95% App G	1, 3
	RDX	ug/L	2.6E+01	1.4E+02	NP	1.9E+02	1.4E+02	ug/L	99% KM-c	1

ProUCL, Version 4.1 used to determine distribution of data and calculate 95% UCL, following recommendations in users guide (USEPA. May 2010. Prepared by Lockheed Martin Environmental Services).
Options: 95% Approximate Gamma (95% App G); 99% Kaplan-Meier (Chebyshev) UCL (99% KM-c)

UCL Rationale:
(1) Shapiro-Wilk W Test/Lilliefors test indicates data are log-normally distributed.
(2) Shapiro-Wilk W Test/Lilliefors indicates data are normally distributed.
(3) Test indicates data are gamma distributed.
(4) Distribution tests are inconclusive (data are not normal, log-normal, or gamma-distributed).
(6) Maximum concentration used because calculated UCL exceeds maximum concentration.

NP = Non-Parametric
G = Gamma

ug/L = micrograms per liter

TABLE 4.1.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

ABL Site 1 Groundwater (Explosives)

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Adult	Tap Water	CW	Chemical Concentration in Water	See Table 3.1.RME	µg/l	See Table 3.1.RME	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-W	Ingestion Rate of Water	2	liters/day	EPA, 1997	CW x IR-W x EF x ED x CF2 x 1/BW x 1/AT
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				ED	Exposure Duration	24	years	EPA, 1991	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
		Child	Tap Water	CW	Chemical Concentration in Water	See Table 3.1.RME	µg/l	See Table 3.1.RME	CDI (mg/kg-day) =
				IR-W	Ingestion Rate of Water	1	liters/day	EPA, 1997	CW x IR-W x EF x ED x CF2 x 1/BW x 1/AT
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				ED	Exposure Duration	6	years	EPA, 1991	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				BW	Body Weight	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
		Child/Adult	Tap Water	CW	Chemical Concentration in Water	See Table 3.1.RME	µg/l	See Table 3.1.RME	CDI (mg/kg-day) =
				IR-W-A	Ingestion Rate of Water, Adult	2	liters/day	EPA, 1997	CW x IR-W-Adj x EF x CF2 x 1/AT
				IR-W-C	Ingestion Rate of Water, Child	1	liters/day	EPA, 1997	
				IR-W-Adj	Ingestion Rate of Water, Age-adjus	1.09	liter-year/kg-day	calculated	IR-W-Adj (liter-year/kd-day) =
				EF	Exposure Frequency	350	days/year	EPA, 1991	(ED-C x IR-W-C / BW-C) +
				ED-A	Exposure Duration, Adult	24	years	EPA, 1991	(ED-A x IR-W-A / BW-A)
				ED-C	Exposure Duration, Child	6	years	EPA, 1991	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				BW-A	Body Weight , Adult	70	kg	EPA, 1991	
				BW-C	Body Weight, Child	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	

TABLE 4.1.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

ABL Site 1 Groundwater (Explosives)

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Resident	Adult	Tap Water	CW	Chemical Concentration in Water	See Table 3.1.RME	µg/l	See Table 3.1.RME	CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Even	calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2004	
				K_p	Permeability Coefficient	chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF2 x CF3
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}	Event Time	0.58	hr/event	EPA, 2004	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Co	18,000	cm^2	EPA, 2004	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				EV	Event Frequency	1	events/day	EPA, 2004	x CF2 x CF3
				EF	Exposure Frequency	350	days/year	EPA, 2004	
				ED	Exposure Duration	24	years	EPA, 2004	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	70	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + 3B^2)/(1+B)^2)) x CF2 x CF3
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				CF3	Conversion Factor 3	0.001	l/cm^3	- -	
		Child	Tap Water	CW	Chemical Concentration in Water	See Table 3.1.RME	µg/l	See Table 3.1.RME	CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Even	calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2004	
				K_p	Permeability Coefficient	chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF2 x CF3
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}	Event Time	1.0	hr/event	EPA, 2004	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Co	6,600	cm^2	EPA, 2004	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				EV	Event Frequency	1	events/day	EPA, 2004	x CF2 x CF3
				EF	Exposure Frequency	350	days/year	EPA, 2004	
				ED	Exposure Duration	6	years	EPA, 2004	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	15	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + 3B^2)/(1+B)^2)) x CF2 x CF3
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				CF3	Conversion Factor 3	0.001	l/cm^3	- -	

TABLE 4.1.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

ABL Site 1 Groundwater (Explosives)

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Resident	Child/Adult	Tap Water	CW	Chemical Concentration in Water	See Table 3.1.RME	µg/l	See Table 3.1.RME	CDI (mg/kg-day) = DA-Adj x EF x 1/AT
				DAevent-A	Dermally Absorbed Dose per Ever	calculated	mg/cm^2-event	calculated	
				DAevent-C	Dermally Absorbed Dose per Ever	calculated	mg/cm^2-event	calculated	DA-Adj = (Daevent-A x SA-A x ED-A x 1/BW-A)
				DA-Adj	Dermally Absorbed Dose, Age-adj	calculated	mg-year/event-kg	calculated	+ (Daevent-C x SA-C x ED-C x 1/BW-C)
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2004	
				K_p	Permeability Coefficient	chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF2 x CF3
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}-A	Event Time, Adult	0.58	hr/event	EPA, 2004	t_{event}<t*: DAevent (mg/cm^2-event) =
				t_{event}-C	Event Time, Child	1.0	hr/event	EPA, 2004	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				SA-A	Skin Surface Area, Adult	18,000	cm^2	EPA, 2004	x CF2 x CF3
				SA-C	Skin Surface Area, Child	6,600	cm^2	EPA, 2004	
				EV	Event Frequency	1	events/day	EPA, 2004	t_{event}>t*: DAevent (mg/cm^2-event) =
				EF	Exposure Frequency	350	days/year	EPA, 2004	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				ED-A	Exposure Duration, Adult	24	years	EPA, 2004	((1 + 3B + 3B^2)/(1+B)^2)) x CF2 x CF3
				ED-C	Exposure Duration, Child	6	years	EPA, 2004	
				BW-A	Body Weight, Adult	70	kg	EPA, 1991	
				BW-C	Body Weight, Child	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				CF3	Conversion Factor 3	0.001	l/cm^3	- -	

TABLE 4.1.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

ABL Site 1 Groundwater (Explosives)

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Construction Worker	Adult	Water in Excavation	CW	Chemical Concentration in Water	See Table 3.1.RME	µg/l	See Table 3.1.RME	CDI (mg/kg-day) =
			Trench	DAevent	Dermally Absorbed Dose per Ever	calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2004	
				K_p	Permeability Coefficient	chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF2 x CF3
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}	Event Time	8	hr/day	(1)	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Co	5,700	cm^2	EPA, 2004, (3)	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				EV	Event Frequency	1	events/day	EPA, 2004	x CF2 x CF3
				EF	Exposure Frequency	125	days/year	(2)	
				ED	Exposure Duration	1	years	EPA, 1991	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	70	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF2 x CF3
				AT-N	Averaging Time (Non-Cancer)	365	days	EPA, 1989	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				CF3	Conversion Factor 3	0.001	l/cm^3	- -	

(1) Professional judgment based on construction activities that would occur 8 hrs per day for the RME.

(2) Assumed duration of construction project may be 1/2 a year.

(3) Skin surface area in contact with groundwater assumed to be hands, forearms, lower legs, and feet.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 2004 . Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment (Final). EPA/540/R/99/005. July 2004.

TABLE 4.2.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
ABL Site 1 Groundwater (Explosives)

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Recreational User	Adult	River	CSW	Chemical Concentration in Surface Water	See Table 3.1.RME	µg/l	See Table 3.1.RME	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-SW	Ingestion Rate of Surface Water	0.05	l/hour	EPA, 2012	CSW x IR-SW x ET x EF x ED x CF x
				ET	Exposure Time	3	hr/month	EPA, 2012 (1)	1/BW x 1/AT
				EF	Exposure Frequency	12	month/year	(1)	
				ED	Exposure Duration	24	years	EPA, 1991	
				CF	Conversion Factor	0.001	mg/µg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
		Adolescent	River	CSW	Chemical Concentration in Surface Water	See Table 3.1.RME	µg/l	See Table 3.1.RME	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-SW	Ingestion Rate of Surface Water	0.05	l/hour	EPA, 2012	CSW x IR-SW x ET x EF x ED x CF x
				ET	Exposure Time	3	hr/month	EPA, 2012 (1)	1/BW x 1/AT
				EF	Exposure Frequency	12	month/year	(1)	
				ED	Exposure Duration	9	years	(2)	
				CF	Conversion Factor	0.001	mg/µg	- -	
				BW	Body Weight	51	kg	EPA, 1997, (3)	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
		Child	River	CSW	Chemical Concentration in Surface Water	See Table 3.1.RME	µg/l	See Table 3.1.RME	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-SW	Ingestion Rate of Surface Water	0.05	l/hour	EPA, 2012	CSW x IR-SW x ET x EF x ED x CF x
				ET	Exposure Time	3	hr/month	EPA, 2012 (1)	1/BW x 1/AT
				EF	Exposure Frequency	12	month/year	(1)	
				ED	Exposure Duration	6	years	EPA, 1991	
				CF	Conversion Factor 1	0.001	mg/µg	- -	
				BW	Body Weight	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	

TABLE 4.2.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

ABL Site 1 Groundwater (Explosives)

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Recreational User	Adult	River	CSW	Chemical Concentration in Surface Water	See Table 3.1.RME	µg/l	See Table 3.1.RME	CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	Calculated	mg/cm^2-event	Calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	Chemical specific	dimensionless	EPA, 2004	
				Kp	Permeability Coefficient	Chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	Chemical specific	hr/event	EPA, 2004	Kp x CW x tevent x CF x CF2
				t*	Time to Reach Steady-state	Chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	Chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}	Event Time	3	hr/month	EPA, 2012 (1)	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	18,000	cm^2	EPA, 2004, (4)	2 x FA x Kp x CW x (sqrt((6 xτ x t_{event})/π))
				EV	Event Frequency	1	events/month	(1)	x CF x CF2
				EF	Exposure Frequency	12	month/year	(1)	
				ED	Exposure Duration	24	years	EPA, 1991	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	70	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + 3B2)/(1+B)2)) x CF x CF2
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				CF2	Conversion Factor 2	0.001	l/cm^3	- -	
		Adolescent	River	CSW	Chemical Concentration in Surface Water	See Table 3.1.RME	µg/l	See Table 3.1.RME	CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	Calculated	mg/cm^2-event	Calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	Chemical specific	dimensionless	EPA, 2004	
				Kp	Permeability Coefficient	Chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	Chemical specific	hr/event	EPA, 2004	Kp x CW x tevent x CF1 x CF2
				t*	Time to Reach Steady-state	Chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	Chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}	Event Time	3	hr/month	EPA, 2012 (1)	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	15,900	cm2	EPA, 2011, (4,5)	2 x FA x Kp x CW x (sqrt((6 xτ x t_{event})/π))
				EV	Event Frequency	1	events/month	(1)	x CF x CF2
				EF	Exposure Frequency	12	month/year	(1)	
				ED	Exposure Duration	9	years	(2)	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	51	kg	EPA, 1997, (3)	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + 3B2)/(1+B)2)) x CF1 x CF2
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				CF2	Conversion Factor 2	0.001	l/cm^3	- -	

TABLE 4.2.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

ABL Site 1 Groundwater (Explosives)

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Recreational	Child	River	CSW	Chemical Concentration in Surface Water	See Table 3.1.RME	µg/l	See Table 3.1.RME	CDI (mg/kg-day) =
(continued)	User			DAevent	Dermally Absorbed Dose per Event	Calculated	mg/cm^2-event	Calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	Chemical specific	dimensionless	EPA, 2004	
				Kp	Permeability Coefficient	Chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	Chemical specific	hr/event	EPA, 2004	Kp x CW x tevent x CF x CF2
				t*	Time to Reach Steady-state	Chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	Chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}	Event Time	3	hr/month	EPA, 2012 (1)	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	6,600	cm^2	EPA, 2004, (4)	2 x FA x Kp x CW x (sqrt((6 xτ x t_{event})/π))
				EV	Event Frequency	1	events/month	(1)	x CF x CF2
				EF	Exposure Frequency	12	month/year	(1)	
				ED	Exposure Duration	6	years	EPA, 1991	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	15	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + 3B2)/(1+B)2)) x CF1 x CF2
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				CF2	Conversion Factor 2	0.001	l/cm^3	- -	

Surface water concentrations are represented by groundwater concentrations shown in Table 3.1.RME.

Notes:

(1) Professional Judgment assuming exposure time of 3 hours/month averaged across the year

(2) Professional Judgment assuming adolescents from 9 to 18 years of age.

(3) Body weight is average of the mean values for boys and girls for the ages 9 through 18.

(4) Skin surface area in contact with surface water based on contact while swimming and includes the full body.

(5) Mean full body skin surface area for 11 to <16 year old male and females.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

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EPA, 2004 . Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment (Final). EPA/540/R/99/005. July 2004.

EPA, 2011 . Exposure Factors Handbook 2011 Edition (Final). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-09/052F. September 2011.

EPA, 2012 . Regional Screening Level Table, Calculator Tool. November 2012.

TABLE 4.1.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURE

ABL Site 1 Groundwater (Explosives)

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Adult	Tap Water	CW	Chemical Concentration in Water	See Table 3.1.CTE	µg/l	See Table 3.1.CTE	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-W	Ingestion Rate of Water	1.4	liters/day	EPA, 1993	CW x IR-W x EF x ED x CF2 x 1/BW x 1/AT
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				ED	Exposure Duration	9	years	EPA, 1993	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
		Child	Tap Water	CW	Chemical Concentration in Water	See Table 3.1.CTE	µg/l	See Table 3.1.CTE	CDI (mg/kg-day) =
				IR-W	Ingestion Rate of Water	1	liters/day	EPA, 1997	CW x IR-W x EF x ED x CF2 x 1/BW x 1/AT
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				ED	Exposure Duration	6	years	EPA, 1991	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				BW	Body Weight	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
		Child/Adult	Tap Water	CW	Chemical Concentration in Water	See Table 3.1.CTE	µg/l	See Table 3.1.CTE	CDI (mg/kg-day) =
				IR-W-A	Ingestion Rate of Water, Adult	1.4	liters/day	EPA, 1993	CW x IR-W-Adj x EF x CF2 x 1/AT
				IR-W-C	Ingestion Rate of Water, Child	1	liters/day	EPA, 1997	
				IR-W-Adj	Ingestion Rate of Water, Age-adjusted	0.58	liter-year/kg-day	calculated	IR-W-Adj (liter-year/kd-day) =
				EF	Exposure Frequency	234	days/year	EPA, 1993	(ED-C x IR-W-C / BW-C) +
				ED-A	Exposure Duration, Adult	9	years	EPA, 1993	(ED-A x IR-W-A / BW-A)
				ED-C	Exposure Duration, Child	6	years	EPA, 1991	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				BW-A	Body Weight , Adult	70	kg	EPA, 1991	
				BW-C	Body Weight, Child	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	

TABLE 4.1.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURE

ABL Site 1 Groundwater (Explosives)

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Resident	Adult	Tap Water	CW	Chemical Concentration in Water	See Table 3.1.CTE	µg/l	See Table 3.1.CTE	CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	Calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	Chemical specific	dimensionless	EPA, 2004	
				K_p	Permeability Coefficient	Chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	Chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF2 x CF3
				t*	Time to Reach Steady-state	Chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	Chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}	Event Time	0.25	hr/event	EPA, 2004	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	18,000	cm^2	EPA, 2004	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				EV	Event Frequency	1	events/day	EPA, 2004	x CF2 x CF3
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				ED	Exposure Duration	9	years	EPA, 2004	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	70	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF2 x CF3
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				CF3	Conversion Factor 3	0.001	l/cm^3	- -	
		Child	Tap Water	CW	Chemical Concentration in Water	See Table 3.1.CTE	µg/l	See Table 3.1.CTE	CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	Calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	Chemical specific	dimensionless	EPA, 2004	
				K_p	Permeability Coefficient	Chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	Chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF2 x CF3
				t*	Time to Reach Steady-state	Chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	Chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}	Event Time	0.33	hr/event	EPA, 2004	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	6,600	cm^2	EPA, 2004	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				EV	Event Frequency	1	events/day	EPA, 2004	x CF2 x CF3
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				ED	Exposure Duration	6	years	EPA, 2001	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	15	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF2 x CF3
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				CF3	Conversion Factor 3	0.001	l/cm^3	- -	

TABLE 4.1.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURE

ABL Site 1 Groundwater (Explosives)

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Resident	Child/Adult	Tap Water	CW	Chemical Concentration in Water	See Table 3.1.CTE	µg/l	See Table 3.1.CTE	CDI (mg/kg-day) = DA-Adj x EF x 1/AT
(cont'd)				DAevent-A	Dermally Absorbed Dose per Event, Adult	Calculated	mg/cm^2-event	calculated	
				DAevent-C	Dermally Absorbed Dose per Event, Child	Calculated	mg/cm^2-event	calculated	DA-Adj = (Daevent-A x SA-A x ED-A x 1/BW-A)
				DA-Adj	Dermally Absorbed Dose, Age-adjusted	Calculated	mg-year/event-kg	calculated	+ (Daevent-C x SA-C x ED-C x 1/BW-C)
				FA	Fraction absorbed water	Chemical specific	dimensionless	EPA, 2004	
				K_p	Permeability Coefficient	Chemical specific	cm/hr	EPA, 2004	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	Chemical specific	hr/event	EPA, 2004	Kp x CW x t_{event} x CF2 x CF3
				t*	Time to Reach Steady-state	Chemical specific	hours	EPA, 2004	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	Chemical specific	dimensionless	EPA, 2004	Organics :
				t_{event}-A	Event Time, Adult	0.25	hr/event	EPA, 2004	t_{event}<t*: DAevent (mg/cm^2-event) =
				t_{event}-C	Event Time, Child	0.33	hr/event	EPA, 2004	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				SA-A	Skin Surface Area, Adult	18,000	cm^2	EPA, 2004	x CF2 x CF3
				SA-C	Skin Surface Area, Child	6,600	cm^2	EPA, 2004	
				EV	Event Frequency	1	events/day	EPA, 2004	t_{event}>t*: DAevent (mg/cm^2-event) =
				EF	Exposure Frequency	234	days/year	EPA, 1993	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				ED-A	Exposure Duration, Adult	9	years	EPA, 2001	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF2 x CF3
				ED-C	Exposure Duration, Child	6	years	EPA, 2001	
				BW-A	Body Weight, Adult	70	kg	EPA, 1991	
				BW-C	Body Weight, Child	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				CF2	Conversion Factor 2	0.001	mg/µg	- -	
				CF3	Conversion Factor 3	0.001	l/cm^3	- -	

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 2004 . Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment (Final). EPA/540/R/99/005. July 2004.

TABLE 5.1

NON-CANCER TOXICITY DATA -- ORAL/DERMAL

ABL Site 1 Groundwater (Explosives)

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY)
Perchlorate	Chronic	7.0E-04	mg/kg-day	100%	7.0E-04	mg/kg-day	Thyroid	10	IRIS	01/11/13
	Subchronic	N/A			N/A					
RDX	Chronic	3.0E-03	mg/kg-day	100%	3.0E-03	mg/kg-day	Prostate	100	IRIS	01/11/13
	Subchronic	1.0E-01	mg/kg-day	100%	1.0E-01	mg/kg-day	Neurological, Reproductive	30	ATSDR	1/2012

Notes:

(1) Source: Risk Assessment Guidance for Superfund. Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. Section 4.2 and Exhibit 4-1. USEPA recommends that the oral RfD should not be adjusted to estimate the absorbed dose for compounds when the absorption efficiency is greater than 50%. Constituents that do not have oral absorption efficiencies reported on this table were assumed to have an oral absorption efficiency of 100%.

(2) Adjusted based on RAGS Part E. (dermal RfD = Oral RfD x oral absorption efficiency)

Definitions: IRIS = Integrated Risk Information System
ATSDR = Agency for Toxic Substances and Disease Registry
N/A = Not Available

TABLE 6.1

CANCER TOXICITY DATA -- ORAL/DERMAL

ABL Site 1 Groundwater (Explosives)

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal Cancer Slope Factor (2)	Units	EPA Carcinogen Group	Source	Date (MM/DD/YY)
Perchlorate	N/A		N/A		Not likely to be Carcinogenic	IRIS	1/11/2013
RDX	1.1E-01	100	1.1E-01	$(mg/kg\text{-}day)^{-1}$	C	IRIS	1/11/2013

(1) Source: Risk Assessment Guidance for Superfund. Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final. Section 4.2 and Exhibit 4-1. USEPA recommends that the oral slope factor should not be adjusted to estimate the absorbed dose for compounds when the absorption efficiency is greater than 50%. Constituents that do not have oral absorption efficiencies reported on this table were assumed to have an oral absorption efficiency of 100%.

(2) Adjusted based on RAGS Part E. (dermal CSF = Oral CSF / oral absorption efficiency)

Definitions: IRIS = Integrated Risk Information System
N/A = Not Available

Weight of Evidence definitions:

Group A chemicals (known human carcinogens) are agents for which there is sufficient evidence to support the causal association between exposure to the agents in humans and cancer.

Group B1 chemicals (probable human carcinogens) are agents for which there is limited evidence of possible carcinogenicity in humans.

Group B2 chemicals (probable human carcinogens) are agents for which there is sufficient evidence of carcinogenicity in animals but inadequate or a lack of evidence in humans.

Group C chemicals (possible human carcinogens) are agents for which there is limited evidence of carcinogenicity in animals and inadequate or a lack of human data.

Group D chemicals (not classifiable as to human carcinogenicity) are agents with inadequate human and animal evidence of carcinogenicity or for which no data are available.

Group E chemicals (evidence of noncarcinogenicity in humans) are agents for which there is no evidence of carcinogenicity from human or animal studies, or both.

TABLE 7.1.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

ABL Site 1 Groundwater (Explosives)

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Groundwater	Tap Water	Ingestion	Perchlorate	7.7E+02	ug/L	N/A		N/A		N/A	2.1E-02	mg/kg/day	7.0E-04	mg/kg/day	3.0E+01
				RDX	1.4E+02	ug/L	N/A		N/A		N/A	3.9E-03	mg/kg/day	3.0E-03	mg/kg/day	1.3E+00
			Exp. Route Total								N/A					3.1E+01
			Dermal	Perchlorate	7.7E+02	ug/L	N/A		N/A		N/A	2.7E-04	mg/kg/day	7.0E-04	mg/kg/day	3.9E-01
				RDX	1.4E+02	ug/L	N/A		N/A		N/A	3.3E-05	mg/kg/day	3.0E-03	mg/kg/day	1.1E-02
			Exp. Route Total								N/A					4.0E-01
	Exposure Medium Total										N/A					3.2E+01
Groundwater Total											N/A					3.2E+01
										Total of Receptor Risk	N/A				Total of Receptor Hazard	3.2E+01

Notes-

DAevent for exposure to groundwater calculated on Table 7.1.RME Supplement A.

N/A = Not applicable.

Table 7.1.RME Supplement A
Calculation of DAevent for Groundwater
Adult Resident
ABL Site 1 Groundwater (Explosives)

Chemical of Potential Concern	Water Concentration (CW) (μg/L)	Permeability Coefficient (Kp) (cm/hr)	Molecular Weight MW (g/mol)	B (dimensionless)	Lag Time (τ_{event}) (hr)	t* (hr)	Fraction Absorbed Water (FA) (dimensionless)	Duration of Event (tevent) (hr)	DAevent (mg/cm^2-event)	Eq
Perchlorate	7.7E+02	1.0E-03	1.2E+02	4.2E-03	4.7E-01	1.1E+00	1.0E+00	0.58	1.1E-06	1
RDX	1.4E+02	3.4E-04	2.2E+02	1.9E-03	1.8E+00	4.4E+00	1.0E+00	0.58	1.4E-07	1

Notes:
Kp and MW from Risk Assessment Information System Database (http://rais.ornl.gov/cgi-bin/tools/TOX_search)
B - Dimensionless ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis (dimensionless).
t* - Time to reach steady-state

$B = Kp \times (MW)^{1/2}/2.6$

$\tau_{event} = 0.105 \times 10^{(0.0056 \times MW)}$

$t^* = 2.4 \times \tau_{event}$

If tevent<t*, then DAevent =
$2 \times FA \times Kp \times CW \times (sqrt((6 \times \tau_{event} \times t_{event})/\pi)) \times 0.001$ mg/ug x 0.001 l/cm^3 (eq 1)

If tevent>t*, then DAevent =
$FA \times Kp \times CW \times (t_{event}/(1+B) + 2 \times \tau_{event} \times ((1 + 3xB + 3xB^2)/(1+B)^2) \times 0.001$ mg/ug x 0.001 l/cm^3 (eq 2)

TABLE 7.2.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

ABL Site 1 Groundwater (Explosives)

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Groundwater	Tap Water	Ingestion	Perchlorate	7.7E+02	ug/L	N/A		N/A		N/A	4.9E-02	mg/kg/day	7.0E-04	mg/kg-day	7.0E+01
				RDX	1.4E+02	ug/L	N/A		N/A		N/A	9.0E-03	mg/kg/day	3.0E-03	mg/kg-day	3.0E+00
			Exp. Route Total								N/A					7.3E+01
			Dermal	Perchlorate	7.7E+02	ug/L	N/A		N/A		N/A	6.2E-04	mg/kg/day	7.0E-04	mg/kg-day	8.8E-01
				RDX	1.4E+02	ug/L	N/A		N/A		N/A	7.5E-05	mg/kg/day	3.0E-03	mg/kg-day	2.5E-02
			Exp. Route Total								N/A					9.0E-01
	Exposure Medium Total										N/A					7.4E+01
Groundwater Total											N/A					7.4E+01
										Total of Receptor Risk	N/A				Total of Receptor Hazard	7.4E+01

Notes-

DAevent for exposure to groundwater calculated on Table 7.2.RME Supplement A.

N/A = Not applicable.

Table 7.2.RME Supplement A
Calculation of DAevent for Groundwater
Child Resident
ABL Site 1 Groundwater (Explosives)

Chemical of Potential Concern	Water Concentration (CW) (μg/L)	Permeability Coefficient (Kp) (cm/hr)	Molecular Weight MW (g/mol)	B (dimensionless)	Lag Time (τ_{event}) (hr)	t* (hr)	Fraction Absorbed Water (FA) (dimensionless)	Duration of Event (tevent) (hr)	DAevent (mg/cm^2-event)	Eq
Perchlorate	7.7E+02	1.0E-03	1.2E+02	4.2E-03	4.7E-01	1.1E+00	1.0E+00	1	1.5E-06	1
RDX	1.4E+02	3.4E-04	2.2E+02	1.9E-03	1.8E+00	4.4E+00	1.0E+00	1	1.8E-07	1

Notes:
Kp and MW from Risk Assessment Information System Database (http://rais.ornl.gov/cgi-bin/tools/TOX_search)
B - Dimensionless ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis (dimensionless).
t* - Time to reach steady-state

$B = Kp \times (MW)^{1/2}/2.6$
$\tau_{event} = 0.105 \times 10^{(0.0056 \times MW)}$
$t^* = 2.4 \times \tau_{event}$

If tevent<t*, then DAevent =
$2 \times FA \times Kp \times CW \times (sqrt((6 \times \tau_{event} \times t_{event})/\pi)) \times 0.001$ mg/ug x 0.001 l/cm^3 (eq 1)

If tevent>t*, then DAevent =
$FA \times Kp \times CW \times (t_{event}/(1+B) + 2 \times \tau_{event} \times ((1 + 3xB + 3xB^2)/(1+B)^2) \times 0.001$ mg/ug x 0.001 l/cm^3 (eq 2)

TABLE 7.3.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

ABL Site 1 Groundwater (Explosives)

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Groundwater	Tap Water	Ingestion	Perchlorate	7.7E+02	ug/L	1.1E-02	mg/kg/day	N/A	1/mg/kg-day	N/A	N/A		N/A		N/A
				RDX	1.4E+02	ug/L	2.1E-03	mg/kg/day	1.1E-01	1/mg/kg-day	2.3E-04	N/A		N/A		N/A
			Exp. Route Total								2.3E-04					N/A
			Dermal	Perchlorate	7.7E+02	ug/L	1.5E-04	mg/kg/day	N/A	1/mg/kg-day	N/A	N/A		N/A		N/A
				RDX	1.4E+02	ug/L	1.8E-05	mg/kg/day	1.1E-01	1/mg/kg-day	2.0E-06	N/A		N/A		N/A
			Exp. Route Total								2.0E-06					N/A
	Exposure Medium Total										2.3E-04					N/A
Groundwater Total											2.3E-04					N/A
										Total of Receptor Risk	2.3E-04				Total of Receptor Hazard	N/A

Notes-

DAevent for exposure to groundwater calculated on Tables 7.1.RME Supplement A and 7.2.RME Supplement A.

N/A = Not applicable.

TABLE 7.4.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

ABL Site 1 Groundwater (Explosives)

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Groundwater	Water in Excavation Trench	Dermal	Perchlorate	7.7E+02	ug/L	2.7E-06	mg/kg/day	N/A	1/mg/kg-day	N/A	1.9E-04	mg/kg/day	7.0E-04	mg/kg-day	2.7E-01
				RDX	1.4E+02	ug/L	2.2E-07	mg/kg/day	1.1E-01	1/mg/kg-day	2.4E-08	1.5E-05	mg/kg/day	1.0E-01	mg/kg-day	1.5E-04
			Exp. Route Total								2.4E-08					2.7E-01
	Exposure Medium Total										2.4E-08					2.7E-01
Groundwater Total											2.4E-08					2.7E-01
										Total of Receptor Risk	2.4E-08				Total of Receptor Hazard	2.7E-01

Notes-
N/A = Not applicable.
DAevent for exposure to groundwater calculated on Table 7.4.RME Supplement A.

Table 7.4.RME Supplement A
Calculation of DAevent for Groundwater
Adult Construction Worker
ABL Site 1 Groundwater (Explosives)

Chemical of Potential Concern	Water Concentration (CW) (µg/L)	Permeability Coefficient (Kp) (cm/hr)	Molecular Weight MW (g/mol)	B (dimensionless)	Lag Time (τ_{event}) (hr)	t* (hr)	Fraction Absorbed Water (FA) (dimensionless)	Duration of Event (tevent) (hr)	DAevent (mg/cm^2-event)	Eq
Perchlorate	7.7E+02	1.0E-03	1.2E+02	4.2E-03	4.7E-01	1.1E+00	1.0E+00	8	6.8E-06	2
RDX	1.4E+02	3.4E-04	2.2E+02	1.9E-03	1.8E+00	4.4E+00	1.0E+00	8	5.5E-07	2

Notes:
Kp and MW from Risk Assessment Information System Database (http://rais.ornl.gov/cgi-bin/tools/TOX_search)
B - Dimensionless ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis (dimensionless).
t* - Time to reach steady-state

$B = Kp \times (MW)^{1/2}/2.6$

$\tau_{event} = 0.105 \times 10^{(0.0056 \times MW)}$

$t^* = 2.4 \times \tau_{event}$

If tevent<t*, then DAevent =
$2 \times FA \times Kp \times CW \times (\mathrm{sqrt}((6 \times \tau_{event} \times t_{event})/\pi)) \times 0.001$ mg/ug $\times 0.001$ l/cm^3 (eq 1)

If tevent>t*, then DAevent =
$FA \times Kp \times CW \times (t_{event}/(1+B) + 2 \times \tau_{event} \times ((1 + 3xB + 3xB^2)/(1+B)^2) \times 0.001$ mg/ug $\times 0.001$ l/cm^3 (eq 2)

TABLE 7.5.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

ABL Site 1 Groundwater (Explosives)

Scenario Timeframe: Current/Future
Receptor Population: Recreational User
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Surface Water	River	Ingestion	Perchlorate	7.7E+02	ug/L	1.9E-05	mg/kg/day	N/A	1/mg/kg-day	N/A	5.4E-05	mg/kg/day	7.0E-04	mg/kg/day	7.7E-02
				RDX	1.4E+02	ug/L	3.4E-06	mg/kg/day	1.1E-01	1/mg/kg-day	3.8E-07	9.9E-06	mg/kg/day	3.0E-03	mg/kg/day	3.3E-03
			Exp. Route Total								3.8E-07					8.0E-02
			Dermal Absorption	Perchlorate	7.7E+02	ug/L	8.8E-06	mg/kg/day	N/A	1/mg/kg-day	N/A	2.6E-05	mg/kg/day	7.0E-04	mg/kg/day	3.6E-02
				RDX	1.4E+02	ug/L	8.9E-07	mg/kg/day	1.1E-01	1/mg/kg-day	9.8E-08	2.6E-06	mg/kg/day	3.0E-03	mg/kg/day	8.7E-04
			Exp. Route Total								9.8E-08					3.7E-02
		Exposure Point Total									4.7E-07					1.2E-01
Surface Water (represented by groundwater data) Total											4.7E-07					1.2E-01
										Total of Receptor Risk	4.7E-07				Total of Receptor Hazard	1.2E-01

Notes-
N/A = Not applicable.
DAevent for exposure to surface water calculated on Table 7.5.RME Supplement A.

Table 7.5.RME Supplement A
Calculation of DAevent for Surface Water
Receeational User
ABL Site 1 Groundwater (Explosives)

Chemical of Potential Concern	Water Concentration (CW) (µg/L)	Permeability Coefficient (Kp) (cm/hr)	Molecular Weight MW (g/mol)	B (dimensionless)	Lag Time (τ_{event}) (hr)	t* (hr)	Fraction Absorbed Water (FA) (dimensionless)	Duration of Event (tevent) (hr)	DAevent (mg/cm^2-event)	Eq
Perchlorate	7.7E+02	1.0E-03	1.2E+02	4.2E-03	4.7E-01	1.1E+00	1.0E+00	3	3.0E-06	2
RDX	1.4E+02	3.4E-04	2.2E+02	1.9E-03	1.8E+00	4.4E+00	1.0E+00	3	3.1E-07	1

Notes:
Kp and MW from Risk Assessment Information System Database (http://rais.ornl.gov/cgi-bin/tools/TOX_search)
B - Dimensionless ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis (dimensionless).
t* - Time to reach steady-state

$B = Kp \times (MW)^{1/2}/2.6$
$\tau_{event} = 0.105 \times 10^{(0.0056 \times MW)}$
$t^* = 2.4 \times \tau_{event}$

If tevent<t*, then DAevent =
$2 \times FA \times Kp \times CW \times (sqrt((6 \times \tau_{event} \times t_{event})/\pi)) \times 0.001$ mg/ug $\times 0.001$ l/cm^3 (eq 1)

If tevent>t*, then DAevent =
$FA \times Kp \times CW \times (t_{event}/(1+B) + 2 \times \tau_{event} \times ((1 + 3xB + 3xB^2)/(1+B)^2) \times 0.001$ mg/ug $\times 0.001$ l/cm^3 (eq 2)

TABLE 7.6.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

ABL Site 1 Groundwater (Explosives)

Scenario Timeframe: Current/Future
Receptor Population: Recreational User
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Surface Water	River	Ingestion	Perchlorate	7.7E+02	ug/L	9.5E-06	mg/kg/day	N/A	1/mg/kg-day	N/A	7.4E-05	mg/kg/day	7.0E-04	mg/kg/day	1.1E-01
				RDX	1.4E+02	ug/L	1.8E-06	mg/kg/day	1.1E-01	1/mg/kg-day	1.9E-07	1.4E-05	mg/kg/day	3.0E-03	mg/kg/day	4.6E-03
			Exp. Route Total								1.9E-07					1.1E-01
			Dermal Absorption	Perchlorate	7.7E+02	ug/L	4.0E-06	mg/kg/day	N/A	1/mg/kg-day	N/A	3.1E-05	mg/kg/day	7.0E-04	mg/kg/day	4.4E-02
				RDX	1.4E+02	ug/L	4.1E-07	mg/kg/day	1.1E-01	1/mg/kg-day	4.5E-08	3.2E-06	mg/kg/day	3.0E-03	mg/kg/day	1.1E-03
			Exp. Route Total								4.5E-08					4.5E-02
		Exposure Point Total									2.4E-07					1.6E-01
Surface Water (represented by groundwater data) Total											2.4E-07					1.6E-01
										Total of Receptor Risk	2.4E-07				Total of Receptor Hazard	1.6E-01

Notes-

N/A = Not applicable.

DAevent for exposure to surface water calculated on Table 7.5.RME Supplement A.

TABLE 7.7.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

ABL Site 1 Groundwater (Explosives)

Scenario Timeframe: Current/Future
Receptor Population: Recreational User
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Surface Water	River	Ingestion	Perchlorate	7.7E+02	ug/L	2.2E-05	mg/kg/day	N/A		N/A	2.5E-04	mg/kg/day	7.0E-04	mg/kg/day	3.6E-01
				RDX	1.4E+02	ug/L	4.0E-06	mg/kg/day	1.1E-01		4.4E-07	4.6E-05	mg/kg/day	3.0E-03	mg/kg/day	1.5E-02
			Exp. Route Total								4.4E-07					3.8E-01
			Dermal Absorption	Perchlorate	7.7E+02	ug/L	3.7E-06	mg/kg/day	N/A		N/A	4.4E-05	mg/kg/day	7.0E-04	mg/kg/day	6.2E-02
				RDX	1.4E+02	ug/L	3.8E-07	mg/kg/day	1.1E-01		4.2E-08	4.5E-06	mg/kg/day	3.0E-03	mg/kg/day	1.5E-03
			Exp. Route Total								4.2E-08					6.4E-02
		Exposure Point Total									4.8E-07					4.4E-01
Surface Water (represented by groundwater data) Total											4.8E-07					4.4E-01
										Total of Receptor Risk	4.8E-07				Total of Receptor Hazard	4.4E-01

Notes-
N/A = Not applicable.
DAevent for exposure to surface water calculated on Table 7.5.RME Supplement A.

TABLE 7.1.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

ABL Site 1 Groundwater (Explosives)

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Groundwater	Tap Water	Ingestion	Perchlorate	7.7E+02	ug/L	N/A		N/A		N/A	9.8E-03	mg/kg/day	7.0E-04	mg/kg-day	1.4E+01
				RDX	1.4E+02	ug/L	N/A		N/A		N/A	1.8E-03	mg/kg/day	3.0E-03	mg/kg-day	6.0E-01
			Exp. Route Total								N/A					1.5E+01
			Dermal	Perchlorate	7.7E+02	ug/L	N/A		N/A		N/A	1.2E-04	mg/kg/day	7.0E-04	mg/kg-day	1.7E-01
				RDX	1.4E+02	ug/L	N/A		N/A		N/A	1.5E-05	mg/kg/day	3.0E-03	mg/kg-day	4.9E-03
			Exp. Route Total								N/A					1.8E-01
	Exposure Medium Total										N/A					1.5E+01
Groundwater Total											N/A					1.5E+01
										Total of Receptor Risk	N/A				Total of Receptor Hazard	1.5E+01

Notes-

DAevent for exposure to groundwater calculated on Table 7.1.CTE Supplement A.

N/A = Not applicable.

Table 7.1.CTE Supplement A
Calculation of DAevent
Adult Resident
ABL Site 1 Groundwater (Explosives)

Chemical of Potential Concern	Water Concentration (CW) (μg/L)	Permeability Coefficient (Kp) (cm/hr)	Molecular Weight MW (g/mol)	B (dimensionless)	Lag Time (τ_{event}) (hr)	t* (hr)	Fraction Absorbed Water (FA) (dimensionless)	Duration of Event (tevent) (hr)	DAevent (mg/cm^2-event)	Eq
Perchlorate	7.7E+02	1.0E-03	1.2E+02	4.2E-03	4.7E-01	1.1E+00	1.0E+00	0.25	7.3E-07	1
RDX	1.4E+02	3.4E-04	2.2E+02	1.9E-03	1.8E+00	4.4E+00	1.0E+00	0.25	8.9E-08	1

Notes:
Permeability constants from EPA 2004, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final).* EPA/540/R/99/005. The default value of 0.001 was assigned to inorganics not listed in this document.
Kp and MW from Risk Assessment Information System Database (http://rais.ornl.gov/cgi-bin/tools/TOX_search)
B - Dimensionless ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis (dimensionless).
t* - Time to reach steady-state

$B = Kp \times (MW)^{1/2}/2.6$

$\tau_{event} = 0.105 \times 10^{(0.0056 \times MW)}$

$t^* = 2.4 \times \tau_{event}$

If tevent<t*, then DAevent =
$2 \times FA \times Kp \times CW \times (sqrt((6 \times \tau_{event} \times t_{event})/\pi)) \times 0.001$ mg/ug $\times 0.001$ l/cm^3 (eq 1)

If tevent>t*, then DAevent =
$FA \times Kp \times CW \times (t_{event}/(1+B) + 2 \times \tau_{event} \times ((1 + 3xB + 3xB^2)/(1+B)^2) \times 0.001$ mg/ug $\times 0.001$ l/cm^3 (eq 2)

TABLE 7.2.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

ABL Site 1 Groundwater (Explosives)

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Groundwater	Tap Water	Ingestion	Perchlorate	7.7E+02	ug/L	N/A		N/A		N/A	3.3E-02	mg/kg/day	7.0E-04	mg/kg-day	4.7E+01
				RDX	1.4E+02	ug/L	N/A		N/A		N/A	6.0E-03	mg/kg/day	3.0E-03	mg/kg-day	2.0E+00
			Exp. Route Total								N/A					4.9E+01
			Dermal	Perchlorate	7.7E+02	ug/L	N/A		N/A		N/A	2.4E-04	mg/kg/day	7.0E-04	mg/kg-day	3.4E-01
				RDX	1.4E+02	ug/L	N/A		N/A		N/A	2.9E-05	mg/kg/day	3.0E-03	mg/kg-day	9.6E-03
			Exp. Route Total								N/A					3.5E-01
	Exposure Medium Total										N/A					4.9E+01
Groundwater Total											N/A					4.9E+01
										Total of Receptor Risk	N/A				Total of Receptor Hazard	4.9E+01

Notes-

DAevent for exposure to groundwater calculated on Table 7.2.CTE Supplement A.

N/A = Not applicable.

Table 7.2.CTE Supplement A
Calculation of DAevent for Groundwater
Child Resident
ABL Site 1 Groundwater (Explosives)

Chemical of Potential Concern	Water Concentration (CW) (μg/L)	Permeability Coefficient (Kp) (cm/hr)	Molecular Weight MW (g/mol)	B (dimensionless)	Lag Time (τ_{event}) (hr)	t* (hr)	Fraction Absorbed Water (FA) (dimensionless)	Duration of Event (tevent) (hr)	DAevent (mg/cm^2-event)	Eq
Perchlorate	7.7E+02	1.0E-03	1.2E+02	4.2E-03	4.7E-01	1.1E+00	1.0E+00	0.33	8.4E-07	1
RDX	1.4E+02	3.4E-04	2.2E+02	1.9E-03	1.8E+00	4.4E+00	1.0E+00	0.33	1.0E-07	1

Notes:
Permeability constants from EPA 2004, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Final).* EPA/540/R/99/005. The default value of 0.001 was assigned to inorganics not listed in this document.
Kp and MW from Risk Assessment Information System Database (http://rais.ornl.gov/cgi-bin/tools/TOX_search)
B - Dimensionless ratio of the permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis (dimensionless).
t* - Time to reach steady-state

$B = Kp \times (MW)^{1/2}/2.6$

$\tau_{event} = 0.105 \times 10^{(0.0056 \times MW)}$

$t^* = 2.4 \times \tau_{event}$

If tevent<t*, then DAevent =
$2 \times FA \times Kp \times CW \times (sqrt((6 \times \tau_{event} \times t_{event})/\pi)) \times 0.001$ mg/ug $\times 0.001$ l/cm^3 (eq 1)

If tevent>t*, then DAevent =
$FA \times Kp \times CW \times (t_{event}/(1+B) + 2 \times \tau_{event} \times ((1 + 3xB + 3xB^2)/(1+B)^2) \times 0.001$ mg/ug $\times 0.001$ l/cm^3 (eq 1)

TABLE 7.3.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

ABL Site 1 Groundwater (Explosives)

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Groundwater	Tap Water	Ingestion	Perchlorate	7.7E+02	ug/L	4.1E-03	mg/kg/day	N/A	1/mg/kg-day	N/A	N/A		N/A		N/A
				RDX	1.4E+02	ug/L	7.5E-04	mg/kg/day	1.1E-01	1/mg/kg-day	8.3E-05	N/A		N/A		N/A
			Exp. Route Total								8.3E-05					N/A
			Dermal	Perchlorate	7.7E+02	ug/L	3.6E-05	mg/kg/day	N/A	1/mg/kg-day	N/A	N/A		N/A		N/A
				RDX	1.4E+02	ug/L	4.4E-06	mg/kg/day	1.1E-01	1/mg/kg-day	4.8E-07	N/A		N/A		N/A
			Exp. Route Total								4.8E-07					N/A
	Exposure Medium Total										8.3E-05					N/A
Groundwater Total											8.3E-05					N/A
										Total of Receptor Risk	8.3E-05				Total of Receptor Hazard	N/A

Notes-

DAevent for exposure to groundwater calculated on Tables 7.1.CTE Supplement A and 7.2.CTE Supplement A.

N/A = Not applicable.

TABLE 9.1.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

ABL Site 1 Groundwater (Explosives)

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap Water	Perchlorate	N/A	N/A	N/A	N/A	Thyroid	3E+01	N/A	4E-01	3E+01
			RDX	N/A	N/A	N/A	N/A	Prostate	1E+00	N/A	1E-02	1E+00
			Chemical Total	N/A	N/A	N/A	N/A		3E+01	N/A	4E-01	3E+01
		Exposure Point Total					N/A					3E+01
	Exposure Medium Total						N/A					3E+01
Groundwater Total							N/A					3E+01
Receptor Total							N/A				Receptor HI Total	3E+01

Notes:
N/A = Not applicable
HI = Hazard Index

Total Thyroid HI Across All Media =	3E+01
Total Prostate HI Across All Media =	1E+00

TABLE 9.2.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
ABL Site 1 Groundwater (Explosives)

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap Water	Perchlorate	N/A	N/A	N/A	N/A	Thyroid	7E+01	N/A	9E-01	7E+01
			RDX	N/A	N/A	N/A	N/A	Prostate	3E+00	N/A	3E-02	3E+00
			Chemical Total	N/A	N/A	N/A	N/A		7E+01	N/A	9E-01	7E+01
		Exposure Point Total					N/A					7E+01
	Exposure Medium Total						N/A					7E+01
Groundwater Total							N/A					7E+01
Receptor Total							N/A				Receptor HI Total	7E+01

Notes:
N/A = Not applicable
HI = Hazard Index

Total Thyroid HI Across All Media =	7E+01
Total Prostate HI Across All Media =	3E+00

TABLE 9.3.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

ABL Site 1 Groundwater (Explosives)

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap Water	Perchlorate	N/A	N/A	N/A	N/A	Thyroid	N/A	N/A	N/A	N/A
			RDX	2E-04	N/A	2E-06	2E-04	Prostate	N/A	N/A	N/A	N/A
			Chemical Total	2E-04	N/A	2E-06	2E-04		N/A	N/A	N/A	N/A
		Exposure Point Total					2E-04					N/A
	Exposure Medium Total						2E-04					N/A
Groundwater Total							2E-04					N/A
Receptor Total							2E-04				Receptor HI Total	N/A

Notes:

N/A = Not applicable

TABLE 9.4.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
ABL Site 1 Groundwater (Explosives)

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap Water	Perchlorate	N/A	N/A	N/A	N/A	Thyroid	N/A	N/A	3E-01	3E-01
			RDX	N/A	N/A	2E-08	2E-08	Neurological, Reproductive	N/A	N/A	2E-04	2E-04
			Chemical Total	N/A	N/A	2E-08	2E-08		N/A	N/A	3E-01	3E-01
		Exposure Point Total					2E-08					3E-01
	Exposure Medium Total						2E-08					3E-01
Groundwater Total							2E-08					3E-01
Receptor Total							2E-08				Receptor HI Total	3E-01

Notes:
N/A = Not applicable
HI = Hazard Index

Total Thyroid HI Across All Media =	3E-01
Total Neurological HI Across All Media =	2E-04
Total Reproductive HI Across All Media =	0E+00

TABLE 9.5.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
ABL Site 1 Groundwater (Explosives)

Scenario Timeframe: Current/Future
Receptor Population: Recreational User
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Surface Water	River	Perchlorate	N/A	N/A	N/A	N/A	Thyroid	8E-02	N/A	4E-02	1E-01
			RDX	4E-07	N/A	1E-07	5E-07	Prostate	3E-03	N/A	9E-04	4E-03
			Chemical Total	4E-07	N/A	1E-07	5E-07		8E-02	N/A	4E-02	1E-01
		Exposure Point Total					5E-07					1E-01
	Exposure Medium Total						5E-07					1E-01
Surface Water (represented by groundwater data) Total							5E-07					1E-01
Receptor Total							5E-07				Receptor HI Total	1E-01

Notes:
N/A = Not applicable
HI = Hazard Index

Total Thyroid HI Across All Media =	1E-01
Total Prostate HI Across All Media =	4E-03

TABLE 9.6.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

ABL Site 1 Groundwater (Explosives)

Scenario Timeframe: Current/Future
Receptor Population: Recreational User
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Surface Water	River	Perchlorate	N/A	N/A	N/A	N/A	Thyroid	1E-01	N/A	4E-02	2E-01
			RDX	2E-07	N/A	4E-08	2E-07	Prostate	5E-03	N/A	1E-03	6E-03
			Chemical Total	2E-07	N/A	4E-08	2E-07		1E-01	N/A	5E-02	2E-01
		Exposure Point Total					2E-07					2E-01
	Exposure Medium Total						2E-07					2E-01
Surface Water (represented by groundwater data) Total							2E-07					2E-01
Receptor Total							2E-07				Receptor HI Total	2E-01

Notes:
N/A = Not applicable
HI = Hazard Index

Total Thyroid HI Across All Media =	2E-01
Total Prostate HI Across All Media =	6E-03

TABLE 9.7.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

ABL Site 1 Groundwater (Explosives)

Scenario Timeframe: Current/Future
Receptor Population: Recreational User
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Surface Water	River	Perchlorate	N/A	N/A	N/A	N/A	Thyroid	4E-01	N/A	6E-02	4E-01
			RDX	4E-07	N/A	4E-08	5E-07	Prostate	2E-02	N/A	1E-03	2E-02
			Chemical Total	4E-07	N/A	4E-08	5E-07		4E-01	N/A	6E-02	4E-01
		Exposure Point Total					5E-07					4E-01
	Exposure Medium Total						5E-07					4E-01
Surface Water (represented by groundwater data) Total							5E-07					4E-01
Receptor Total							5E-07				Receptor HI Total	4E-01

Notes:
N/A = Not applicable
HI = Hazard Index

Total Thyroid HI Across All Media =	4E-01
Total Prostate HI Across All Media =	2E-02

TABLE 9.1.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURE
ABL Site 1 Groundwater (Explosives)

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap Water	Perchlorate	N/A	N/A	N/A	N/A	Thyroid	1E+01	N/A	2E-01	1E+01
			RDX	N/A	N/A	N/A	N/A	Prostate	6E-01	N/A	5E-03	6E-01
			Chemical Total	N/A	N/A	N/A	N/A		1E+01	N/A	2E-01	1E+01
		Exposure Point Total					N/A					1E+01
	Exposure Medium Total						N/A					1E+01
Groundwater Total							N/A					1E+01
Receptor Total							N/A				Receptor HI Total	1E+01

Notes:
N/A = Not applicable
HI = Hazard Index

Total Thyroid HI Across All Media =	1E+01
Total Prostate HI Across All Media =	6E-01

TABLE 9.2.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURE
ABL Site 1 Groundwater (Explosives)

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap Water	Perchlorate	N/A	N/A	N/A	N/A	Thyroid	5E+01	N/A	3E-01	5E+01
			RDX	N/A	N/A	N/A	N/A	Prostate	2E+00	N/A	1E-02	2E+00
			Chemical Total	N/A	N/A	N/A	N/A		5E+01	N/A	3E-01	5E+01
		Exposure Point Total					N/A					5E+01
	Exposure Medium Total						N/A					5E+01
Groundwater Total							N/A					5E+01
Receptor Total							N/A				Receptor HI Total	5E+01

Notes:
N/A = Not applicable
HI = Hazard Index

Total Thyroid HI Across All Media =	5E+01
Total Prostate HI Across All Media =	2E+00

TABLE 9.3.CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY EXPOSURE

ABL Site 1 Groundwater (Explosives)

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap Water	Perchlorate	N/A	N/A	N/A	N/A	Thyroid	N/A	N/A	N/A	N/A
			RDX	8E-05	N/A	5E-07	8E-05	Prostate	N/A	N/A	N/A	N/A
			Chemical Total	8E-05	N/A	5E-07	8E-05		N/A	N/A	N/A	N/A
		Exposure Point Total					8E-05					N/A
	Exposure Medium Total						8E-05					N/A
Groundwater Total							8E-05					N/A
Receptor Total							8E-05				Receptor HI Total	N/A

Notes:

N/A = Not applicable