Five-Year Review Report

4th Five-Year Review Report

for

McAdoo Associates Superfund Site
McAdoo Borough and Kline Township
Schuylkill County, Pennsylvania

EPA ID#: PAD980712616

July 2010

PREPARED BY:

U.S. Environmental Protection Agency
Region III
Philadelphia, Pennsylvania

Approved by:

Ronald J. Borsellino, Director
Hazardous Site Cleanup Division

Date: 7/12/10

4th Five-Year Review Report

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Attachments

List of Acronyms

AMD	Acid Mine Drainage
ARAR	Applicable and Relevant or Appropriate Requirement
ATSDR	Agency for Toxic Substances and Disease Registry
BNA	Base Neutral and Acid Extractable Priority Pollutants
CD	Consent Decree
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
EPA	Environmental Protection Agency
ESD	Explanation of Significant Differences
FCOR	Final Close-out Report
FFS	Focused Feasibility Study
FS	Feasibility Study
GPRA	Government Performance Results Act
IC	Institutional Control
IRM	Interim Remedial Measure
MBS	McAdoo Blaine Street
MCL	Maximum Contaminant Level
MKT	McAdoo Kline Township
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
OIG	Office of Inspector General
OU	Operable Unit
PADEP	Pennsylvania Department of Environmental Protection
PAH	Polyaromatic Hydrocarbon
PPA	Prospective Purchaser Agreement
ppb	Part Per Billion
ppm	Part Per Million
PRP	Potentially Responsible Party
PV	Polycythemia Vera
RA	Remedial Action
RAO	Remedial Action Objective
RAU	Ready for Anticipated Use
RD	Remedial Design
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SVOC	Semi Volatile Organic Compound
TOC	Total Organic Carbon
TOX	Total Organic Halides
ug/l	Microgram per Liter
USACE	United States Army Corps of Engineers
VOC	Volatile Organic Compound

Executive Summary

The McAdoo Associates Site consists of two operable units that differ geographically. Operable Unit (OU) 1, known as the Kline Township (MKT) location, is in Kline Township, Pennsylvania. OU 2, known as the Blaine Street (MBS) location, is in McAdoo Borough, Pennsylvania.

The remedy for the MKT location included excavation and offsite disposal of contaminated soil, emptying and removal of an above ground storage tank, installation of a protective cap, and groundwater and surface water monitoring. The cap is intended to prevent potential exposure to contaminants present in contaminated soils remaining at the Site, and to reduce or eliminate infiltration of water into the area where contaminated soil remains.

The original remedy for the MBS location included the drainage and removal of five underground storage tanks, excavation and offsite removal of visibly contaminated soil, free product removal and groundwater extraction and treatment. The remedy was then modified to negate free product and contaminated groundwater extraction and removal and changed to manual extraction of free product and contaminated groundwater, with offsite disposal. The current remedy calls for annual groundwater monitoring, annual free product and contaminated groundwater removal and offsite disposal, and institutional controls to prevent new wells from being installed near the MBS location and to protect EPA monitoring wells. EPA is currently evaluating the opportunity for optimization of the present groundwater remedy by conducting a Focused Feasibility Study (FFS).

MKT Location (OU1)

The remedy at the MKT location is determined to be protective of human health and the environment in the short term. Exposure pathways that could result in unacceptable risks are being controlled, and institutional controls that provide for the continued operation and maintenance of the remedy are in place. Percolation of surface water through contaminated soil has been minimized by the protective cap, and current data indicates that the remedy is functioning as required to achieve cleanup goals. Operation and maintenance of the landfill cap and sampling and monitoring of groundwater and surface water will continue.

However, in order for the remedy to remain protective in the long term at the MKT location, 1,4-dioxane must be sampled for in the groundwater to determine whether or not it is present.

MBS Location (OU2)

A protectiveness determination of the remedy at the MBS location (OU2) cannot be made at this time until further information is obtained. Further information will be obtained by completing the vapor intrusion assessment that is currently underway as part of the FFS. It is expected the vapor intrusion assessment will be completed by July 2011, at which time a protectiveness determination will be made.

Additionally, in order for the remedy to remain protective in the long term, institutional controls

(ICs) restricting well drilling must be put in place, and 1,4-dioxane must be sampled for in the groundwater to determine whether or not it is present. EPA intends to have ICs in place by July 2011, and expects to complete sampling for 1,4-dioxane by July 2011.

EPA is deferring a Site-wide protectiveness statement at this time until further information is obtained regarding the vapor intrusion investigation that is being conducted at the MBS location (OU2). Once the vapor intrusion investigation is completed, EPA will make a Site-wide protectiveness determination.

GPRA Measure Review

As part of this Five Year Review the GPRA Measures have also been reviewed. The GPRA Measures and their status are provided as follows:

Environmental Indicators

Human Health: Insufficient Data to Determine Human Exposure (HEID)
Groundwater Migration: Groundwater Migration Under Control (GMUC)

Sitewide RAU

The site has not been designated for re-use.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name *(CERCLIS)*: McAdoo Associates Superfund Site		
EPA ID *(from CERCLIS)*: PAD980712616		
Region: 3	**State:** PA	**City/County:** McAdoo Borough and Kline Twp., Schuylkill County
SITE STATUS		
NPL status: ☐ Final ■ Deleted ☐ Other (specify)		
Remediation status (choose all that apply): ☐ Under Construction ■ Operating ☐ Complete		
Multiple OUs?* ■ YES ☐NO	**Construction completion date:**	
Has site been put into reuse? ☐ YES ■ NO		
REVIEW STATUS		
Lead agency: ■ EPA ☐ State ☐ Tribe ☐ Other Federal Agency _____		
Author name: Bradley C. White		
Author title: Remedial Project Manager	**Author affiliation:** U.S. EPA Reg. 3, HSCD	
Review period:** September 2009 – June 2010		
Date(s) of site inspection: April 28, 2010 (OU1) and May 12, 2010 (OU2)		
Type of review: ■ Post-SARA ☐ Pre-SARA ☐ NPL-Removal only ☐ Non-NPL Remedial Action Site ☐ NPL State/Tribe-lead ☐ Regional Discretion		
Review number: ☐ 1 (first) ☐ 2 (second) ☐ 3 (third) ■ Other (4th)		
Triggering action: ☐ Actual RA Onsite Construction at OU #____ ☐ Actual RA Start at OU#____ ☐ Construction Completion ■ Previous Five-Year Review Report ☐ Other (specify)		
Triggering action date *(from CERCLIS)*: July 12, 2005		
Due date *(five years after triggering action date)*: July 12, 2010		

* ["OU" refers to operable unit.]
** [Review period should correspond to the actual start and end dates of the Five-Year Review in CERCLIS.]

Five-Year Review Summary Form, cont'd.

Issues:

1. ICs identified in 2009 ESD not yet in place.
2. Potential for vapor intrusion not fully evaluated.
3. Presence of 1,4-dioxane in groundwater unknown (MBS location).
4. Presence of 1,4-dioxane in groundwater unknown (MKT location).

Recommendations and Follow-up Actions:

1. EPA is currently evaluating the extent of the groundwater plume at the MBS location as part of a FFS; appropriate ICs will be determined once FFS is complete.
2. Complete vapor intrusion investigation as part of the FFS.
3. Add 1,4-dioxane, at low level of detection, to list of analytes sampled for.
4. Add 1,4-dioxane, at low level of detection, to list of analytes sampled for.

Protectiveness Statement(s):

MKT Location (OU1) - The remedy at the MKT location is determined to be protective of human health and the environment in the short term. Exposure pathways that could result in unacceptable risks are being controlled, and institutional controls that provide for the continued operation and maintenance of the remedy are in place. Percolation of surface water through contaminated soil has been minimized by the protective cap, and current data indicates that the remedy is functioning as required to achieve cleanup goals. Operation and maintenance of the landfill cap and sampling and monitoring of groundwater and surface water will continue. However, in order for the remedy to remain protective in the long term at the MKT location, 1,4-dioxane must be sampled for in the groundwater to determine whether or not it is present.

MBS Location (OU2) - A protectiveness determination of the remedy at the MBS location (OU2) cannot be made at this time until further information is obtained. Further information will be obtained by completing the vapor intrusion assessment that is currently underway as part of the FFS. It is expected the vapor intrusion assessment will be completed by July 2011, at which time a protectiveness determination will be made. Additionally, in order for the remedy to remain protective in the long term, institutional controls (ICs) restricting well drilling must be put in place, and 1,4-dioxane must be sampled for in the groundwater to determine whether or not it is present. EPA intends to have ICs in place by July 2011, and expects to complete sampling for 1,4-dioxane by July 2011.

EPA is deferring a Site-wide protectiveness statement at this time until further information is obtained regarding the vapor intrusion investigation that is being conducted at the MBS location (OU2). Once the vapor intrusion investigation is completed, EPA will make a Site-wide protectiveness determination.

Five-Year Review Report

I. Introduction

The purpose of the five-year review is to determine whether the remedy implemented at the McAdoo Associates Superfund Site (Site) is protective of human health and the environment. The methods, findings, and conclusions of the review are documented in five-year review reports. In addition, five-year review reports identify issues found during the review, if any, and make recommendations to address them.

The United States Environmental Protection Agency (EPA) is preparing this five-year review report pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) §121 and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). CERCLA §121states:

> *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 five 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.*

The Agency interpreted this requirement further in the NCP; 40 Code of Federal Regulations §300.430(f)(4)(ii) states:

> *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 the initiation of the selected remedial action.*

The United States Environmental Protection Agency Region III has conducted a five-year review of the remedial actions implemented at the Site in McAdoo Borough and Kline Township, Schuylkill County, Pennsylvania. This review was conducted from December 2009 through June 2010. This report documents the results of the review.

This is the fourth five-year review for the Site. The triggering action for this review is the signature date of the last five-year review, as shown in EPA's CERCLIS database: July 12, 2005. The five-year reviews at this Site were specifically activated because hazardous substances, pollutants, or contaminants currently remain on-Site above levels that allow for unlimited use and unrestricted exposure.

II. Site Chronology

The table below summarizes important events and relevant dates in the chronology of the Site.

Table 1: Chronology of Site Events

Event	Date
November 1979	Initial discovery of contamination
1979	PADER Order for closure of MKT location
May 1981	Pre-NPL responses
1982	EPA Order requiring removal of wastes from tanks at MBS location
September 8, 1983	Site listed on NPL
June 5, 1984	ROD for interim remedial actions at MBS location (OU2) issued
June 28, 1985	ROD for MKT location (OU1) issued
June 3, 1988	OU1 remedial design started for surface tanks, debris, and soil
June 23, 1988	Consent Decree: US v Air Products and Chemicals et al
October 1, 1988	Remedial action started for surface tanks and debris
November 1988	Removal actions
November 6, 1988	OU1 remedial action completed from surface tank and debris
April 26, 1990	OU1 remedial design completed for soil excavation
May 8, 1990	OU1 remedial action for soil excavation started
June 1, 1990	OU1 remedial action for soil excavation completed
January 10, 1991	OU1 remedial action started for capping
September 30, 1991	No Action ROD for MKT and MBS locations issued
September 30, 1992	OU1 remedial action completed for capping
September 30, 1993	1991 ROD amended to require groundwater extraction at MBS
August 2, 1994	OU2 remedial action for groundwater started
December 1994	EPA Administrative Order on Consent issued for access at MBS
December 28, 1994	First Five Year Review signed
September 26, 1995	ESD modifying September 30, 1993 ROD Amendment issued for OU2
September 26, 1995	Preliminary Close-Out Report signed
December 27, 1995	OU2 remedial action completed for groundwater
May 26, 1998	Consent Decree, US v. Air Products and Chemicals, et al
May 26, 1998	Consent Decree, US v. Alcan, et al
June 27, 2000	Second Five Year Review signed
August 15, 2001	Final Close-Out Report signed
October 3, 2001	Notice of Intent to Delete signed
December 13, 2001	Site deleted from the NPL
June 12, 2005	Third Five Year Review signed
February 22, 2006	Addendum to Five Year Review issued
December 22, 2009	Second ESD issued for OU2

III. Background

Physical Characteristics

The McAdoo Associates Site consists of two Operable Units (OUs) located approximately one and one half miles from each other: the McAdoo Kline Township (MKT) location, designated as OU1 and the McAdoo Blame Street (MBS) location designated as OU2.

The MKT location borders Route 309 at the ramp to Interstate 81 in Kline Township, Schuylkill County, Pennsylvania. This location occupies approximately 8 acres of capped post-industrial areas adjacent to an old coal mine. Land use in the vicinity of the MKT location is either industrial or includes abandoned or reclaimed mine areas. The nearest residential areas are located approximately ¼ mile to the north and one mile to the south of the MKT location. The MKT location is underlain by the Llewellyn and Pottsville formations consisting of sandstones, siltstones, and shales, with interbedded coal. The shallow aquifer at the MKT location consists of groundwater-filled mine workings collectively called the mine pool. The only known discharge for the mine pool is the Silverbrook discharge, which is located just south of the MKT location and which forms the upper reaches of the Little Schuylkill River. The mine itself ranges in depth from approximately 50 to 200 feet below ground surface at the MKT location. The mine pool at the MKT location is not hydrologically connected to other aquifers in the area.

The MBS location consists of a small lot (approximately 100 feet by 150 feet) situated at the intersection of West 4th street and North Harrison Street in a residential area of McAdoo Borough. The actual address is 15-17 North Harrison Street. The MBS location is entirely covered with grass, with gravel parking and alleyways on the south and east side. The location is bordered to the north by a grassy lot and sewage transfer station owned by the Borough of McAdoo, the south and east by residential properties and businesses, and the west by a large tract of reclaimed mine area.

Land and Resource Use

The original use of the MKT location was the strip and deep mining of anthracite coal, which occurred sporadically from the 1880s to the 1960s. In 1975, McAdoo Associates acquired a 1 ½ acre tract comprising the western portion of the MKT location and used this site to reclaim metals from waste sludges by operating two rotary kiln furnaces and a liquid waste incinerator. McAdoo Associates utilized waste solvents as fuel for the furnaces and incinerator This operation was closed by the Pennsylvania Department of Environmental Resources (PADEP) in 1979 as a result of numerous environmental compliance problems.

Prior to 1972 the MBS location was the site of a heating oil and gasoline storage business that utilized five underground storage tanks. From 1972 to 1979 the property was used by McAdoo Associates for temporary storage of various liquid wastes used as fuel at the MKT location. Because both locations were operated as one facility involving the same ownership and waste, they were combined and collectively called the McAdoo Associates Site.

In 1998 EPA entered into a Prospective Purchaser Agreement (PPA) with Albert P. Mertz for the MBS location. The effective date of the PPA was August 6, 1999. The agreement allowed Mr. Mertz to purchase the MBS property from the original owner and settle any Superfund liabilities associated with the MBS location, provided that all terms of the PPA are met. Mr. Mertz has erected a small warehouse/storage building on the property for his business.

Residents in the vicinity of the MKT and MBS locations rely on groundwater as a source of potable water. Water supply in this area is provided by water reservoirs and water supply wells operated by the Kline Township Municipal Authority. The water supply wells are screened in the deep aquifer within the Mauch Chunk formation underlying the region. One of the water supply wells is located more than 1,000 feet southwest of the MBS location.

History of Contamination

Between 1975 and 1979, when McAdoo Associates operated as a metal reclaiming facility, heavy metals, solvents, and waste oils were released into the environment. At the time of closure, the MKT location was inventoried and found to contain an incinerator; garage; office trailer; 6,790 drums of hazardous waste; four 15,000 gallon above ground storage tanks and three 10,000 gallon above ground storage tanks; and miscellaneous bricks, pallets, and debris. The McAdoo Site was evaluated in the Hazard Ranking System scoring process and received a score that was high enough to place the Site on the National Priorities List (NPL). The Site was promulgated on the NPL in September 1983.

Initial Response

Response activities at the Site began in 1979 when PADER issued an order requiring the closing of the MKT location. In 1982, EPA ordered the potentially responsible parties (PRPs) to pump 11,000 gallons of waste liquids from four of the underground storage tanks at the MBS location. The liquid waste was described as petroleum distillates and polyaromatic hydrocarbons (PAHs). Gasoline and water were reported to be contained in one tank, and oils and solvents were identified in the other tanks.

Basis for Taking Action

MKT Location (OU1)

A remedial investigation (RI) at the MKT location was completed in 1984. The results of the RI indicated elevated levels of metals in the mine pool groundwater underlying the Site and in the Site fill. Aluminum; chromium; barium; beryllium; cobalt; copper; iron; nickel; manganese; zinc; and arsenic were detected in the mine pool. In the Site fill, metals such as beryllium; nickel; chromium; and zinc were detected in concentrations of 28; 1,720; 1,370; and 48,000 parts per million (ppm), respectively. Other metals including cadmium, lead, and cyanide were found in Site fill at concentrations higher than those typically found in soil. Elevated levels of organic contaminants were also found at various depths in the Site fill and underlying mine pool. In addition, a one-acre resin sheet was located on the surface in the northern section of the Site. The resin sheet was approximately 1 to 2 inches thick and when sampled was found to contain

numerous organic constituents including benzene; toluene; styrene; 1,1,1-trichloroethane; and 1,2-dichloroethane.

In 1985, EPA released a feasibility study (FS) report for the MKT location that focused primarily on the contamination of soils and wastes. The FS identified and evaluated numerous remedial action alternatives to address two site-specific remediation objectives. The remediation objectives included preventing direct contact with onsite wastes (resin sheet and tank sludge) and contaminated soils and preventing offsite migration of wastes and contaminated soils. The FS provided a detailed analysis of alternatives, including contaminated soil excavation, followed by backfilling and re-vegetation, capping, debris removal, surface water diversion, and no action.

A second RI/FS was conducted in 1991 at the MKT location to evaluate surface water, sediment, and groundwater. The 1991 RI/FS was conducted in support of a pending Record of Decision (ROD) that addressed groundwater, surface water, and related sediment. Based on the findings of the 1991 RI/FS, a ROD was issued in September 1991 that called for no further remedial action at the MKT location, and increased groundwater monitoring. While there were some volatile organic compounds (VOCs) and metals found in the mine pool groundwater, including 1,2-dichloropropane, cobalt, silver, and zinc, EPA determined there was no increased risk to human health because there was no complete pathway for human exposure. EPA recognized that it was unlikely for the mine pool to be used as a drinking water source because of the difficulty in raising the pH and removing the metals associated with acid mine drainage.

MBS Location (OU2)

EPA conducted a field investigation at the MBS location in 1981 and collected liquid samples from four underground storage tanks. The fifth tank was discovered and sampled in 1984. Sample analytical results from the underground storage tanks revealed the elevated concentrations of monocyclic aromatics, including benzene, ethylbenzene, and toluene; chlorinates solvents including 1,1,1-trichloroehtane, 1,1-dichloroethane, tetrachloroethene, trichloroethene, vinyl chloride, and methylene chloride; polynuclear aromatic hydrocarbons including naphthalene, anthracene, fluorene, phenanthrene, pyrene, and acenaphthene; and phthalate esters, including butyl benzyl phthalate and di-n-butyl phthalate.

In 1985, following excavation and removal of the underground storage tanks, EPA collected soil samples from the tank area. Sample analytical results indicated elevated concentrations of polyaromatic hydrocarbons; phthalate esters, including bis(2-ethylhexyl)phthalate; methylene chloride; and total xylenes.

In 1992, as part a focused feasibility study, EPA installed four on-Site groundwater monitoring wells and collected groundwater samples. Sample analytical results indicated elevated concentrations of volatile and semi-volatile organic compounds that were consistent with petroleum products and solvents. The focused feasibility study provided a detailed analysis of alternatives, including free product removal and groundwater pumping and treatment.

IV. Remedial Actions

Remedy Selection

On June 5, 1984, EPA issued a Record of Decision (ROD) for Interim Remedial Measures (IRM) at the MBS location. The 1994 ROD addressed cleaning and removal of underground tanks, the removal of contaminated soil and the sampling of subsurface soil. The Remedial Action Objective (RAO) of the 1984 ROD for the MBS location was to limit the exposure or threat of exposure to a significant health or environmental hazard.

On June 28, 1985 EPA issued a ROD for the MKT location. The 1985 ROD included the following components:

1) The implementation of a mine subsidence study (MSS) to determine the risk and magnitude of mine subsidence;
2) Removing and disposing of miscellaneous surface debris and remaining 15,000 gallon above ground tank;
3) The implementation of a soil sampling program to define the extent of soil contamination;
4) Excavation and offsite disposal of a portion of contaminated soils and backfilling of the excavated area with clean fill;
5) Constructing a cap with surface water diversion and re-vegetation; and
6) Performing operation and maintenance (O&M), including maintenance of the cap and associated surface water diversions, groundwater monitoring of Site monitoring wells, and sampling of the Silverbrook discharge.

The RAOs of the 1985 ROD issued for the MKT location were to:

1) Prevent direct contact with onsite wastes and contaminated soils, and
2) Prevent offsite migration of wastes and contaminated soils through surface water runoff percolation to the mine pool and wind dispersal.

There were still outstanding issues related to the surface water sediment and groundwater at the MKT and MBS locations after issuing and implementing the two RODs, so a new focused Remedial Investigation and Feasibility Study (RI/FS) was conducted by EPA in 1990/1991. Surface water samples collected from Lofty Creek (background) and the Little Schuylkill River indicated that the presence of metals in the surface water was likely a result of the combination of Acid Mine Drainage (AMD) and metals leaching from the MKT location into the mine pool. Based on the analyzed data, AMD was determined to be the primary source of inorganics in the surface water. The surface water and sediment sampling revealed the presence of some semi-volatile compounds (polynuclear aromatic hydrocarbons [PAHs]) in the sediments from nearly every station sampled. These compounds were also detected in the soils at the MKT location and in background samples. The source of the PAHs in the Little Schuylkill River may be from MKT location run off as well as run off from other areas draining into this basin, including PA Rt 309. A comparison of these metals to inorganic background concentrations as related to

former mining activities showed that most of the inorganics present in the sediment are within expected background ranges for the area.

Groundwater samples were collected on two occasions from the seven on-site monitoring wells at the MKT location during the focused RI/FS. The results of these samples indicated that low level organic compounds are present in the mine pool beneath the location. The MKT location is the most likely source of the contaminants detected as there were no organic compounds detected in the upgradient monitoring wells. Inorganics detected in monitoring wells have been attributed to a combination of naturally elevated background conditions, the effects of mining and AMD and former MKT location activities. Six residential wells and the nearest municipal water supply well were sampled during the investigation. Some organic and inorganic contaminants were detected in the residential wells at levels below the Maximum Contaminant Level (MCL). The municipal water supply well did not contain any contaminants.

On September 30, 1991, EPA issued a ROD based on the results of the focused RI/FS completed in July 1991. The ROD stated that no further actions beyond those already implemented at the MKT and MBS locations were required. At the same time, however, the 1991 ROD required long term groundwater monitoring at both locations to continue for a period of 30 years. The major components of the monitoring program included:

1) Expansion of the long term water quality monitoring program at the MKT location to include sampling for VOCs and nine inorganics (cobalt, silver, and zinc, beryllium, cadmium, chromium, nickel, lead, and cyanide) of all seven monitoring wells; and
2) Installation for groundwater monitoring wells at the MBS location to include sampling for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and inorganic compounds.

While EPA determined that no further remedial actions were necessary at either the MKT or MBS locations, the RAO of the 1991 ROD was to institute long-term monitoring of the groundwater at both locations to verify that the previous remedial actions (soil and waste removal, and construction of a cap at the MKT location, and UST and contaminated soil removal at the MBS location) were effective in preventing the migration of wastes left in place.

Subsequent groundwater sampling for the MBS location was performed as part of a new Focused Feasibility Study (FFS) conducted by EPA in the spring of 1993. The results of the FFS sampling confirmed the presence of organic contaminants in the groundwater as well as a free product (in one monitoring well) determined to be weathered fuel oil and gasoline. Based on the results of the FFS EPA issued a ROD Amendment for the MBS location on September 30, 1993. The major components of the 1993 ROD Amendment were

1) Installation of new groundwater extraction wells at the MBS location and extraction of contaminated groundwater;
2) Installation and operation of a free product removal system to extract the weathered fuel oil and gasoline;
3) Installation of a groundwater treatment system to include oil/water separation, air stripping and polishing using granular activated carbon;

4) Performance of groundwater monitoring; and
5) The establishment of Performance Standards for benzene, ethylbenzene, 1,2 dichloroethane, bis(2-ethylhexyl)phthalate and manganese.

The RAOs for the remedial action outlined in the 1993 ROD Amendment were to mitigate the potential threats posed by free product (defined as fuel oil and weathered gasoline) present in the groundwater at the MBS location by removing the free product and reducing the concentrations of the contaminants of concern to MCLs (benzene, ethylbenzene, 1,2 dichloroethane, bis(2-ethylhexyl)phthalate) and background concentrations (manganese). In August 1994, EPA completed the Remedial Design (RD) for the MBS location. The RD included the following phases:

1) Product Recovery and new well installation;
2) Groundwater extraction system and testing; and
3) Treatment system fabrication and installation.

Remedy Implementation

MKT Location (OU1)

A remedial action work plan to implement the 1985 ROD at the MKT location was developed in February 1987 and incorporated into the Consent Decree between EPA and the PRPs for the performance of the ROD remedy. The Consent Decree, which was signed on June 3, 1988, included provisions for the removal of the above ground storage tank, additional soil sampling, implementation of a mine subsidence study, excavation of contaminated soil and installation of a protective soil cap, and groundwater monitoring.

The removal of the storage tank, additional soil sampling, and implementation of the mine subsidence study were performed at the MKT location by the PRPs contractor from October 1988 through January 1989. The excavation of the contaminated soils in two areas and the mine subsidence study were performed in May 1990. The excavated soils were disposed of offsite in a permitted RCRA facility. The 100% cap design was approved by EPA on January 10, 1991. The cap construction was initiated on July 20, 1991 and completed on November 14, 1991. In accordance with the criteria specified during the design phase of the remediation the cap consisted of 18 inches of select low permeability compacted soil underlain by bedding geotile acting as a drainage layer. A 24-inch thick layer of compacted common borrow material, and 12 inches of topsoil suitable for re-vegetation and to overlay the low permeability soil layer was also specified in the design. On March 10, 1992, EPA notified the PRPs that all elements of the remedial action as described in the Consent Decree had been completed satisfactorily.

Following the issuance of the 1991 ROD that called for an expansion of the groundwater monitoring at the MKT location, EPA entered into a consent decree with the Trustees of the MKT location in 1997. Subsequently, the O&M Plan for the Site was amended in June 1998 to include sampling from all Site monitoring wells for VOCs and nine inorganic compounds (cobalt, silver, zinc, beryllium, cadmium, chromium, nickel, lead, and cyanide). Annual

sampling and landfill inspections have been conducted at the Site, and the reports continue to be submitted to EPA yearly.

MBS Location (OU2)

The remedial activities at the MBS location which followed the 1984 ROD for IRM, started in March 1985 with excavation of soils from above and beside the tanks in order to facilitate tank removal. The tanks were purged prior to removal. Once removed, the tanks were found to have no leaks. After the tanks were removed, confirmatory soil sampling was conducted. Those samples indicated that low levels of organic and inorganic contaminants remained in the subsurface soils. Consequently, additional soils were removed from the bottom and sides of the excavation. During a two week period, 1,000 cubic yards of contaminated soils were removed and taken off site for disposal. Some subsurface low level contaminated soils, however, still remained at the site. Backfilling was completed on June 7, 1985. The site was then restored to original grade and covered with three to six inches of coarse gravel. A Final Report for the Interim Remedial Measure at the MBS location was issued in July 1986.

The wells required for the MBS location by the 1991 ROD were installed by EPA in May and June 1992. Groundwater samples were then collected and the results indicated that petroleum related organic compounds and semi-volatile organic compounds were present in the monitoring wells located down gradient of the former tank location. After the FFS was completed, as described above, EPA issued the 1993 ROD Amendment for the MBS location that called for remediation of the contaminated groundwater, groundwater monitoring, and groundwater performance standards for benzene, ethylbenzene, cis-1,2-dichloroethane, bis(2-ethylhexyl)phthalate, and manganese.

To implement the 1993 ROD Amendment pertaining to the MBS location, EPA entered into an Interagency Agreement with the US Army Corps of Engineers (USACE) to perform construction. The remedial action (RA) began in March 1995 with the installation of five groundwater extraction wells. After the installation of the extraction wells, it was determined that a significant pumping rate could not be sustained by pumping these wells either individually or collectively. The capacity of the aquifer to recharge the wells and produce the amount of water needed for treatment (15 gallons per minute) was not sufficient, suggesting that the contaminated water-bearing zone might not constitute a viable aquifer. The RA at the MBS location was terminated at that time.

Following the termination of the RA at the MBS location, EPA issued an Explanation of Significant Differences (ESD) on September 26, 1995. The 1995 ESD identified the following Significant Differences that warranted changes to the remedy presented in the 1993 ROD Amendment for the MBS location:

1) Mechanical pumping of the wells at the MBS location, on a continuous basis, was determined not to be a viable option due to insufficient water volume as described above. The contaminated groundwater would have to be manually extracted by hand bailing the wells;

2) The small volume of groundwater capable of being removed from the extraction wells did not warrant the construction of a treatment system at the MBS location. The manually extracted groundwater would be contained and taken off-site for treatment;
3) The extraction and treatment of groundwater from the MBS location would not be performed on a continuous basis. Rather the manual extraction would be performed on a periodic basis; and
4) The free product recharge rate was extremely slow and as a result a free product recovery system was not warranted. Instead the free product would be manually removed on the same schedule as the manual removal of the contaminated groundwater.

System Operation/Operation and Maintenance

MKT Location (OU1)

The Operations and Maintenance Plan attached to the 1988 Consent Decree for the MKT location, was amended in June 1998 to expand the groundwater monitoring program to include the requirements of the 1991 ROD. Subsequently, annual groundwater monitoring was initiated in October 1998 at the MKT location. The operation and maintenance has been performed satisfactorily, and a report is submitted to EPA and PADEP annually. Since the 2005 Five Year Review of the Site, EPA has received annual reports summarizing the following annual groundwater monitoring and landfill inspection events:

- May 2006
- May 2007
- May 2008
- May 2009

The May 2010 Annual Report will be received in August/September 2010. Annual O&M costs for the MKT location are not provided to EPA.

MBS Location (OU2)

Implementation of the 1995 ESD for the MBS location began in 1996. Monitoring data indicated the presence of some constituents of gasoline and fuel oil, namely benzene and ethylbenzene, at concentrations above the performance standards. Among other chemicals, bis(2-ethylhexyl)phthalate was sporadically present at concentrations slightly above the performance standard. Following a review of the monitoring data, EPA issued a Final Close-Out Report (FCOR) in August 2001. In the FCOR, EPA determined that contaminants remaining in the groundwater at OU2 were not related to the liquid wastes that had been stored at the Site, but were related to the petroleum products that were formerly stored at the property. EPA stated in the FCOR that manual handbailing of free product would be discontinued, but groundwater monitoring would continue. As a result, EPA deleted the Site from the NPL in December 2001.

Following deletion of the Site from the NPL in December 2001, EPA discontinued its hand bailing of the groundwater monitoring wells at the MBS location, but stated groundwater

monitoring would continue. This decision was based on EPA's belief at the time that there were no longer site-related contaminants at OU2 (the petroleum related compounds were not considered to be site-related).

In August 2008, EPA's Office of Inspector General (OIG) published a report evaluating EPA's deletion of several sites from the NPL (EPA Decisions to Delete Superfund Sites Should Undergo Quality Assurance Review, Report No. 08-P-0235 (August 20, 2008)). The McAdoo Associates Site was among those sites included in OIG's evaluation. In the report, OIG found that, among other things, EPA had inappropriately deleted the Site before the groundwater cleanup standards selected in the 1993 ROD Amendment were met. The OIG found that the 1993 ROD Amendment continued to require groundwater monitoring and attainment of the cleanup goals. EPA concurred with this representation and the expectations for groundwater restoration set forth in NCP § 300.430(a)(iii)(F). As a result, EPA issued a second ESD for the MBS location in December 2009.

The 2009 ESD for the MBS location has the following components:

1) Establish Institutional Controls to prohibit the installation of groundwater wells for potable use, and to protect existing groundwater monitoring wells;
2) Establish a groundwater monitoring schedule; and
3) Modification of the performance standards for benzene, ethylbenzene, 1,2-dichloroethane, and bis(2-ethylhexyl)phthalate in groundwater.

Additionally, the 2009 ESD clarifies the fact that the manual extraction and offsite treatment of contaminated groundwater and free product will continue at the Site until a decision document is issued that specifically addresses remediation of the remaining contamination. The manual extraction and offsite treatment of contaminated groundwater and free product will occur on an annual basis. Additional details regarding the components of the 2009 ESD are provided below.

Institutional Controls

Institutional controls in the form of title notices and land use restrictions through easements and covenants and orders from or agreements with EPA and/or PADEP will be established at the MBS location to prevent exposure to contaminated groundwater through the installation of new groundwater wells for potable use, and to prevent the unauthorized destruction of EPA or PADEP groundwater monitoring wells at the property. While there is language in the Prospective Purchaser Agreement between EPA and the current owner of the property that specifies potable water will come from a municipal water supply, EPA will work with PADEP and the property owner to have the institutional controls added to the property deed by September 2010. Additionally, if vapor intrusion is determined to be a concern at the Site, institutional controls will be established in a future decision document.

Groundwater Monitoring Schedule

Groundwater monitoring to determine progress in achieving the performance standards, in conjunction with the manual extraction and offsite treatment of free product, is to occur on an annual basis.

Performance Standard Modification

The remedy, as described in the 1993 ROD Amendment, established the following performance standards at the MBS location:

TABLE 2: MBS Location Performance Standards For Groundwater (1993 ROD Amendment)

Compound	Performance Standard
Benzene	0.2 µg/l
Ethylbenzene	0.2 µg/l
1,2-Dichloroethane	0.03 µg/l
bis(2-ethylhexyl)phthalate	2.5 µg/l
Manganese	Background

The requirement for the cleanup of the chemicals listed above was set for the Site based upon the Pennsylvania Hazardous Waste Management Regulations, where it was required that all groundwater must be remediated to background quality as specified by 25 PA Code Sections 264.97(i) and (j) and Section 264.100(a)(9). For the compounds listed above, excluding manganese, the laboratory method detection limit was provided as the performance standard, since there was no background standard for those compounds.

CERCLA requires EPA to conduct remedial actions in compliance with all environmental laws identified at the time of the ROD, if they are applicable or relevant and appropriate for the situation. These requirements are commonly referred to as ARARs (applicable or relevant and appropriate requirements). EPA is not required to add ARARs that come into effect after the ROD unless the ROD is not protective or a significant new component is added to the remedy. However, in instances where a state ARAR that is more stringent than a federal ARAR is repealed, EPA can re-visit the ROD in appropriate circumstances. In these matters, EPA considers the state's position on the issue.

When the ROD was issued, Pennsylvania's background levels standard was potentially more stringent than the federal standard (i.e., MCLs under the Safe Drinking Water Act as codified under 40 CFR Part 141). Pennsylvania's background levels standard has since been modified by Pennsylvania pursuant to the Land Recycling and Environmental Remediation Standards Act (Act 2, 1995). EPA has determined that Act 2 does not, on the facts and circumstances of this remedy, impose any requirements more stringent than the federal standard.

Therefore, in lieu of Pennsylvania's background levels standard, EPA has determined that the federal MCLs will be used as performance standards at the Site for the remediation of groundwater for benzene, 1,2-dichloroethane, and bis(2-ethylhexyl)phthalate, and a site-specific standard for ethylbenzene. These standards are fully protective of human health and the environment and have been evaluated for total risk in accordance with 40 CFR 300.430(e)(2)(i)(A)(2) and (e)(2)(i)(D). The existing performance standard for manganese of "background" remains unchanged. The modified performance standards are shown below:

Table 3: MBS Location - Modified Performance Standards for Groundwater

Compound	Performance Standard
Benzene	5 µg/l
Ethylbenzene	280 µg/l*
1,2-Dichloroethane	5 µg/l
bis(2-ethylhexyl)phthalate	6 µg/l
Manganese	Background

* The performance standard for ethylbenzene is a risk-based site specific standard.

EPA's proposed modifications to the remedies selected for the MBS location were released to the public on August 14, 2009 for a 30-day review and comment period. No comments were received from the public. Additionally, in accordance with 40 C.F.R. § 300.435(c)(2), EPA provided PADEP with an opportunity to comment on this modification to the selected remedy described in this 2009 ESD. PADEP provided their written concurrence to the 2009 ESD.

As a result of the 2009 ESD, EPA resumed the manual removal of free product from impacted wells at the MBS location. On December 8, 2009, EPA contractors removed a total of approximately 7 gallons of free product from impacted wells at the MBS location. The free product was containerized for off-site disposal. Following removal of the free product, annual sampling of the monitoring wells at the MBS location was conducted. The results of the sampling are discussed in the following section.

V. Progress Since the Last Five-Year Review

This is the fourth (4th) Five-Year review for the Site and has been prepared in accordance with EPA's Comprehensive Five-Year Review Guidance (June 2001). Table 5 summarizes the progress at the Site since the last Five-Year review. The issues and recommendations in Table 5 were generated from the 3rd Five-Year Review Report for the Site. The statements on protectiveness from the 3rd Five-Year Review are provided below:

MKT Location

"The MKT location is currently protective because the landfill cap, fencing, and annual monitoring by the PRPs provide lines of defense to prevent any potential for direct contact with contaminated soil. There are currently no known exposures to Site-related groundwater contaminants. No institutional controls were required by any of the decision documents for the

MKT location; however, there is no indication that the land use at the MKT location will be changed in the foreseeable future. The institutional controls that were specified in the Consent Decree should be reassessed for adequacy." – 2005 Five Year Review

MBS Location

"The MBS location is protective in the short term considering there are no known current exposures to the contaminants, but the remedy is not functioning as expressed in the decision documents for that location. The groundwater monitoring wells at the MBS location have been reduced in number by construction and dumping activities, and no definite schedule has been developed for the groundwater monitoring. Significant contamination of the groundwater remains at the MBS location, monitoring cannot be fully accomplished there, and the MBS location does not have in place institutional controls. Therefore, under the present circumstances, the MBS location is considered to not be protective over the long term" - 2005 Five Year Review.

Table 4: Actions Taken Since the Last Five-Year Review

Issues	Recommendations/ Follow-up Actions	Party Responsible	Action Taken and Outcome	Date of Action
MBS Location				
Some monitoring wells are no longer available	Determine whether the wells should be replaced	EPA	7 of the 8 monitoring wells were located during subsequent site visits and have been sampled	November 2006
Institutional controls are not in place	EPA will request PADEP to issue State order for institutional controls	EPA and PADEP	EPA issued 2nd ESD to establish ICs; appropriate ICs will be finalized following Focused Feasibility Study	December 2009
Gasoline and fuel oil on groundwater might result in vapor intrusion	Determine vapor intrusion potential	EPA and PADEP	In a letter dated November 21, 2007, PADEP agreed to investigate the potential for vapor intrusion at the MBS location; as part of the Focused Feasibility Study EPA is conducting an independent investigation	November 2007; April 2010 to present

Table 4: Actions Taken Since the Last Five-Year Review

Issues	Recommendations/ Follow-up Actions	Party Responsible	Action Taken and Outcome	Date of Action
No inspection schedule	Develop and implement an inspection schedule	EPA	Annual inspections and groundwater monitoring established in 2006 Addendum to 3rd Five Year Review and second ESD	February 2006; December 2009
Site deleted from NPL and not eligible for remedial actions	Investigate State and federal options	EPA	Not applicable	EPA has reevaluated this issue; sites deleted from the NPL remain eligible for remedial actions (NCP 300.425(e)(3)
MKT Location				
No decision document for institutional controls	Make a determination of the adequacy of the current institutional controls	EPA	Current ICs are adequate.	May 2010

On February 22, 2006, EPA issued an Addendum to the 2005 Five Year Review report, which addressed the issues outlined in the 2005 Five Year Review report. Additionally, EPA issued the second ESD for the MBS location, which is described in detail in Section IV of this report.

Following issuance of the 2005 Five Year Review, EPA conducted at least annual inspections of the MBS location, as well as annual groundwater sampling events and associated activities. The following activities have been conducted at the MBS location since July 2005:

- November 15, 2006 – Annual sampling of monitoring wells. Trip report dated January 29, 2007;
- July 16, 2007 – Surveying of monitoring wells;
- September 6, 2007 – Surface water sampling of adjacent Hunkeydory Creek, downhole geophysical survey of monitoring wells, and sampling and oil fingerprint analysis of free product in one monitoring well;
- November 6-7, 2007 – Annual sampling of monitoring wells. Trip report dated February 8, 2008 summarizes all 2007 site activities;
- October 30, 2008 – Annual sampling of monitoring wells. Trip report dated February 9, 2009;
- December 8, 2009 – Annual sampling of monitoring wells. Trip report dated February 9, 2010.

Additionally, EPA has begun a comprehensive review of the MBS location and the effectiveness of the current remedial action being conducted there (annual sampling and free product removal). The objectives of the FFS are to 1) fully characterize the remaining contamination at the MBS location, and 2) indentify and evaluate viable remedial alternatives. The FFS includes a detailed review of the local geology, collection of subsurface soil samples, installation of additional groundwater monitoring wells, groundwater sampling, an evaluation of the potential for vapor intrusion, and an evaluation of remedial alternatives to address the groundwater contamination remaining at the MBS location.

VI. Five-Year Review Process

Administrative Components

The McAdoo Site Five-Year Review Team was led by Brad White (EPA Remedial Project Manager), with EPA technical support staff Bruce Rundell (hydrogeologist), Jennifer Hubbard (toxicologist), and Larry Johnson (Community Involvement Coordinator). Joseph Iannuzzo, PADEP Hazardous Site Cleanup Act Project Manager, assisted in the review as the representative of the support agency. Due to a limited review period, PADEP comments were not received prior to issuance of this report; they will be addressed, as appropriate, in a subsequent addendum to the five year review.

Beginning in October 2009 and extending through June 2010, the review team established the review schedule whose components included:

- Community Involvement;
- Document Review;
- Data Review;
- Site Inspection; and
- Five-Year Review Report Development and Review.

Community Involvement

Five Year Review

A notice announcing that EPA was conducting a five-year review for the Site was published in *The Hazleton Standard Speaker*, a widely-distributed local newspaper in the greater Hazleton, Pennsylvania area, on March 17, 2010. On March 29, 2010, EPA received a call from a reporter from *the Hazleton Standard Speaker* and answered general questions about the five year review process. No other correspondence was received regarding the five year review.

On May 12, 2010, EPA met with McAdoo Borough officials including the Council president, one Borough council member, and the Borough secretary. EPA provided an update of current activities that are being conducted at the MBS location, as well as a general history of the Site. Borough officials stated that local residents have expressed interest in the Site, and are curious about EPA's current sampling and drilling activities. While no specific issues or concerns were

raised, Borough officials want to ensure they are kept up to date on activities at the MBS location.

Also on May 12, 2010, EPA spoke on the telephone to the Kline Township secretary and Kline Township supervisor regarding the MKT location. The Township supervisor said that people in the community have concerns regarding the area polycythemia vera occurrences, and if there is a correlation to the Site. People on Silverbrook Road have also expressed interest in having their private wells sampled. The supervisor indicated Kline Township has not been receiving the annual reports for the MKT location, or other reports related to the MKT location.

Following signature of this five-year review, an ad will be placed in *The Pittsburgh Post-Gazette* announcing that the 2nd Five-Year Review is complete, and that the results of the review, and the report, are available to the public on the EPA Region III website.

Other Regional Concerns

In October 2006, the Pennsylvania Department of Health requested the Agency for Toxic Substances and Disease Registry's (ATSDR) help in investigating a high number of polycythemia vera (PV) cases reported in Carbon, Luzerne, and Schuylkill counties. Several of these reported cases were in close proximity to the McAdoo Site (MKT location). PV is a rare illness, with no known cause, that causes the body to make too many red blood cells. ATSDR was asked to make sure that the reported cases actually had PV, and to find any other cases of PV in the tri-county area. A survey of the possible cases was conducted to collect information on work and residence histories, health status, and other factors that might be related to PV. ATSDR's field work began in November 2006, and was completed in July 2007. On August 25, 2008, ATSDR presented the final results of the investigation to the public. The results of the investigation were summarized as follows:

- Through blood testing, a recently-discovered biomarker, JAK2, was used to confirm 33 cases of PV;
- The confirmed cases had no common occupations, ancestry, lifestyle choices or exposures;
- The cancer registry did not accurately reflect the true number of PV cases in the area;
- In some areas, the PV rates were higher than the rest of the tri-county area; however, only one of these areas was statistically significant;
- There were potential environmental exposure sources common to some of the high-rate areas. It is not known whether a relationship exists between any of these sources and the PV cases. ATSDR's investigation was not designed to study such relationships. Further, the cause of PV is unknown; hence, it is difficult to link the illness to any environmental agent or any other factor; and
- More research is needed to understand the reasons for the high rate of PV in this area.

In 2009, ATSDR completed additional geospatial analyses of the case information, and identified a cluster of PV cases near the nexus of Luzerne, Schuylkill, and Carbon Counties and a second cluster in Schuylkill County, Pennsylvania. In response to these findings, ATSDR began funding studies at PADOH, Drexel University, University of Pittsburgh, Mount Sinai Medical

Center, Geisinger Health System, and ATSDR/CDC to further investigate PV and other similar illnesses in the tri-county area.

In addition, ATSDR, with the assistance of PADEP, is currently conducting an investigation that is designed to evaluate potential environmental exposure sources within the tri-county study area. This includes evaluating existing sample data, as well as the collection of additional water, sediment, and soil samples. EPA has provided historical analytical data related to the various Superfund sites that are located in the study area, including the McAdoo Associates Site, and will continue to support ATSDR with this investigation. More information relating to ATSDR's investigation can be found at http://www.atsdr.cdc.gov/sites/polycythemia_vera/, or by calling ATSDR at (800) 232-4636.

Document Review

A complete list of documents reviewed can be found in Attachment 3. Documents reviewed in the process of conducting this five-year review included the previous three Five-Year Review reports, historical EPA decision documents (RODs, ROD Amendments, and ESDs), annual reports for the MKT location, and groundwater monitoring trip reports for the MBS location, among others.

Data Review

MKT Location

The 1998 Consent Decree sets forth the requirement for O&M at the MKT location. Under the terms of the Consent Decree, the PRPs are required to annually inspect the MKT location to assure that the requirements of the remedial action are being met, and collect samples and perform analyses at all the monitoring wells, as well as the surface water runoff at the Silverbrook discharge near the Site. Under the terms of the 1985 ROD, three of the monitoring wells, six lysimeters, and the Silverbrook Discharge are to be sampled for total organic carbon (TOC), total organic halides (TOX), and base neutral and acid extractable organic priority pollutants (BNAs). The Silverbrook Discharge is a former mine shaft entrance that now serves as the primary discharge point for water that drains the mine pool. Under the terms of the 1991 ROD, all seven monitoring wells at the MKT location are to be sampled for VOCs and nine inorganic compounds, including cobalt, silver, zinc, beryllium, cadmium, chromium, nickel, lead, and cyanide.

The inspection reports prepared by Clean Sites Environmental Services, Inc (Clean Sites) found the Site to be in acceptable condition with regard to access barriers and security devices, cover material, the stormwater control, and groundwater monitoring wells and lysimeters. The lysimeters at the MKT location are devices that are used to monitor the collection of water underneath the protective soil barrier/cap that is part of the protective remedy. Water underneath the cap would indicate a breach in the cap; there has been no evidence of water accumulating underneath the protective cap.

Data reviewed for the MKT location included the annual reports that are prepared by PRP Trustee environmental consultant Clean Sites. For the purpose of this Five Year Review, EPA reviewed the 2005, 2006, 2007, 2008, and 2009 Annual Reports. Information summarized in the Annual Reports includes the findings of the annual Site inspections and groundwater sampling analytical results. Additionally, EPA collected split samples with Clean Sites during the May 2008 groundwater sampling event and had the samples analyzed by an independent laboratory. The purpose of the split sampling event was to verify the accuracy of the laboratory being used by Clean Sites. EPA collected split samples for three of the monitoring wells, in addition to the Silverbrook Discharge. EPA then compared the reported analytical results from the two laboratories; the results were similar, therefore, EPA verified the accuracy of the laboratory being used by Clean Sites.

The 2009 Annual Report indicated the only VOC to exceed its MCL concentration of 5 parts per billion (ppb), a Federal drinking water standard established under the Safe Drinking Water Act, was 1,2-dichloropropane detected at a concentration of 47 ppb. The only inorganic compound to exceed its MCL of 4 ppm was beryllium detected at a concentration of 5.9 ppb. Both of these compounds were found in well MW9, which is just downgradient from the Site and screened in the same mine pool that flows beneath the MKT location. TOC was detected in MW5 at a concentration of 1.5 ppm, which is a monitoring well located within the fenced area of the MKT location and is screened in the mine pool. TOX was measured in MW9 at a concentration of 42 ppb. Other VOCs detected at the MKT location below Federal drinking water standards include 1,1,1-trichloroethane; 1,1-dichloroethane; and bis(2-ethylhexyl)phthalate. While other inorganic compounds continue to be detected in Site monitoring wells and the Silverbrook Discharge, they are also detected in the upgradient monitoring wells and are consistent with those typically found in areas associated with historical mining. The concentrations of parameters detected over the past five years have remained relatively consistent, while the concentrations of parameters detected since implementation of the remedy have declined.

MBS Location

As discussed in the previous section of this report, numerous sampling events have been conducted at the MBS location since the previous Five Year Review report was issued in 2005. For each of the annual groundwater sampling events, samples were collected from six of the seven monitoring wells; the seventh well, the only shallow (less than 25 feet deep) monitoring well on the site, has remained dry.

The analytical results of the groundwater sampling events have been fairly consistent; petroleum-related contamination is present in monitoring wells located in the former underground storage tank area, as well as in monitoring wells downgradient of the former underground storage tank area Free product continues to collect in at least one monitoring well (MW5). EPA sampled the free product in 2007 and had an oil fingerprint analysis conducted on it. The results indicated the product is consistent with the fingerprint of weathered gasoline and diesel, which was consistent with the results of historical analyses conducted on the free product. Dissolved-phase petroleum-related contamination is observed in four of the six monitoring wells. The two upgradient wells nearest to Blaine Street (MW2 and MW6) do not have Site-related contaminants present in them, and are considered to be representative of normal background conditions. Compounds that are

detected in concentrations greater than the established performance standards (shown in Table 3 above) or greater than MCLs at the MBS location are provided below:

Table 5: 2009 Groundwater Performance Standard Exceedances at MBS Location

Compound	Performance Standard (ug/l)	MCL (ug/l)	Maximum Detection (ug/l)	Well ID
Benzene	5	5	110	MW7
Ethylbenzene	280	700	940	MW1
bis(2-ethylhexyl)phthalate	6	6	8.2	MW1
Manganese	Background	NA	18,700	MW7

It should be noted that solvents historically observed in the groundwater at the MBS location, such as 1,2-dichloroethane and 1,1,1-trichloroethane, are either no longer detected, or are detected at low concentrations below drinking water standards. Bis(2-ethylhexyl)phthalate, which was historically present in groundwater samples at concentrations as high as 1,200 ug/l, is now either not detected or detected at concentrations typically at or just above the MCL of 6 ug/l. The remainder of the contaminants detected in groundwater samples at the MBS location are consistent with compounds that are associated with petroleum products.

The tables found in Attachment 6 provide a summary of the most recent annual groundwater sampling event at the MBS location.

EPA is currently conducting a focused feasibility study (FFS) at the MBS location to fully characterize and delineate the plume of contaminated groundwater, evaluate the potential for vapor intrusion, and evaluate viable remedial alternatives to optimize the remedy for the contaminated groundwater.

Site Inspection

MKT Location

On April 27, 2010, EPA met with Clean Sites to conduct the site inspection of the MKT location. An inspection was conducted of the fencing surrounding the Site, surface water drainages, condition of the protective cap, and visual integrity of the monitoring wells and lysimeters. No breeches were identified in the fencing, and the gates were functional and locked. On the north side of the Site, there were birch trees beginning to encroach upon the fencing; EPA was assured the trees will be pruned back in the fall as part of routine maintenance activities. One burrowing animal hole was found on the west side of the Site near the fence. Clean Sites contacted EPA following the site inspection and stated the hole had been filled in. EPA observed no other areas of sparse or missing vegetation. The surface water drainages appeared to be intact and were not clogged with debris. All monitoring wells and lysimeters appeared to be intact.

In summary, the site inspection did not reveal any significant issues and the fencing, protective cap and vegetation, monitoring wells and lysimeters, and surface water drainages all appeared to be functioning as designed.

MBS Location

EPA most recently visited the MBS location on May 12, 2010 to oversee the drilling of additional groundwater wells as part the ongoing FFS. Apart from equipment that is on-site for the drilling activities, the MBS location is mixed gravel and grass, with a small storage shed used by the current owner located on the south side. The parcel to the north of the MBS location is vacant except for a McAdoo Sewer Authority sewage pumping station. All EPA monitoring wells are intact and secured.

VII. Technical Assessment

- ***Question A: Is the remedy functioning as intended by the decision documents?***

The remedy is functioning as intended by the 1985 and 1991 RODs at the MKT location. The remedy is functioning as intended by the 1993 ROD Amendment and 1995 ESD at the MBS location; however, the institutional controls specified in the 2009 ESD have not yet been implemented.

Remedial Action Performance

MKT Location

The review of Site-related documents, risk assumptions, and the results of the Site inspections indicated the remedy at the MKT location is functioning in accordance with the 1985 ROD that called for the removal of a storage tank and debris, excavation and offsite disposal of a portion of the contaminated soil, and capping of the area and diversion of surface water. The remedy is also functioning in accordance with the 1991 ROD, which called for no further action with groundwater and surface water monitoring.

The cap and fencing at the MKT location are in good condition and maintained as necessary by the PRP, and are preventing any exposure to the contaminated soil remaining beneath the cap. Additionally, the cap is minimizing infiltration of surface water, as evidenced by the inability to collect water samples from the lysimeters during annual sampling activities. The surface water drainages are in sound condition and free of blockages.

Contaminant concentrations in groundwater at the MKT location, including total organic carbon, total organic halides, diethylphthalate, di-n-butylphthalate, and phenol, appear to have generally declined since implementation of the remedy in 1992. Other contaminants, including 1,2-dichloropropane and bis(2-ethylhexyl)phthalate, have remained fairly stable over time and are not widely detected. VOCs are only detected in two wells, both of which are screened in mine pool. Most recently, only 1,2-dichloropropane was detected above its MCL. Additionally, beryllium, detected in a mine pool well, is the only metal found at a concentration above its MCL.

MBS Location

The review of Site-related documents and the results of the Site inspections indicate the remedy at the MBS location is functioning in accordance with the 1993 ROD Amendment, as modified by the 1995 ESD and 2009 ESD. The current remedy includes manual bailing and offsite removal of free product, annual groundwater monitoring, institutional controls, and the establishment of performance standards for groundwater.

EPA has been conducting annual groundwater sampling at the MBS location since the last five year review, and has resumed the manual extraction and treatment of contaminated groundwater and free product. Benzene and ethylbenzene continue to be detected in the groundwater at concentrations above their performance standards. Current concentrations of bis(2-ethylhexyl)phthalate are much lower than historical concentrations, and it is only sporadically detected above its performance standard. 1,2-dichloroethane is no longer detected in groundwater samples at the MBS location. Manganese continues to be detected at high concentrations in monitoring wells where VOC and SVOC contamination is found, and is likely a function of the contamination dissolving the naturally occurring manganese from the bedrock. Upgradient, background concentrations of manganese are approximately 200 ug/l. While floating, free product is still observed in one monitoring well at the MBS location, the thickness of the product has been greatly reduced following the resumption of manually removing it.

Institutional Controls

MKT Location

EPA has evaluated the ICs that are part of the 1988 and 1998 consent decrees (CD) and found them to be sufficient. The ICs specified in the CDs are:

1988 CD

- No conveyance of title is to occur without a provision permitting the continued operation and maintenance of the Site;
- All conveyances are required to contain a covenant to permit work and comply with deed notice requirements under State law; and
- A copy of the CD was to be recorded with the County and the restrictions described in the CD are to run with the land.

1998 CD

- A copy of the CD is be filed with the Recorder of Deeds Office (Schuylkill County) within 15 days of its entry;
- Each deed, title, or other instrument must contain a notice about the CD and any lien held by the U.S.;
- Defendant was required to record notice of its obligation to provide access and related covenants; and
- Within 30 days of any conveyance of its property, defendant must provide notice to EPA, the grantee, and the Commonwealth of PA.

MBS Location

EPA identified the need to institute ICs in the 2009 ESD that prevent the installation of a new well for potable use, and to protect existing monitoring wells located near the MBS location. EPA is currently working to have the ICs in place by July 2011.

Optimization Opportunities

MBS Location

EPA is currently conducting a FFS at the MBS location to identify remedial options that may be more efficient than hand bailing for the remediation of contaminated groundwater.

- ***Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of remedy selection still valid?***

Yes, although there have been significant changes in risk assessment methodology, toxicity factors, and exposure factors since the original ROD was signed, and at various times since subsequent decision documents were issued. The impacts of these changes are discussed below.

Changes in Standards and To Be Considered

Have standards identified in the ROD been revised, and does this call in to question the protectiveness of the remedy? Do newly promulgated standards call in to question the protectiveness of the remedy? Have TBCs used in selecting cleanup levels at the site changed, and could this affect the protectiveness of the remedy?

MKT Location

Soil cleanup criteria were set in 1985, based on surface water criteria at the time. However, there is no need to reevaluate these criteria since the soil has been capped. The cap prevents direct contact and water migration; thus, there are no complete exposure pathways and the soil cleanup is protective.

No groundwater cleanup criteria were set for the mine pool groundwater at the Kline site.

MBS Location

Soil was excavated, backfilled, and covered with gravel; specific cleanup standards were not identified. However, this soil is currently being reevaluated in the ongoing FFS.

The following table lists the groundwater cleanup standards that were set in the most recent decision document (the 2009 ESD). This table also lists the current MCLs or non-zero MCLGs for these chemicals.

Chemical	ESD standard (ug/L)	Current MCL/ Non-zero MCLG (ug/L)
Bis(2-ethylhexyl) phthalate	6	6
Ethylbenzene	280*	700
1,2-Dichloroethane	5	5
Benzene	5	5
Manganese	background	NA

* Risk-based concentration that considers the cumulative risk of the other contaminants of concern.

It is clear that the ESD standards would still meet ARARs. The protectiveness of the groundwater standards was evaluated below, in the Toxicity and Other Contaminant Characteristics section.

Changes in Exposure Pathways

Has land use or unexpected land use on or near the site changed?

MKT Location

No. Institutional controls in the form of easements for continued access and property conveyance notification are in place at the MKT location

MBS Location

Since the original decision documents, a sewage pumping station has been installed near, and a storage shed has been constructed on, the MBS location. Neither building is reported to be continuously occupied at this time by either workers or residents. Institutional controls are in progress for the MBS location.

Have human health or ecological routes of exposure or receptors been newly identified or changed in a way that could affect the protectiveness of the remedy?

Vapor intrusion is discussed below. The exposure assumptions used in the original risk assessment have changed also, but the effects of those changes are discussed in subsequent sections, along with the changes in Toxicity and Other Contaminant Characteristics.

MKT Location

The groundwater data indicate that subsurface VOCs are still present, most notably in the wells MW-5 and MW-9, which are screened in the mine pool. There are no Site-related monitoring wells located downgradient of MW-9; however, the discharge point for the mine

pool is the Silverbrook discharge, which is located approximately 1,500 feet south of the Site. If present, any buildings within 100 feet of groundwater containing VOCs should be investigated for potential vapor intrusion. There are no buildings within 100 feet at this time.

MBS Location

Subsurface VOCs are present at the Blaine site, and a vapor intrusion investigation has been initiated.

Are there newly identified contaminants or contaminant sources?

EPA has recently become aware that 1,4-dioxane, a solvent stabilizer, may be present at sites contaminated with solvents. This is particularly true of sites with 1,1,1-TCA, which has been detected at the McAdoo site. 1,4-dioxane is of particular concern because it is not addressed by many of the cleanup methods that treat solvent VOCs. The groundwater should be sampled for 1,4-dioxane to determine whether it is present at concentrations of potential concern.

Are there unanticipated byproducts of the remedy not previously addressed? No.

Have physical site conditions or the understanding of these conditions changed in a way that could affect the protectiveness of the remedy?

MKT Location

No.

MBS Location

No. If the understanding of physical site conditions changes based on findings during the FFS that is currently being conducted, they will be documented in the FFS report.

Changes in Toxicity and Other Characteristics

Have toxicity factors for contaminants of concern at the site changed in a way that could affect the protectiveness of the remedy? Have other contaminant characteristics changed in a way that could affect the protectiveness of the remedy?

There have been many changes in toxicity factors and in chemical-specific factors such as dermal permeability constants over the years, as well as changes in exposure factors and risk assessment methodology, and changes in some groundwater standards. These changes have been incorporated into overall protectiveness assessments for this five-year review. The MKT and MBS locations are discussed separately with respect to groundwater, soil, surface water, and sediment.

MKT Location

Soil: Soil cleanup criteria were set in 1985, based on soil to groundwater criteria at the time. However, there is no need to reevaluate these criteria since the soil has been capped. The cap prevents direct contact and water migration; thus, there are no complete exposure pathways and the soil cleanup is protective.

Groundwater: No groundwater cleanup criteria were set for the groundwater at the MKT location. The shallow groundwater at the MKT location consists of groundwater-filled mine workings (the mine pool), which discharges immediately south of the Site at the Silverbrook discharge. Because of this, and the difficulty associated with adjusting the pH and removing the metals present in the mine pool water from acid mine drainage, EPA determined at the time the 1985 and 1991 RODs were issued that use of the mine pool water as a drinking water supply was highly unlikely. Residential wells in the vicinity of the MKT location were evaluated and found to not be hydraulically connected to the mine pool water.

Surface Water: A risk assessment was conducted on historical surface water data using current Regional screening levels. Specific metals and compounds that were evaluated, included antimony, cobalt, manganese, and bis(2-ethylhexyl)phthalate. Based on the historical and more recent sample results of water collected from the Silverbrook discharge, screening levels were for surface water were below a Hazard Quotient (HQ) of 1. EPA considers a HQ below 1 to protective of non-cancer risk.

Sediment: A risk assessment was conducted on historical sediment data using current Regional screening levels. Specific compounds that were evaluated included arsenic, chromium, iron, manganese, and benzo(a)pyrene. Based on the data evaluated, screening levels for sediment were below a HQ of 1 and cancer risk of 1E-4. EPA considers a HQ below 1, or a cancer risk below 1E-4 to be protective. Chromium would only be of concern if the sediment concentrations were in the hexavalent form of the metal, which would be unusual.

More detailed information regarding the risk analysis conducted can be found in Attachment 9 of this report.

MBS Location

Soil: Soil was excavated, backfilled, and covered with gravel; specific cleanup standards were not identified. However, this soil is currently being reevaluated in the ongoing FFS.

Groundwater: Groundwater cleanup standards were set in the most recent decision document (the 2009 ESD). As established, those performance standards would be protective when reached (See Attachment 9). The 2009 groundwater data show that most of these standards have not yet been reached. A review of the 2009 groundwater data also show that benzo(a)pyrene exceeded its maximum contaminant level (MCL), and additional compounds exceeded RSLs. The MBS location is undergoing a FFS which will enable a reconsideration of the groundwater cleanup.

Changes in Risk Assessment Methods

Have standardized risk assessment methodologies changed in a way that could affect the protectiveness of the remedy?

There have been major changes to risk assessment methodology since the original risk assessment. Current methodology was used in Attachment 9 to assist in the determination of protectiveness, and in the screening of recent monitoring data.

Expected Progress Toward Meeting RAOs

Is the remedy progressing as expected?

MKT Location

Yes. The soil cap is preventing direct contact to contaminated soil and is limiting the amount of surface water that can percolate through contaminated soil and further contaminate the groundwater.

No groundwater cleanup criteria were set for the mine pool groundwater at the Kline site.

MBS Location

Yes. Soil was excavated, backfilled, and covered with gravel; specific cleanup standards were not identified. However, this soil is currently being reevaluated in the ongoing FFS. Free product continues to be manually removed, as specified in the 2009 ESD.

As established, the 2009 groundwater performance standards would be protective when reached. The 2009 groundwater data show that most of these standards not yet been reached. A review of the 2009 groundwater data also show that benzo(a)pyrene exceeded its maximum contaminant level (MCL), and additional compounds exceeded RSLs. The MBS location is undergoing a FFS which will enable a reconsideration of the groundwater cleanup.

- ***Question C: Has any other information come to light that could call into question the protectiveness of the remedy?***

No.

Additional information has not been revealed during the performance of this five year review that calls into question the protectiveness of the remedy as specified in the decision documents.

Technical Assessment Summary

According to the data reviewed, the Site inspection, and the interviews, the remedy is functioning as intended by the decision documents with the exception of the institutional controls that have not yet been put into place at the MBS location. There have been no changes in the

physical conditions at the Site that would affect the protectiveness of the remedy. The performance standards and ARARs for groundwater have not yet been met. There have been changes in toxicity factors and risk assessment methods, and these changes were incorporated into the overall protectiveness assessment of the Site. At the MKT location, the remedy with respect to soil, sediment, and surface water remains protective. An evaluation of the mine pool water indicates that a hazard index greater than 1 exists from elevated levels of cobalt. However, the likelihood of using the mine pool as a source of potable water is very low, given the problems associated with acid mine drainage and the fact that it discharges to the surface at a location adjacent to the Site. At the MBS location, the current performance standards for groundwater are protective. However, there are additional compounds detected in groundwater above screening levels that are being evaluated as part of the FFS. The groundwater at both the MKT and MBS locations should be sampled for 1,4-dioxane, and the vapor intrusion pathway should be evaluated for the MBS location.

VIII. Issues

Table 6 summarizes the current issues at the Site.

Table 6: Issues

Issues	Affects Current Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
MBS Location		
1. ICs identified in 2009 ESD not yet in place.	N	Y
2. Potential for vapor intrusion not fully evaluated.	N	Y
3. Presence of 1,4-dioxane in groundwater unknown.	N	Y
MKT Location		
4. Presence of 1,4-dioxane in groundwater unknown.	N	Y

IX. Recommendations and Follow-up Actions

EPA's recommendations and follow-up actions for the Site are in the following table:

Table 7: Recommendations and Follow-up Actions

Issue	Recommendations and Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)	
					Current	Future
1.	EPA is currently evaluating extent of groundwater contamination at MBS location as part of FFS; appropriate ICs will be determined once FFS is completed	EPA	EPA, PADEP	7/12/2011	N	Y
2.	Complete vapor intrusion investigation as part of FFS	EPA	EPA, PADEP	7/12/2011	N	Y
3.	Add 1,4-dioxane, at low level of detection, to list of analytes sampled for.	EPA	EPA, PADEP	7/12/2011	N	Y
4.	Add 1,4-dioxane, at low level of detection, to list of analytes sampled for	PRP	EPA, PADEP	7/12/2011	N	Y

X. Protectiveness Statement

MKT Location (OU1)

The remedy at the MKT location is determined to be protective of human health and the environment in the short term. Exposure pathways that could result in unacceptable risks are being controlled, and institutional controls that provide for the continued operation and maintenance of the remedy are in place. Percolation of surface water through contaminated soil has been minimized by the protective cap, and current data indicates that the remedy is functioning as required to achieve cleanup goals. Operation and maintenance of the landfill cap and sampling and monitoring of groundwater and surface water will continue.

However, in order for the remedy to remain protective in the long term at the MKT location, 1,4-dioxane must be sampled for in the groundwater to determine whether or not it is present.

MBS Location (OU2)

A protectiveness determination of the remedy at the MBS location (OU2) cannot be made at this time until further information is obtained. Further information will be obtained by completing the vapor intrusion assessment that is currently underway as part of the FFS. It is expected the vapor intrusion assessment will be completed by July 2011, at which time a protectiveness

determination will be made.

Additionally, in order for the remedy to remain protective in the long term, institutional controls (ICs) restricting well drilling must be put in place, and 1,4-dioxane must be sampled for in the groundwater to determine whether or not it is present. EPA intends to have ICs in place by July 2011, and expects to complete sampling for 1,4-dioxane by July 2011.

EPA is deferring a Site-wide protectiveness statement at this time until further information is obtained regarding the vapor intrusion investigation that is being conducted at the MBS location (OU2). Once the vapor intrusion investigation is completed, EPA will make a Site-wide protectiveness determination.

Government Performance Results Act (GPRA) Measure Review

As part of this Five Year Review the GPRA Measures were reviewed. The GPRA Measures and their status are provided as follows:

Environmental Indicators

Human Health: Insufficient Data to Determine Human Exposure Control Status (HEID)
Groundwater Migration: Groundwater Migration Under Control (GMUC)

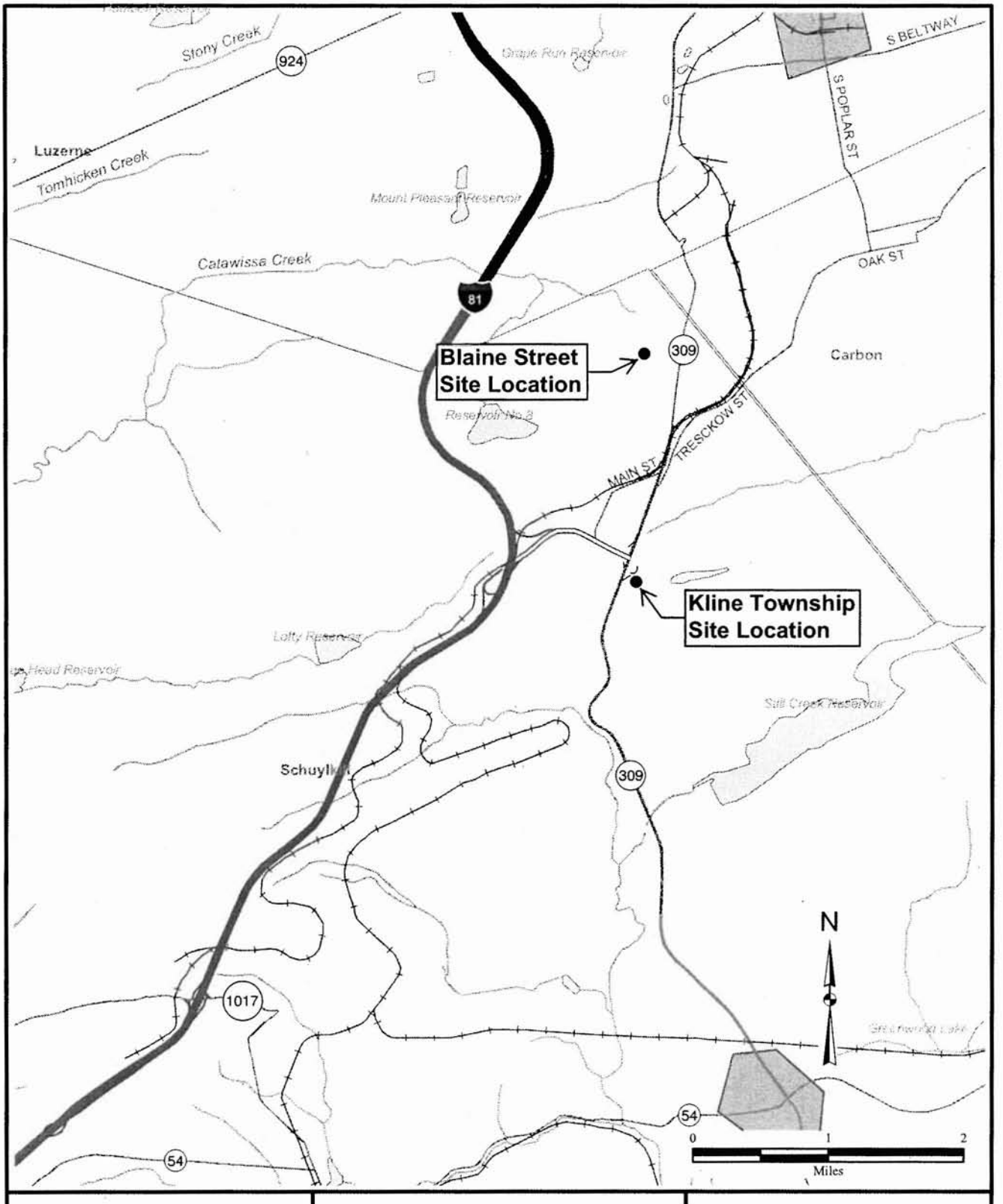
Sitewide RAU

The Site has not been determined to be Ready for Anticipated Use (RAU).

XI. Next Review

EPA will conduct another five-year review within five years of the completion of this five-year review report. The completion date is the date of the signature on the front of this report.

Attachment 1: Site Location Map



HGL

Figure 2.1
Site Location

Attachment 2: Site Layout Map, MKT Location

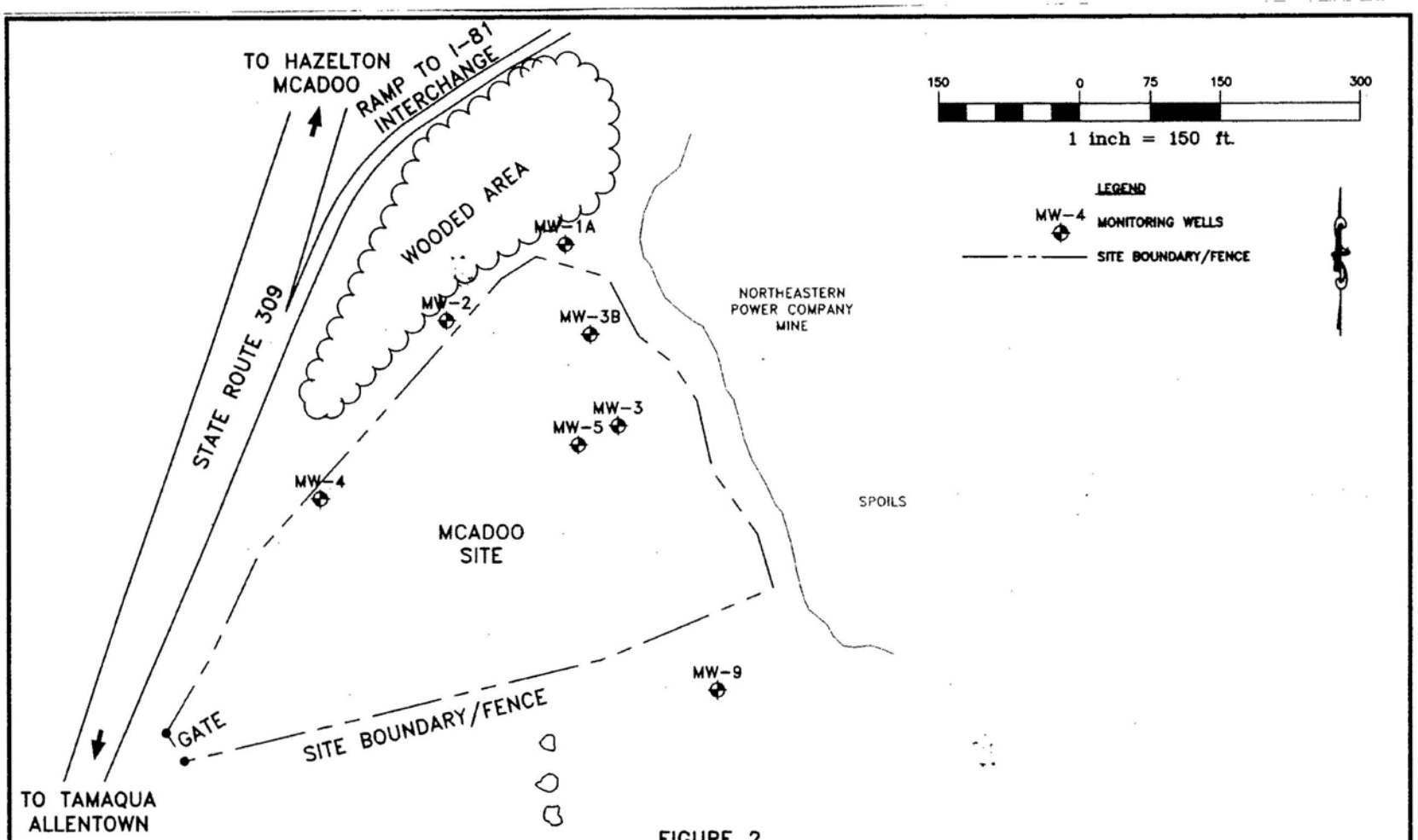


FIGURE 2
MONITORING WELL LOCATION MAP
MCADOO ASSOCIATES SITE
MCADOO, PENNSYLVANIA

SCALE:	1" = 150'	DATE:	JUNE 2005
S.O. NO.:	104985	FILE:	MCADOOF03
DSN/DWN:	RGR/WJH	CHK:	RGR

CLEAN SITES
ENVIRONMENTAL SERVICES, INC.
ALEXANDRIA, VIRGINIA

Attachment 3: Site Layout Map, MBS Location

HGL—McAdoo Associates OU2 Site, FFS Sampling and Analysis Plan – McAdoo, Schuylkill County, PA

Figure 2.2
Site Layout

Legend

Monitoring Well

Parcel Boundary

Aerial Photo Date: 2008

N

0 20 40 80
SCALE IN FEET

T:\McAdoo\E39TU_2\FS\Site_Layout.mxd
E39027.01.02 11/09/07 TB
Map Source: HGL GIS Database 2008

HGL

ATTACHMENT 4: List of Documents Reviewed

Record of Decision, McAdoo Associates Site, U.S. EPA Region III, April 9, 1984.

Record of Decision, McAdoo Associates Site, U.S. EPA Region III, June 28, 1985.

Record of Decision, McAdoo Associates Site, U.S. EPA Region III, September 30, 1991.

Record of Decision Amendment, McAdoo Associates Site, U.S. EPA Region III, September 29, 1993.

Five-Year Review Report, McAdoo Associates Site, U.S. EPA Region III, December 28, 1994.

Explanation of Significant Differences, McAdoo Associates, U.S. EPA Region III, September 26, 1995.

Five-Year Review Report, McAdoo Associates Site, U.S. EPA Region III, June 27, 2000.

Five-Year Review Report, McAdoo Associates Site, U.S. EPA Region III, July 12, 2005.

Five-Year Review Report Addendum, McAdoo Associates Site, U.S. EPA Region III, February 22, 2006.

Explanation of Significant Differences, McAdoo Associates Site, U.S. EPA Region III, December 22, 2009.

2005 Annual Report, McAdoo Associates Site (Kline Township Location), Clean Sites Environmental Services, Inc., October.

2006 Annual Report, McAdoo Associates Site (Kline Township Location), Clean Sites Environmental Services, Inc., September.

2007 Annual Report, McAdoo Associates Site (Kline Township Location), Clean Sites Environmental Services, Inc., October.

2008 Annual Report, McAdoo Associates Site (Kline Township Location), Clean Sites Environmental Services, Inc., October.

2009 Annual Report, McAdoo Associates Site (Kline Township Location), Clean Sites Environmental Services, Inc., October.

Trip Report, McAdoo Associates Site (Blaine Street Location), Tetra Tech EM Inc, September 22, 2005.

Trip Report, McAdoo Associates Site (Blaine Street Location), Tetra Tech EM Inc., January 29, 2007.

Trip Report, McAdoo Associates Site (Blaine Street Location), Lockheed Martin, February 8, 2008.

Trip Report, McAdoo Associates Site (Blaine Street Location), Tetra Tech EM Inc., February 9, 2009.

Data Summary Report, McAdoo Associates Site (Blaine Street Location), Hydrogeologic, Inc., February 9, 2010.

ATTACHMENT 5: MKT Location – 2009 Annual Groundwater Sampling Results Summary with Historical Data

Table 3
Summary of Post-Closure Monitoring Results
September 1992 through May 2008
McAdoo Associates Site - MKT Location

Parameter	Total Organic Carbon (TOC), ppm					Total Organic Halide (TOX), ppb				
Location	Lysimeter 1	MW-2	MW-5	MW-9	Silverbrook Discharge	Lysimeter 1	MW-2	MW-5	MW-9	Silverbrook Discharge
Date										
Sep-92	NA	1.3	8.1	1.0	2.1	NA	18.5	29.6	119	13.6
Mar-93	6.0	2.0	2.3	31.8	3.4	52.8	ND	262	112	74.9
Sep-93	5.5	1.1	407	1.2	0.59	98.1	6.8	44.9	116	ND
Mar-94	3.1	0.77	3.7	1.4	0.59	102	145	128	176	24.6
Oct-94	NA	2.2	4.6	1.0	0.80	NA	34.3	42.5	123	21.2
Apr-95	NA	ND	4.0	0.99	ND	NA	37.5	110	293	15.8
Oct-95	NA	0.66	4.0	2.2	ND	NA	86.4	92.9	106	82.7
Apr-96	NA	0.72	1.6	0.82	ND	NA	24.9	162	139	23.2
Nov-96	NA	1.2	5.1	0.64	ND	NA	36.9	75.3	81.3	20.4
Apr-97	NA	1.1	2.6	1.1	0.87	NA	107	87.0	90.2	107
Oct-97	NA	0.9	3.2	19	ND	NA	44	102.0	141	55.2
Oct-98	NA	ND	1.7	ND	ND	NA	42.5	30.5	69	12.5
Jul-99	NA	2.54	ND	3.28	ND	NA	15.0	10.4	70.4	ND
Jul-00	NA	ND	1.6	1.72	ND	NA	ND	ND	ND	ND
May-01	NA	ND	1.78	1.17	1.59	NA	ND	ND	ND	ND
May-02	NA	1.1	3.1	1.8	ND	NA	ND	ND	15	ND
May-03	NA	ND	2.4	2.0	1.8	NA	14	ND	41	ND
May-04	NA	ND	1.7	ND	ND	NA	ND	ND	112	ND
May-05	NA	ND	1.6	ND	ND	NA	ND	ND	71	ND
May-06	NA	ND	1.3	ND	ND	NA	ND	ND	64	ND
May-07	NA	12	1.8	ND	ND	NA	ND	ND	49	ND
May-08	NA	ND	NA	ND	ND	NA	ND	NA	54	NA
May-09	NA	ND	1.5	ND	ND	NA	ND	ND	42	ND

Table 3 (continued)
Summary of Post-Closure Monitoring Results
September 1992 through May 2008
McAdoo Associates Site - MKT Location

Parameter	Diethylphthalate, ppb					Di-n-butylphthalate, ppb				
Location	Lysimeter 1	MW-2	MW-5	MW-9	Silverbrook Discharge	Lysimeter 1	MW-2	MW-5	MW-9	Silverbrook Discharge
Date										
Sep-92	NA	1.0	ND	ND	ND	NA	3.0	10.0	5.0	4.0
Mar-93	ND	2.0	ND	ND	ND	ND	1.0	2.0	ND	ND
Sep-93	ND	3.0	2.0	ND	ND	3.0	4.0	2.0	3.0	2.0
Mar-94	ND	ND	ND	ND	ND	7.0	3.0	9.0	4.0	7.0
Oct-94	NA	ND	ND	ND	ND	NA	ND	3.0	3.0	2.0
Apr-95	NA	ND	ND	ND	ND	NA	ND	ND	ND	ND
Oct-95	NA	ND	1.0	1.0	ND	NA	ND	1.0	1.0	ND
Apr-96	NA	ND	ND	ND	ND	NA	ND	ND	ND	ND
Nov-96	NA	ND	ND	ND	ND	NA	ND	ND	ND	ND
Apr-97	NA	ND	ND	ND	ND	NA	ND	ND	ND	ND
Oct-97	NA	ND	ND	ND	ND	NA	ND	ND	ND	ND
Oct-98	NA	ND	ND	ND	ND	NA	ND	ND	ND	ND
Jul-99	NA	ND	ND	ND	ND	NA	ND	ND	ND	ND
Jul-00	NA	ND	ND	ND	ND	NA	ND	ND	ND	ND
May-01	NA	ND	ND	ND	ND	NA	ND	ND	ND	ND
May-02	NA	ND	ND	ND	ND	NA	6.9 J	ND	ND	6.7 J
May-03	NA	ND	ND	ND	ND	NA	ND	ND	ND	ND
May-04	NA	ND	ND	ND	ND	NA	1.3 J	ND	2.3 J	1.9 J
May-05	NA	ND	ND	ND	ND	NA	ND	ND	ND	ND
May-06	NA	ND	ND	ND	ND	NA	ND	ND	ND	ND
May-07	NA	ND	ND	ND	ND	NA	ND	ND	ND	ND
May-08	NA	ND	ND	ND	ND	NA	ND	ND	ND	ND
May-09	NA	ND	ND	ND	ND	NA	ND	ND	ND	ND

Table 3 (continued)
Summary of Post-Closure Monitoring Results
September 1992 through May 2008
McAdoo Associates Site - MKT Location

Parameter	Bis(2-ethylhexyl)phthalate, ppb					Phenol, ppb				
Location	Lysimeter 1	MW-2	MW-5	MW-9	Silverbrook Discharge	Lysimeter 1	MW-2	MW-5	MW-9	Silverbrook Discharge
Date										
Sep-92	NA	3.0	29.0	24.0	14.0	NA	ND	ND	ND	ND
Mar-93	4.0	2.0	2.0	ND	ND	ND	ND	ND	ND	ND
Sep-93	12.0	3.0	2.0	4.0	3.0	1.0	2.0	ND	ND	ND
Mar-94	8.0	4.0	12.0	5.0	9.0	ND	ND	ND	ND	ND
Oct-94	NA	ND	ND	1.0	ND	NA	ND	ND	ND	ND
Apr-95	NA	4.0	26.0	ND	ND	NA	ND	ND	ND	ND
Oct-95	NA	1.0	2.0	4.0	ND	NA	ND	ND	2.0	ND
Apr-96	NA	4.0	20.0	5.0	ND	NA	ND	ND	ND	ND
Nov-96	NA	2.0 J	3.0 J	ND	ND	NA	ND	ND	ND	ND
Apr-97	NA	1 JB	2 JB	3 JB	2 JB	NA	ND	ND	ND	ND
Oct-97	NA	390 B	350 B	120 B	280 B	NA	ND	ND	ND	ND
Oct-98	NA	ND	280	1.0 J	36	NA	ND	ND	ND	ND
Jul-99	NA	ND	1 J	ND	ND	NA	ND	ND	ND	ND
Jul-00	NA	3.92 J	ND	7.15 J	ND	NA	ND	ND	ND	ND
May-01	NA	ND	ND	ND	ND	NA	ND	ND	ND	ND
May-02	NA	6.2 J	ND	ND	ND	NA	ND	ND	ND	ND
May-03	NA	ND	ND	2.8 J	1.2 J	NA	ND	ND	ND	ND
May-04	NA	2.4 J	2.5 J	2.8 J	5.6 J	NA	ND	ND	ND	ND
May-05	NA	ND	ND	1.2 J	1.6 J	NA	ND	ND	ND	ND
May-06	NA	17.0	ND	ND	ND	NA	ND	ND	ND	ND
May-07	NA	3.2	12	52	53	NA	ND	ND	ND	ND
May-08	NA	ND	2.4 J	ND	ND	NA	ND	ND	ND	ND
May-09	NA	ND	ND	ND	ND	NA	ND	ND	ND	ND

Table 3 (continued)
Summary of Post-Closure Monitoring Results
September 1992 through May 2008
McAdoo Associates Site - MKT Location

Parameter	1,2-Dichloropropane, ppb	Beryllium, ppb						
Location	MW-9	MW-1A	MW-2	MW-3	MW-3B	MW-4	MW-5	MW-9
Date								
Oct-98	42	0.38	0.85	0.98	0.6	ND	ND	6.2
Jul-99	107	ND	ND	ND	ND	ND	ND	8.2
Jul-00	28.5	0.80	0.99	0.823	0.991	0.256	0.122	5.0
May-01	53.2	2.42	2.12	1.30	1.90	0.891	0.795	6.91
May-02	16	1.6	1.2	0.87	0.99	0.36	ND	5.6
May-03	69	2.2	1.8	0.63	1.1	0.17	ND	6.4
May-04	110	1.9	1.7	1.2	1.3	0.64	0.18	5.6
May-05	74	0.90 J	0.77 J	NA	0.60 J	ND	ND	4.8
May-06	44	1.5 J	1.4 J	1.1 J	1.2 J	0.49 J	0.27 J	5.8
May-07	150	1.2 J	1.1 J	0.90 J	0.65 J	0.30 J	ND	5.0
May-08	52	1.6 J	1.4 J	1.2 J	1.3 J	1.0 J	0.67 J	5.8
May-09	47	2.1 J	2.0 J	1.0 J	1.1 J	1.1 J	0.29 J	5.9

Notes:
J = value is less than the reporting limit but greater than the IDL/MD
NA = Not Analyzed
ND = Non-Detect

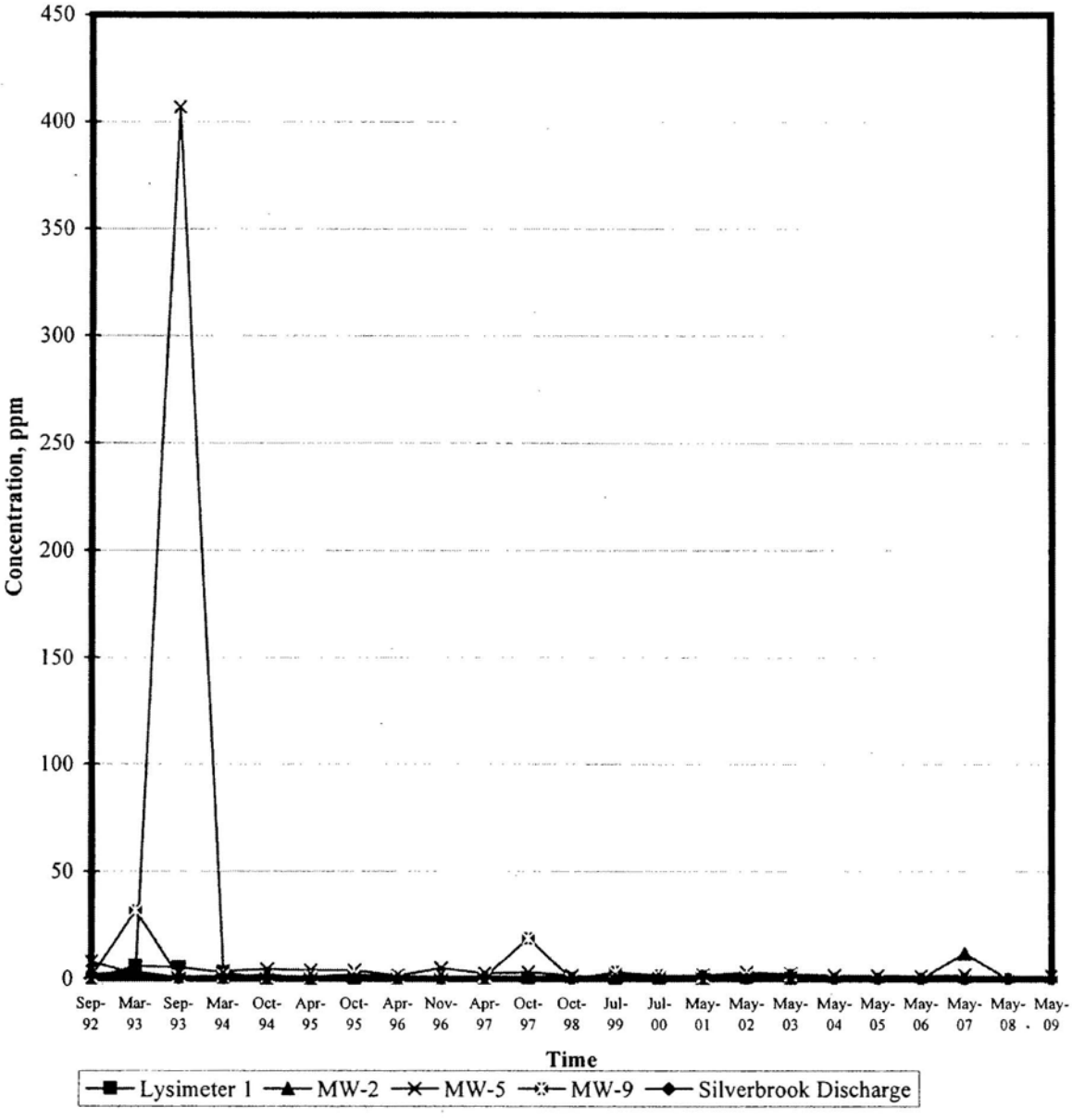


Figure 3
Total Organic Carbon (TOC) Concentration Versus Time

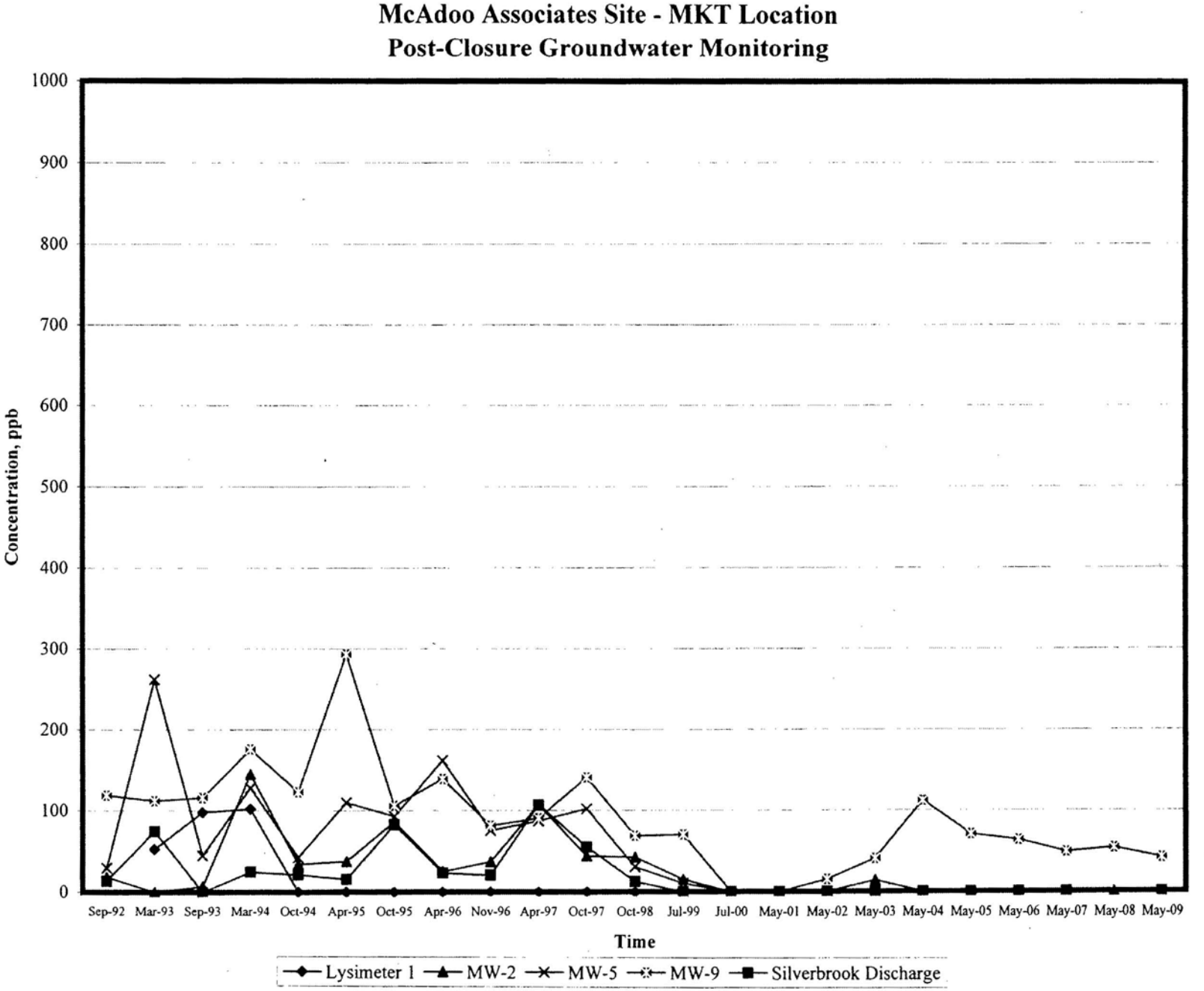


Figure 4
Total Organic Halides (TOX) Concentration Versus Time

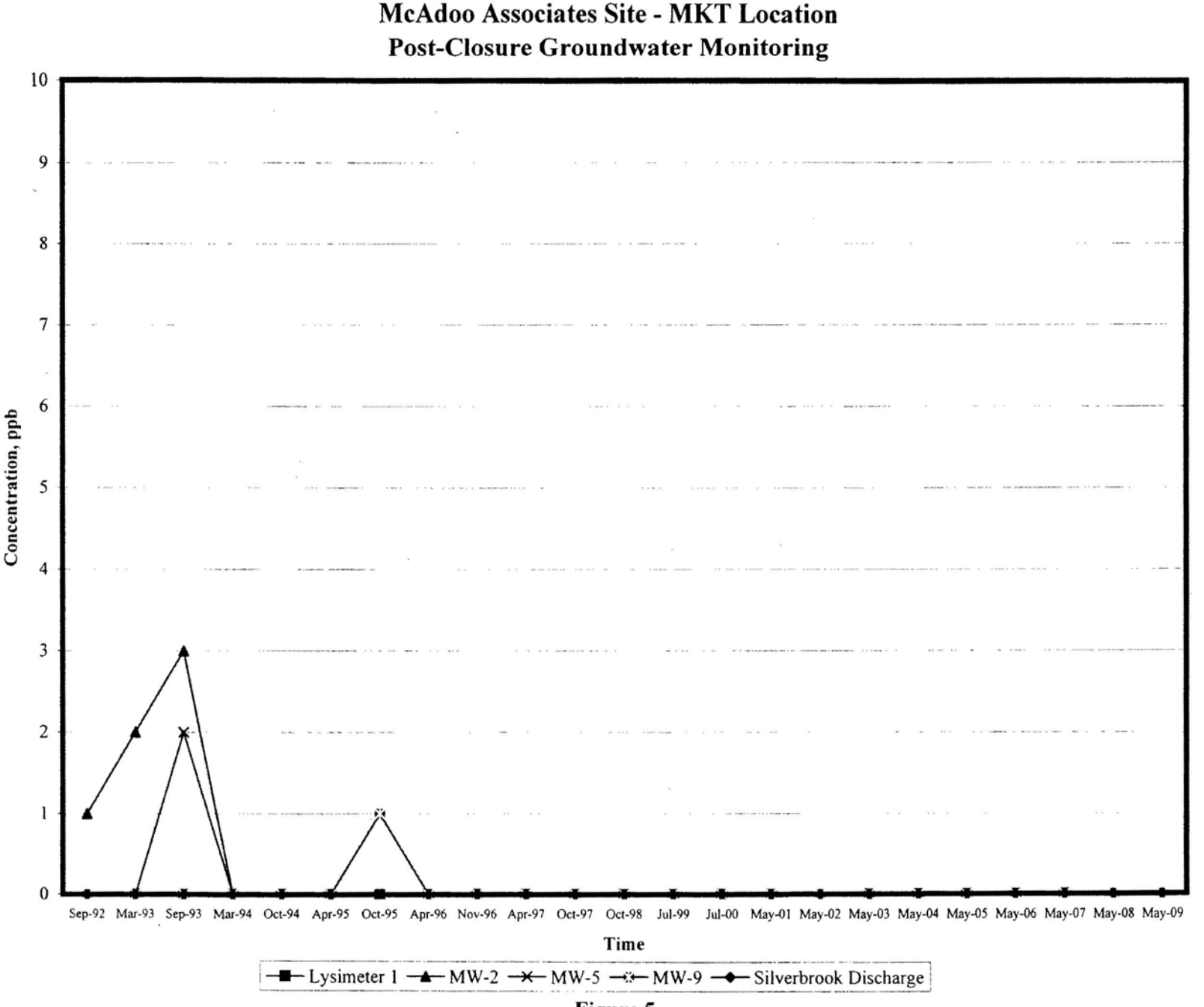


Figure 5

Diethylphthalate Concentration Versus Time

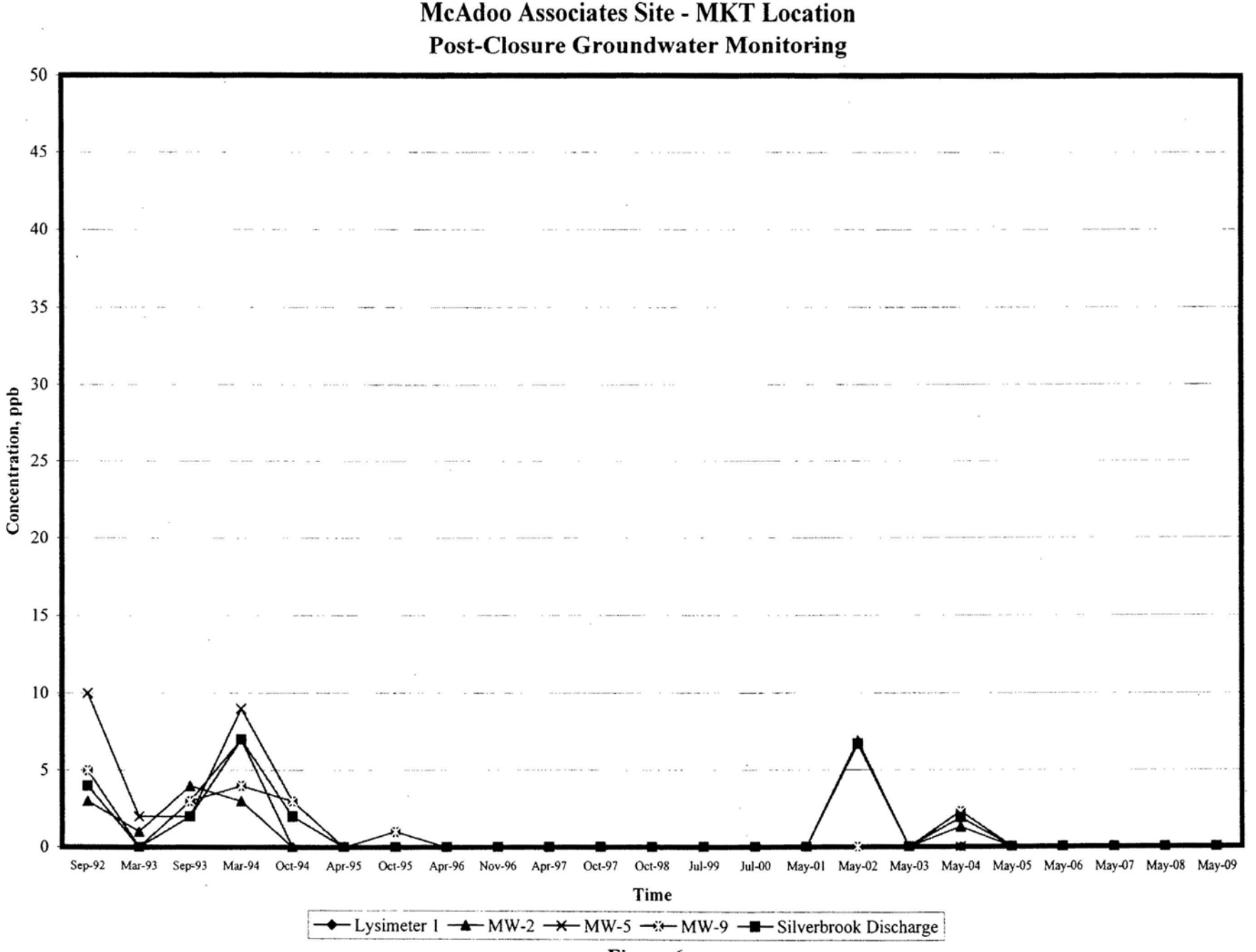


Figure 6
Di-n-butylphthalate Concentration Versus Time

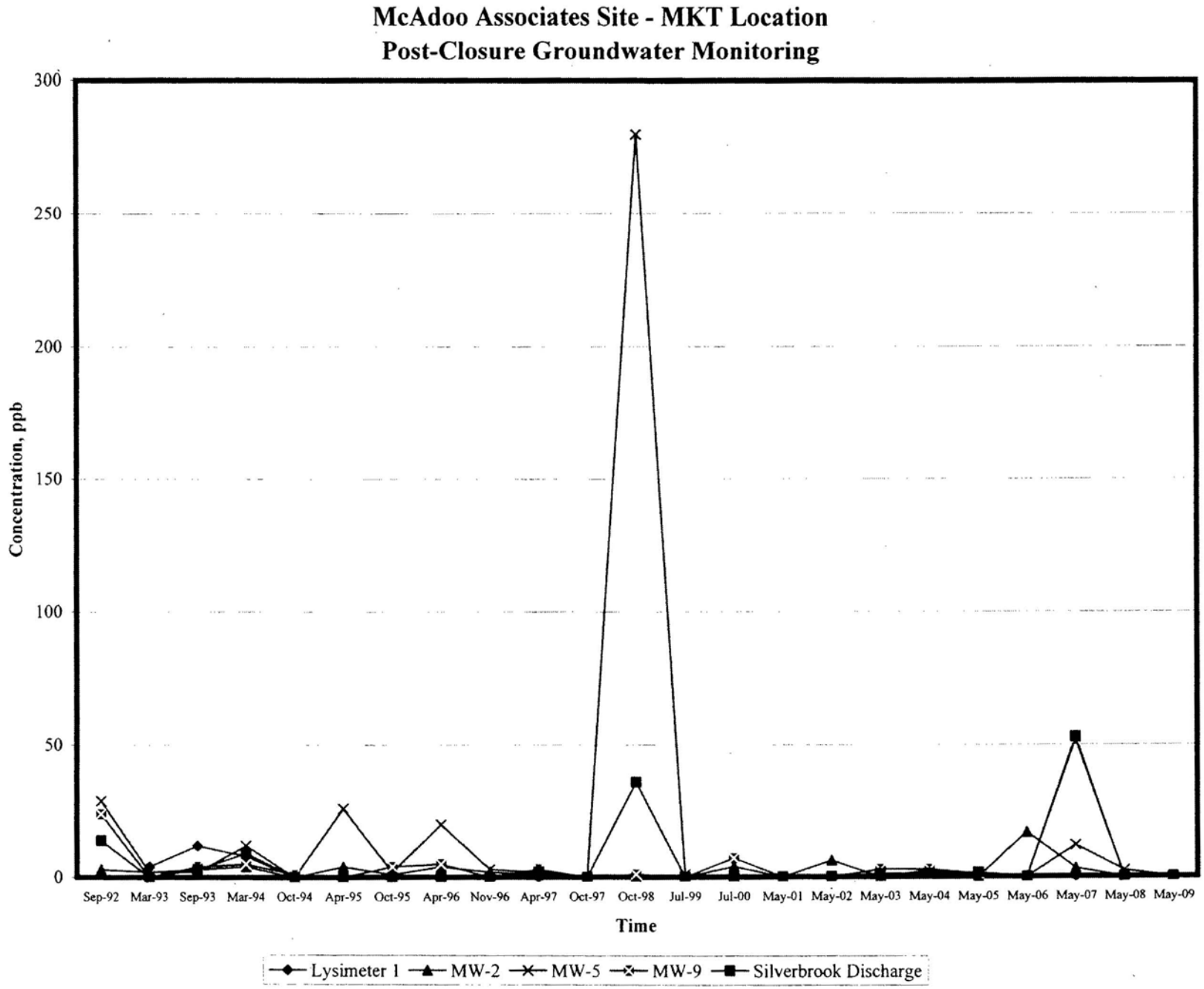


Figure 7
Bis(2-ethylhexyl)phthalate Concentration Versus Time

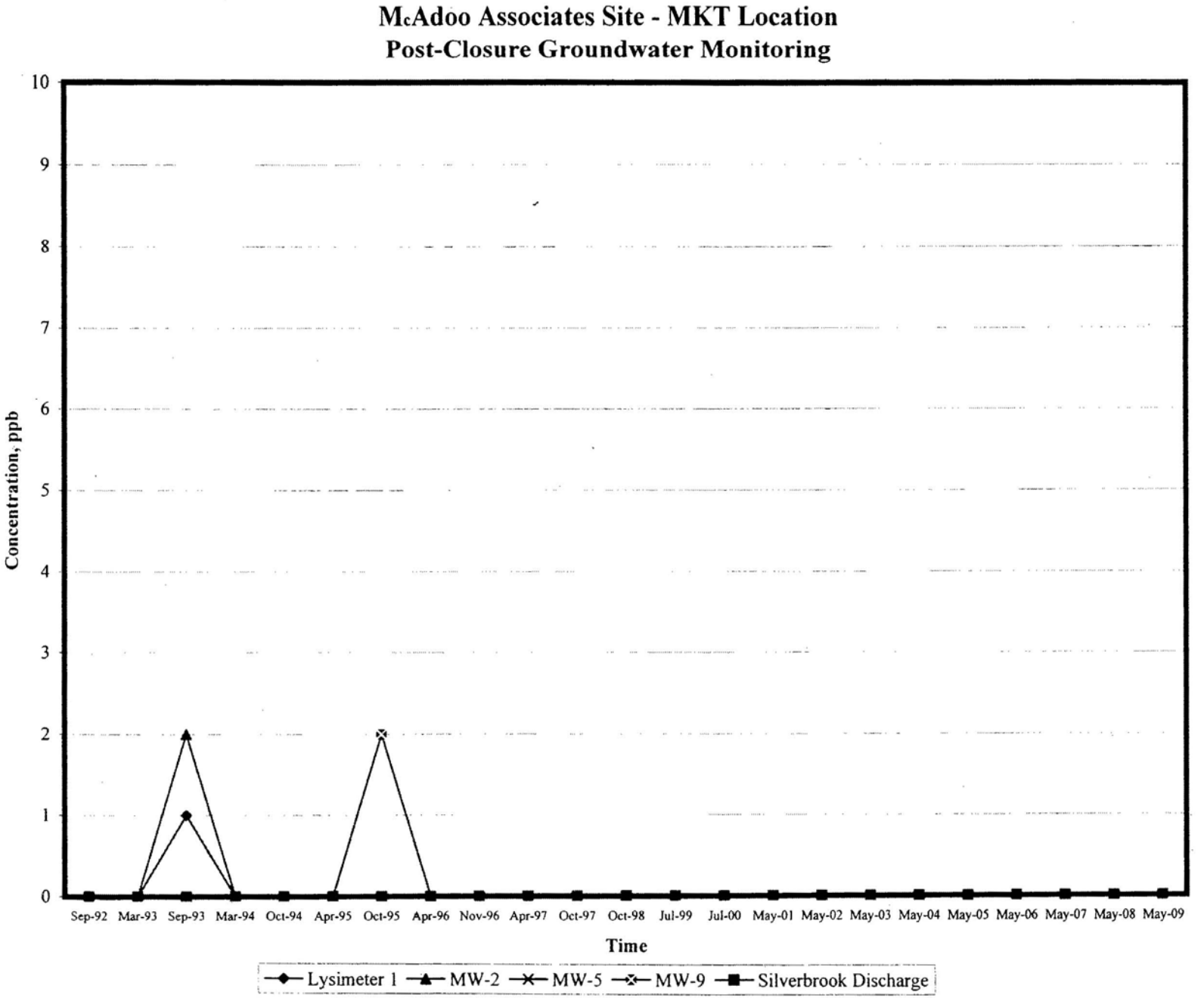


Figure 8
Phenol Concentration Versus Time

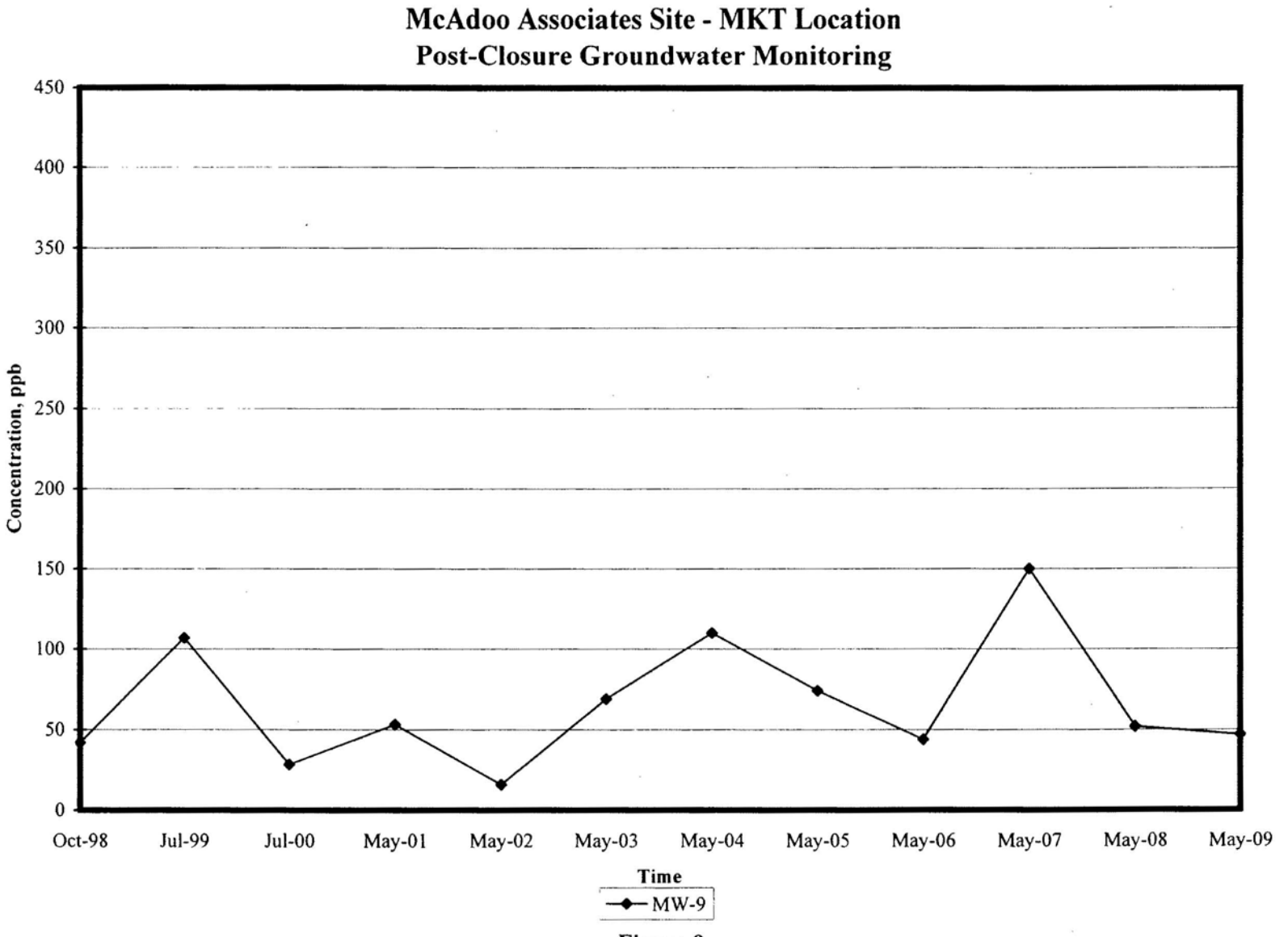


Figure 9
1,2-Dichloropropane Concentration Versus Time

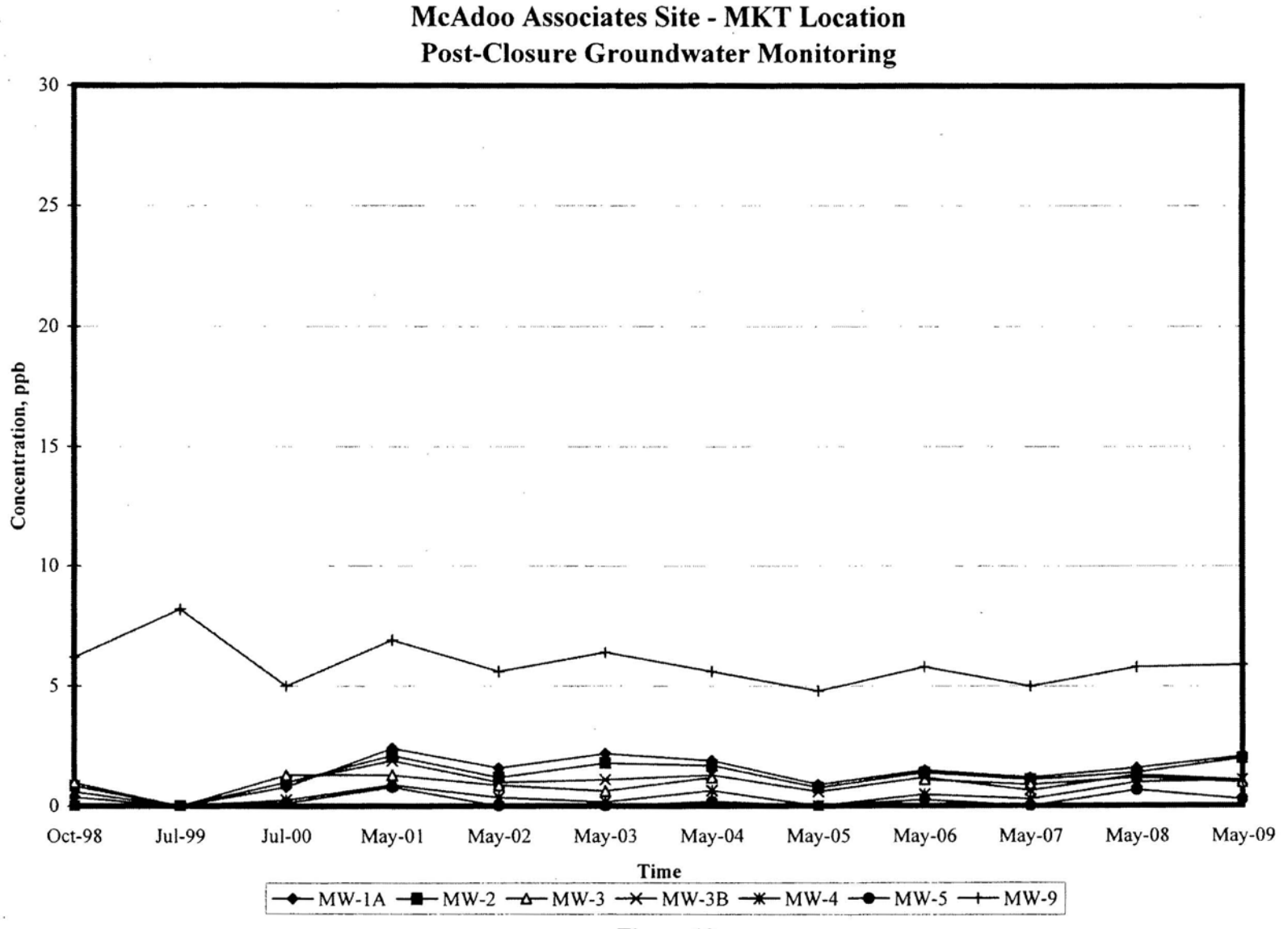


Figure 10
Beryllium Concentration Versus Time

ATTACHMENT 6: MBS Location – 2009 Annual Groundwater Sampling Result Summary

Table 1
Groundwater Analytical Results, December 2009 - VOCs
McAdoo Associates Site, OU2, McAdoo, PA

Sample Number:			C0742		C0744		C0746		C0748		C0749		C0752		C0755	
Sampling Location : (Prefix: MA09-)			MW1-120809		MW2-120809		MW4-120809		MW5-120809		MW5-120809-2		MW6-120809		MW7-120809	
Field QC :									Dup. of C0749		Dup. of C0748					
Matrix :			Water		Water		Water		Water		Water		Water		Water	
Units :			ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Date Sampled :			12/8/2009		12/8/2009		12/8/2009		12/8/2009		12/9/2009		12/8/2009		12/8/2009	
Time Sampled :			18:30		13:30		16:40		18:10		18:25		13:45		16:20	
Trace Volatile Compound	**CRQL**	**Screening Level ug/L**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**	**Result**	**Flag**
Methylene chloride	0.5	5														UJ
1,1-Dichloroethane	0.5	2.4											0.73			UJ
Cyclohexane	0.5	13000	67				2.2		21		19				33+	
Benzene	0.5	0.2	**72**				**37+**		**82+**		**81+**				**110+**	
1,2-Dichloroethane	0.5	0.03					**0.92**		**0.89**	J	**0.84**	J				UJ
Methylcyclohexane	0.5	710	30				1.5		16		15				28	J
Toluene	0.5	1000	4.8	B			0.46	B	4.5		4.4				3.6	B
Ethylbenzene	0.5	0.2	**620+**				**10**		**98+**		**94+**				**180+**	
o-Xylene	0.5	1400	9				0.64		32		29				6.6	J
m,p-Xylene	0.5	NA	720 +				1.2		210+		210+				310+	
Isopropylbenzene	0.5	8.4	**59**				4.6		**15**		**15**				**34**	J
Benzene	0.2	0.2	**100**				**34+**		**92**		**87**				**110**	
1,2-Dichloroethane	0.05	0.03					**0.89**		**0.86**	J	**0.8**	J				
Ethylbenzene	0.2	0.2	**940**				**7.9+**	J	**130**		**99**				**180**	

Highlighted cell indicate results of SIM analysis

4.6 - Results in bold red font exceed screening levels

Screening Levels are based on the Draft SAP for McAdoo Associates Site, OU2.

Only compounds that were detected in one or more samples are reported in the table.

NA - Not available

µg/L - micrograms per Liter

QC- Quality Control

CRQL - contract required quantitation limit

B - not detected substantially above level detected in laboratory or field blanks

J - analyte detected; reported value may not be accurate or precise

UJ - not detected; quantitation limit may not be accurate or precise

Table 1 (continued)
Groundwater Analytical Results, December 2009 - VOCs
McAdoo Associates Site, OU2, McAdoo, PA

Sample Number:			C0733		C0734		C0735		C0736		C0738		C0740	
Sampling Location : (Prefix: MA09-)			TB-120809-1		TB-120809-2		TB-120809-3		TB-120809-4		Eb-120909		FB-120809	
Field QC :			Trip Blank		Trip Blank		Trip Blank		Trip Blank		Rinsate Blank		Field Blank	
Matrix :			Water		Water		Water		Water		Water		Water	
Units :			ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Date Sampled :			12/8/2009		12/9/2009		12/8/2009		12/8/2009		12/9/2009		12/8/2009	
Time Sampled :			11:05		11:15		11:20		11:30		13:00		11:00	
Trace Volatile Compound	CRQL	Screening Level ug/L	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
Methylene chloride	0.5	5					0.26	J			0.26	J	0.28	J
1,1-Dichloroethane	0.5	2.4												
Cyclohexane	0.5	13000												
Benzene	0.5	0.2												
1,2-Dichloroethane	0.5	0.03												
Methylcyclohexane	0.5	710												
Toluene	0.5	1000	0.34	J	0.33	J	0.35	J			0.36	J	0.37	J
Ethylbenzene	0.5	0.2												
o-Xylene	0.5	1400												
m,p-Xylene	0.5	NA												
Isopropylbenzene	0.5	8.4												
Benzene	0.2	0.2												
1,2-Dichloroethane	0.05	0.03												
Ethylbenzene	0.2	0.2												

Highlighted cell indicate results of SIM analysis

4.6 - Results in bold red font exceed screening levels

Screening Levels are based on the Draft SAP for McAdoo Associates Site, OU2.

Only compounds that were detected in one or more samples are reported in the table.

NA - Not available

µg/L - micrograms per Liter

QC- Quality Control

CRQL - contract required quantitation limit

B - not detected substantially above level detected in laboratory or field blanks

J - analyte detected; reported value may not be accurate or precise

UJ - not detected; quantitation limit may not be accurate or precise

Table 2
Groundwater Analytical Results, December 2009 - SVOCs
McAdoo Associates Site, OU2, McAdoo, PA

Sample Number :			C0742		C0744		C0746		C0748		C0749	
Sampling Location : (Prefix: MA09-)			MW1-120809		MW2-120809		MW4-120809		MW5-120809		MW5-120809-2	
Field QC :									Dup. of C0749		Dup. of C0748	
Matrix :			Water		Water		Water		Water		Water	
Units :			ug/L		ug/L		ug/L		ug/L		ug/L	
Date Sampled :			12/8/2009		12/8/2009		12/8/2009		12/8/2009		12/9/2009	
Time Sampled :			18:30		13:30		16:40		18:10		18:25	
Dilution Factor :			1.0/2.0		1.0		1.0		1.0		1.0	
Semivolatile Compound	CRQL	Screening Level	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
Benzaldehyde	5	3700	36						11		12	
Acetophenone	5	3700	21						6.1		7.2	
Naphthalene	5	0.14	**66+**						**12**		**14**	
2-Methylnaphthalene	5	150	55+						11		13	
1,1-Biphenyl	5	1800	2.3	J					0.64	J	0.74	J
Acenaphthene	5	2200	0.62	J								
Fluorene	5	1500	1.1	J							0.73	J
Atrazine	5	3		R		R		R	0.87	J		R
Phenanthrene	5	NA	0.9	J					0.89	J	0.81	J
Chrysene	5	2.9	0.75	J								
Bis(2-ethylhexyl)phthalate	5	2.5	**8.2**	B	0.64	B					0.61	B
Benzo(k)fluoranthene	5	0.29	**0.9**	J								
Benzo(a)pyrene	5	0.2	**0.86**	J								
Naphthalene	0.14	0.14	**78+**	J	0.056	J	**0.15**		**8.8**	J	**15**	J
Benzo(a)anthracene	0.05	0.029	**0.53+**	J		UJ		UJ		UJ		UJ
Bis(2-ethylhexyl)phthalate	2.5	2.5	**6.7+**	J	0.34	B	0.16	B	0.11	B	0.27	B
Benzo(b)fluoranthene	0.05	0.029		UJ		UJ		UJ		UJ		UJ
Benzo(k)fluoranthene	0.29	0.29	**0.39+**	J		UJ		UJ		UJ		UJ
Benzo(a)pyrene	0.2	0.2	**0.64+**	J		UJ		UJ		UJ	0.039	B
Indeno(1,2,3-cd)pyrene	0.05	0.029	**0.13**	B		UJ		UJ		UJ		UJ
Dibenzo(a,h)anthracene	0.05	0.0029	**0.061**	B		UJ		UJ		UJ		UJ

Highlighted cell indicate results of SIM analysis

Screening Levels are based on the Draft SAP for McAdoo Associates Site, OU2.

NA - Not available µg/L - micrograms per Liter QC- Quality Control

B - not detected substantially above level detected in laboratory or field blanks

UJ - not detected; quantitation limit may not be accurate or precise

4.6 - Results in bold red font exceed screening levels

Only compounds that were detected in one or more samples are reported in the table.

CRQL - contract required quantitation limit

J - analyte detected; reported value may not be accurate or precise

R - unusable result

Table 2 (continued)
Groundwater Analytical Results, December 2009 - SVOCs
McAdoo Associates Site, OU2, McAdoo, PA

Sample Number :			C0752		C0755		C0738		C0740	
Sampling Location : (Prefix: MA09-)			MW6-120809		MW7-120809		Eb-120909		FB-120809	
Field QC :							Rinsate Blank		Field Blank	
Matrix :			Water		Water		Water		Water	
Units :			ug/L		ug/L		ug/L		ug/L	
Date Sampled :			12/8/2009		12/8/2009		12/9/2009		12/8/2009	
Time Sampled :			13:45		16:20		13:00		11:00	
Dilution Factor :			1.0		1.0		1.0		1.0	
Semivolatile Compound	CRQL	Screening Level	Result	Flag	Result	Flag	Result	Flag	Result	Flag
Benzaldehyde	5	3700			16					
Acetophenone	5	3700			17					
Naphthalene	5	0.14			**25**					
2-Methylnaphthalene	5	150			28					
1,1-Biphenyl	5	1800			1.6	J				
Acenaphthene	5	2200								
Fluorene	5	1500			0.83	J				
Atrazine	5	3		R		R		R		R
Phenanthrene	5	NA			0.83	J				
Chrysene	5	2.9								
Bis(2-ethylhexyl)phthalate	5	2.5	0.8	B					1.7	J
Benzo(k)fluoranthene	5	0.29								
Benzo(a)pyrene	5	0.2								
Naphthalene	0.14	0.14	0.072		**42**	J				
Benzo(a)anthracene	0.05	0.029		UJ		UJ	**0.067**	J	**0.13**	J
Bis(2-ethylhexyl)phthalate	2.5	2.5	0.38	B	0.17	B	0.3	J	1.6 +	J
Benzo(b)fluoranthene	0.05	0.029		UJ		UJ		UJ	**0.52**	J
Benzo(k)fluoranthene	0.29	0.29		UJ		UJ				
Benzo(a)pyrene	0.2	0.2		UJ	0.042	J	0.13	J	**0.28**	J
Indeno(1,2,3-cd)pyrene	0.05	0.029		UJ		UJ	**0.15**	J	**0.16**	J
Dibenzo(a,h)anthracene	0.05	0.0029		UJ		UJ	**0.27**	J	**0.45**	J

Highlighted cell indicate results of SIM analysis

Screening Levels are based on the Draft SAP for McAdoo Associates Site, OU2.

NA - Not available µg/L - micrograms per Liter QC- Quality Control

B - not detected substantially above level detected in laboratory or field blanks

UJ - not detected; quantitation limit may not be accurate or precise

4.6 - Results in bold red font exceed screening levels

Only compounds that were detected in one or more samples are reported in the table.

CRQL - contract required quantitation limit

J - analyte detected; reported value may not be accurate or precise

R - unusable result

Table 3
Groundwater Analytical Results, December 2009 – Metals (Total)
McAdoo Associates Site, OU2, McAdoo, PA

Sample Number:			MC0742		MC0744		MC0746		MC0748		MC0749		MC0752		MC0755		MC0738		MC0740	
Sampling Location: (Prefix: MA09-)			MW1-120809		MW2-120809		MW4-120809		MW5-120809		MW5-120809-2		MW6-120809		MW7-120809		Eb-120909		FB-120809	
Field QC:									Dup. of MC0749		Dup. of MC0748						Rinsate Blank		Field Blank	
Matrix:			Water		Water		Water		Water		Water		Water		Water		Water		Water	
Units:			ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Date Sampled:			12/8/2009		12/8/2009		12/8/2009		12/8/2009		12/9/2009		12/8/2009		12/8/2009		12/9/2009		12/8/2009	
Time Sampled:			18:30		13:30		16:40		18:10		18:25		13:45		16:20		13:00		11:00	
Dilution Factor:			1		1		1.0/3.0		1.0/2.0		1.0/2.0		1		1.0/10		1		1	
Analyte	CRQL	Screening Level	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
Total Metals																				
Antimony	2	6	0.4	B	0.12	B	0.15	B	0.11	B	0.083	B	0.4	B	0.11	B				
Arsenic	1	10	0.35	J	0.88	J	0.49	J	0.18	J	0.17	J	6.6		0.12	J				
Barium	10	2000	50.4		17.3		84.2		78.6		80.6		21.5		120		0.089	B	0.041	B
Beryllium	1	4	0.11	B	0.093	B	0.036	B	0.054	B	0.063	B	0.055	B			0.1	B		
Cadmium	1	5	0.21	J			0.7	J	0.17	J	0.17	J			0.047	B				
Chromium	2	100	0.43	B	1.2	B	0.33	B	0.33	B	0.29	B	1.5	B	0.38	B	0.18	B	0.22	B
Cobalt	1	11	0.44	J	5.5		0.98	J	**14.6**		**15.5**		1.9		0.32	J				
Copper	2	1300	0.48	B	2.4		0.7	B	0.81	B	0.44	B	5.9		0.61	B	0.43	B	0.17	B
Lead	1	15	0.81	J	1.9		0.43	J	0.91	J	0.92	J	3.4		0.72	J	0.036	J	0.036	J
Manganese	1	background	2510		351		7170+		5240+		6070+		183		18700+		0.2	B	0.063	B
Nickel	1	730	0.6	B	1.8		5.7		2.2		2.1		1.2		0.62	B	0.17	B	0.12	B
Selenium	5	50	0.56	B	0.7	B	14.6		0.37	B	0.32	B	0.56	B	0.53	B				
Silver	1	180					0.079	J					0.018	J						
Thallium	1	2			0.01	B	0.014	B					0.03	B						
Vanadium	5	260	0.42	J	0.65	J	0.11	B	0.16	B	0.15	B	1.9	J	0.069	B	0.065	B	0.027	B
Zinc	2	11000	4.8	B	8.4	B	21.9		3	B	2.8	B	9.2	B	5.7	B	2.4		1.8	J
Aluminum	200	3700	33.6	B	578		48.7	B	28.3	B			368		33.7	B				
Barium	200	2000	32.3	J	10.3	J	59.5	J	53.7	J	53.9	J	13.1	J	83.8	J				
Calcium	5000	NA	20000		13100		10100		6850		7010		15900		15900					
Iron	100	26000	**73400**		1290		9330		9400		9540		439		**36200**				24.3	B
Magnesium	5000	NA	6550		3020	J	4320	J	2270	J	2300	J	1780	J	4480	J				
Potassium	5000	NA	2860	J	13200	J	2940	J	1460	J	1460	J	2660	J	4530	J				
Sodium	5000	NA	18700		50800		20100		27100		27400		17700		20800					

Highlighted cell indicate results of ICP-AES analysis

Screening Levels are based on the Draft SAP for McAdoo Associates Site, OU2.

NA - Not available

µg/L - micrograms per Liter

CRQL - contract required quantitation limit

J - analyte detected; reported value may not be accurate or precise

4.6 - Results in bold red font exceed screening levels

Only compounds that were detected in one or more samples are reported in the table.

QC- Quality Control

B - not detected substantially above level detected in laboratory or field blanks

UL - not detected; quantitation limit is probably higher

Table 4
Groundwater Analytical Results, December 2009 – Metals (Dissolved)
McAdoo Associates Site, OU2, McAdoo, PA

Sample Number:			MC0742		MC0744		MC0746		MC0748		MC0749		MC0752		MC0755		MC0738		MC0740	
Sampling Location: (Prefix: MA09-)			MW1-120809		MW2-120809		MW4-120809		MW5-120809		MW5-120809-2		MW6-120809		MW7-120809		Eb-120909		FB-120809	
Field QC:									Dup. of MC0749		Dup. of MC0748						Rinsate Blank		Field Blank	
Matrix:			Water		Water		Water		Water		Water		Water		Water		Water		Water	
Units:			ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L		ug/L	
Date Sampled:			12/8/2009		12/8/2009		12/8/2009		12/8/2009		12/9/2009		12/8/2009		12/8/2009		12/9/2009		12/8/2009	
Time Sampled:			18:30		13:30		16:40		18:10		18:25		13:45		16:20		13:00		11:00	
Dilution Factor:			1		1		1.0/3.0		1.0/2.0		1.0/2.0		1		1.0/10		1		1	
Analyte	CRQL	Screening Level	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag	Result	Flag
Filtered Metals																				
Antimony	2	6	1.8	B	0.13	B	0.17	B	0.13	B	0.12	B	0.43	B	0.08	B	0.1	B	0.055	B
Arsenic	1	10	0.2	J	0.22	J	0.43	J	0.099	B	0.14	J	5		0.084	J				
Barium	10	2000	46.4	J	13.5	J	78.2	J	81.7	J	80.7	J	18.1	J	115	J	0.38	J	0.087	B
Beryllium	1	4	0.064	B	0.076	B	0.1	B	0.051	B	0.063	B	0.041	B			0.03	B		
Cadmium	1	5					0.14	J												
Chromium	2	100	0.23	B	0.56	B	0.51	B	0.24	B	0.23	B	0.76	B	0.3	B	0.24	B	0.21	B
Cobalt	1	11	0.17	B	2.4		0.86	J	**13.8**		**14.6**		0.19	B	0.084	B	0.083	B		
Copper	2	1300	0.2	B	1	B	0.67	B	0.44	B	0.28	B	1.7	J	0.34	B	0.3	B	0.13	B
Lead	1	15	0.72	B	0.071	B	0.15	B	0.37	B	0.29	B	0.21	B	0.15	B	0.16	J	0.22	J
Manganese	1	background	2300		193		6270 +		5050 +		6420 +		15.7		19300 +		0.93	B	0.12	B
Nickel	1	730	0.37	B	0.69	B	5.6		2.1		2.1		0.56	B	0.35	B	0.17	B	0.11	B
Selenium	5	50	0.49	B	0.99	B	15.4		0.24	B	0.4	B	0.54	B	0.5	B			0.2	B
Silver	1	180	0.019	J																
Thallium	1	2	0.021	B	0.008	B	0.009	B	0.027	B			0.019	B			0.013	B		
Vanadium	5	260	0.23	B	0.084	B	0.13	B	0.25	B	0.1	B	0.94	J	0.038	B	0.1	B	0.072	B
Zinc	2	11000	1.8	B	3.7	B	18.5		1.8	B	1.9	B	4.4	B	2.4	B	1.7	J	1.9	J
Aluminum	200	3700	55	B	604		59.3	B	45.9	B	41.4	B	377		65.1	B	36.2	J		
Barium	200	2000	32.6	J	10.3	J	59.2	J	53.3	J	55.3	J	12.6	J	84.9	J				
Calcium	5000	NA	20300		13500		10500		6970		7220		15400		16500			UL		UL
Iron	100	26000	**74900**		1340		9720		9650		9950		430		**37700**				20.2	J
Magnesium	5000	NA	6630		3130	J	4470	J	2310	J	2390	J	1750	J	4630	J		UL		UL
Potassium	5000	NA	2970	J	13800		3040	J	1520	J	1560	J	2700	J	4780	J				
Sodium	5000	NA	19300		52900		20800		27800		28700		17700		21800					

Highlighted cell indicate results of ICP-AES analysis

Screening Levels are based on the Draft SAP for McAdoo Associates Site, OU2.

NA - Not available

µg/L - micrograms per Liter

CRQL - contract required quantitation limit

J - analyte detected; reported value may not be accurate or precise

4.6 - Results in bold red font exceed screening levels

Only compounds that were detected in one or more samples are reported in the table.

QC- Quality Control

B - not detected substantially above level detected in laboratory or field blanks

UL - not detected; quantitation limit is probably higher

ATTACHMENT 7: MKT Location, Summary of EPA Split Sample Results

McAdoo Associates Site - MKT Location Monitoring Well Split Sample Results Summary

Compounds	Sample Date 5/17/2008															
	EPA Sample Result (ug/L)								Clean Sites Sample Result (ug/L)							
	SD01		MW2		MW5		MW9		SD01		MW2		MW5		MW9	
ALUMINUM	3850		1600		354		14900		NA		NA		NA		NA	
ANTIMONY									NA		NA		NA		NA	
*ARSENIC					13.8				NA		NA		NA		NA	
BARIUM	25.4	J	238		64.7	J	13.5	J	NA		NA		NA		NA	
BERYLLIUM	2.5	J	1.5	J	0.45	J	6.2	J	NA		1.4	J	0.67	J	5.8	
*CADMIUM	0.46	J	0.86	J	0.41	J	0.4	J	NA		0.4	J		U	0.6	J
CALCIUM	31800		16400		8520		19100		NA		NA		NA		NA	
*CHROMIUM		UL		UL		UL	3.1	J	NA		0.98	J	0.97	J		
COBALT	51.4		13.5	J	262		97.6		NA		10.7		232			
COPPER	4.5	J	7.5	J			111		NA		NA		NA		NA	
IRON	8780		15.4	J	13200		63.3	J	NA		NA		NA		NA	
*LEAD	6.8	J	5.4	J					NA		3.9	J		U	4.4	J
MAGNESIUM	7880		8110		4980	J	7510		NA		NA		NA		NA	
MANGANESE	1150		551		3490		1450		NA		NA		NA		NA	
MERCURY									NA		NA		NA		NA	
*NICKEL	54.3		25.1	J	33.2	J	120		NA		22.8					
POTASSIUM	3060	J	3070	J	1440	J	2740	J	NA		NA		NA		NA	
SELENIUM									NA		NA		NA		NA	
SILVER					0.79	J			NA			U		U		U
SODIUM	17600		208000	0	63400		5260		NA		NA		NA		NA	
THALLIUM									NA		NA		NA		NA	
VANADIUM		UL		UL		UL		UL	NA		NA		NA		NA	
ZINC	183	J	121	J	54.8	J	319	J	NA		109		59.3		321	
*CYANIDE		UL		UL		UL		UL	NA			U		U		U

McAdoo Associates Site - Kline Township Monitoring Well Split Sample Results Summary

Compound	Sample Date 5/17/2008															
	EPA Sample Result								Clean Sites Sample Result							
	SD01		MW2		MW5		MW9		SD01		MW2		MW5		MW9	
Dichlorodifluoromethane																
Chloromethane																
*Vinyl chloride																
Bromomethane																
Chloroethane																
Trichlorofluoromethane																
*1,1-Dichloroethene																
1,1,2-Trichloro-1,2,2-trifluoroethane																
Acetone																
Carbon Disulfide																
Methyl acetate																
*Methylene chloride	1.8	B	1.7	B	1.8	B	1.6	B								
trans-1,2-Dichloroethene																
Methyl tert-butyl ether																
1,1-Dichloroethane					8.6		3.3	J								
cis-1,2-Dichloroethene																
*2-Butanone																
Bromochloromethane																
Chloroform																
*1,1,1-Trichloroethane					4.7	J	28	J							34	
Cyclohexane																
*Carbon tetrachloride																
*Benzene																
*1,2-Dichloroethane																
1,4-Dioxane																
Trichloroethene																
Methylcyclohexane																
*1,2-Dichloropropane	0.25	J			0.48	J	56								52	
Bromodichloromethane																
cis-1,3-Dichloropropene																
4-Methyl-2-pentanone																
*Toluene																
trans-1,3-Dichloropropene																
1,1,2-Trichloroethane																
*Tetrachloroethene																
2-Hexanone																
Dibromochloromethane																
1,2-Dibromoethane																
*Chlorobenzene																
*Ethylbenzene																
o-Xylene					1.3	J										
m,p-Xylene																
*Styrene																
Bromoform																
Isopropylbenzene																
1,1,2,2-Tetrachloroethane																
*1,3-Dichlorobenzene																
*1,4-Dichlorobenzene																
1,2-Dichlorobenzene																
1,2-Dibromo-3-chloropropane																
1,2,4-Trichlorobenzene																
1,2,3-Trichlorobenzene																

McAdoo Associates Site - Kline Township Monitoring Well Split Sample Results Summary

Compound	Sample Date 5/17/2008															
	EPA Sample Result								Clean Sites Sample Result							
	SD01		MW2		MW5		MW9		SD01		MW2		MW5		MW9	
Benzaldehyde																
Phenol																
Bis(2-Chloroethyl)ether																
2-Chlorophenol																
2-Methylphenol																
2,2'-Oxybis(1-chloropropane)																
Acetophenone																
4-Methylphenol																
N-Nitroso-di-n-propylamine																
Hexachloroethane																
Nitrobenzene																
Isophorone																
2-Nitrophenol																
2,4-Dimethylphenol																
Bis(2-chloroethoxy)methane																
2,4-Dichlorophenol																
Naphthalene																
4-Chloroaniline																
Hexachlorobutadiene																
Caprolactam																
4-Chloro-3-methylphenol																
2-Methylnaphthalene																
Hexachlorocyclopentadiene																
2,4,6-Trichlorophenol																
2,4,5-Trichlorophenol																
1,1'-Biphenyl																
2-Chloronaphthalene																
2-Nitroaniline																
Dimethylphthalate																
2,6-Dinitrotoluene																
Acenaphthylene																
3-Nitroaniline																
Acenaphthene																
2,4-Dinitrophenol																
4-Nitrophenol																
Dibenzofuran																
2,4-Dinitrotoluene																
Diethylphthalate																
Fluorene																
4-Chlorophenyl-phenylether																
4-Nitroaniline																
4,6-Dinitro-2-methylphenol																
N-Nitrosodiphenylamine																
1,2,4,5-Tetrachlorobenzene																
4-Bromophenyl-phenylether																
*Hexachlorobenzene																
Atrazine																
*Pentachlorophenol																
Phenanthrene																
Anthracene																
Carbazole																

McAdoo Associates Site - Kline Township Monitoring Well Split Sample Results Summary

Compound	Sample Date 5/17/2008															
	EPA Sample Result								Clean Sites Sample Result							
Di-n-butylphthalate																
Fluoranthene																
Pyrene																
Butylbenzylphthalate																
3,3'-Dichlorobenzidine																
Benzo(a)anthracene																
Chrysene																
Bis(2-ethylhexyl)phthalate			3.4	J									2.4			
Di-n-octylphthalate																
Benzo(b)fluoranthene																
Benzo(k)fluoranthene																
Benzo(a)pyrene																
Indeno(1,2,3-cd)pyrene																
Dibenzo(a,h)anthracene																
Benzo(g,h,I)perylene																
2,3,4,6-Tetrachlorophenol																

McAdoo Associates Site - Kline Township Monitoring Well EPA Sample Results Summary

Compound	EPA Sample Result															
	MW-1	Q	MW-2	Q	MW-4	Q	MW-4 (dup)	Q	MW-5	Q	MW-6	Q	MW-7	Q	RB-01	Q
alpha-BHC																
gamma-BHC																
beta-BHC																
delta-BHC																
Heptachlor																
Aldrin																
Heptachlor Epoxide																
gamma-Chlordane																
alpha-Chlordane																
Endosulfan (I)																
p,p'-DDE																
Dieldrin																
Endrin																
p,p'-DDD																
Endosulfan (II)																
Endrin Aldehyde																
p,p'-DDT																
Endosulfan Sulfate																
Methoxychlor																
Endrin Ketone																
Toxaphene																
Aroclor 1016																
Aroclor 1221																
Aroclor 1232																
Aroclor 1242																
Aroclor 1248																
Aroclor 1254																
Aroclor 1260																
Aroclor 1268																

ATTACHMENT 8: Applicable or Relevant and Appropriate Requirements

Medium/Authority	ARAR	Status	Requirement Synopsis	Action to be Taken to Attain ARAR
OU2 ARARs (taken from 1993 ROD Amendment, 1995 ESD, and 2009 ESD)				
Groundwater/SDWA	Federal – SDWA – Maximum Contaminant Levels (MCLs) (40 CFR Part 141.11-141.16	Applicable	Federal statute and regulation which set enforceable MCLs for drinking water.	MCLs will be attained in groundwater at the point of compliance.
Groundwater/"background" quality for drinking water	25 PA Code §§264.90 through 264.100, §§ 264.97(i),(j), and 264.100 (a)(9)	Applicable	Hazardous substances in groundwater must be remediated to "background" quality	ARAR no longer applies. The 2009 ESD modified the cleanup standard in groundwater to Federal MCLs or Site-specific risk-based concentrations.
Groundwater/Pennsylvania well drilling regulations	PA Code Chapter 107	Relevant and Appropriate	Sets forth regulations concerning well drilling (in this case, extraction wells)	ARAR met during construction.
VOC emissions from air stripping tower/CAA	42 U.S.C §§ 7401 et seq.	Applicable	Identifies and regulates the release of pollutants to the air.	ARAR no longer applies. The 1995 ESD eliminated the pump and treat component of the selected remedy.
VOC emissions from air stripping tower/ Pennsylvania Best Available Technology (BAT) requirement	PA Code § 127.12(a)(5)	Applicable	Sets forth regulations requiring that emissions be reduced to the minimum obtainable levels through the use of BAT	ARAR no longer applies. The 1995 ESD eliminated the pump and treat component of the selected remedy.

Medium/Authority	ARAR	Status	Requirement Synopsis	Action to be Taken to Attain ARAR
OU2 ARARs (taken from 1993 ROD Amendment, 1995 ESD, and 2009 ESD)				
VOC emissions from storage or treatment facilities and fugitive dust/NAAQS and Pennsylvania ambient air quality standards	40 CFR Part 50 and PA Code 131.2 and 131.3	Relevant and Appropriate	Set forth regulations pertaining to emissions or dust from storage or treatment facilities.	ARAR no longer applies. The 1995 ESD eliminated the pump and treat component of the selected remedy; therefore, no treatment or storage facilities are present at the Site.
Free product/ Hazardous waste generator	40 CFR Part 262–264, 268 and PA Code Chapter 262-264, 268	Applicable	Set forth regulations pertaining to generating, shipping, treating, and disposing hazardous waste	ARAR does not apply; captured free product that is manually removed from wells has been classified as non-hazardous waste.

Attachment 9: Evaluation of Protectiveness of Groundwater Performance Standards

Considering Changes in Standards, Toxicity and Exposure Factors, and Risk Assessment Methodology

Risks were estimated for people consuming water at the performance standards for benzene, ethylbenzene, 1,2-dichloroethane (12DCA); and bis(2-ethylhexyl) phthalate (BEHP). (The manganese performance standard is background, in which case the risk contribution from site-related manganese would be zero.) In reality, it is likely that when groundwater cleanup standards are achieved, the concentrations will be even lower. However, to demonstrate the protectiveness at the performance standards, this assessment shows the risk for achieving all standards simultaneously.

The ingestion assessment equation was from the EPA "RAGS A" guidance. The dermal assessment came from "RAGS E." The inhalation assessment was from Foster and Chrostowski, 1987. Showering was assumed to occur only for adults; children were assumed to take baths and have generally lower (unquantified) inhalation exposure.

Most of the default exposure assumptions were from the 1991 Standard Default Exposure Factors guidance, RAGS E, or the 1997 Exposure Factors Handbook. The showering model also included the following inputs: a shower room volume of 12 m^3 (based on professional judgment, considered to represent an average bathroom), a drop time of 0.5 seconds (based on CPF Associates, 2003), and a shower flow rate of 10 L/min (based on professional judgment, which incorporates considerations of reported flow rates in the 1997 Exposure Factors Handbook). Henry's Law constants were obtained from the 1996 Soil Screening Guidance. For dermal exposure to adults, the available groundwater concentration was considered to be the initial concentration minus the amount volatilized out (Cwd, the concentration leaving the water droplet).

The toxicity factors were obtained from the following sources:

Chem	Oral/ derm RfD	Source	Oral/ derm CSF	Source	RfC	Source	IUR	Source
BEHP	2E-2	I	1.4E-2	I	--	--	2.4E-6	C
EB	1E-1	I	1.1E-2	C	1	I	2.5E-6	C
12DCA	2E-2	P	9.1E-2	I	2.4	M	2.6E-5	I
benzene	4E-3	I	5.5E-2	I	0.03	I	7.8E-6	I

Oral RfDs = Dermal RfDs, for this group of chemicals.
I = Integrated Risk Information System
P = Provisional Peer-Reviewed Toxicity Value
C = California EPA (as recommended by EPA)
M = ATSDR Minimal Risk Level

The risks are summarized on the following table:

Chemical	Child HI	Adult HI	Cancer risk
EB	0.3	0.1	9E-5
BEHP	0.05	0.02	3E-6
12DCA	0.02	7E-3	1E-5
benzene	0.09	0.05	6E-6
TOTAL	0.4	0.2	1E-4

The Hazard Indices are less than 1, thus meeting the protectiveness goal for noncancer risk. The estimated cancer risk is 1E-4, at the upper end of the acceptable risk range of 1E-6 to 1E-4.

The risk estimates are expected to be biased high for the following reasons, and therefore are more likely to err on the side of protectiveness:

Although a combination of average and high-end exposure factors is used, the goal of the Reasonable Maximum Exposure assessment is to estimate risks in the 90th-99th percentile. Therefore, the risk estimates are designed to be protective of most of the population.

No threshold effects were assumed for carcinogens. Rather, it was assumed that any exposure to a carcinogen could theoretically increase cancer risk. If any of these carcinogens do in fact have thresholds below the levels encountered at the site, the cancer risk could be lower than shown here.