

Five-Year Review Report

5th Five-Year Review Report

for

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

EPA ID#: PAD980712616

July 2015

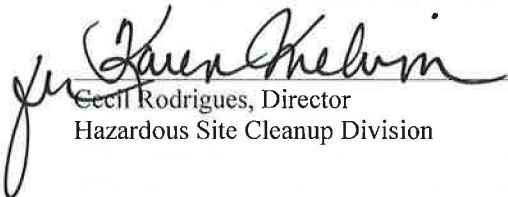
PREPARED BY:

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

Approved by:

Date:

JUL 8 2015


Cecil Rodrigues, Director
Hazardous Site Cleanup Division

5th Five-Year Review Report

Table of Contents

| | |
|---|-----------|
| List of Acronyms..... | iii |
| Executive Summary..... | iv |
| Five-Year Review Summary Form | v |
| 1.0 Introduction..... | 1 |
| 2.0 Site Chronology..... | 2 |
| 3.0 Background | 3 |
| 3.1 Physical Characteristics | 3 |
| 3.2 Land and Resource Use | 3 |
| 3.3 History of Contamination | 4 |
| 3.4 Initial Response | 4 |
| 3.5 Basis for Taking Action..... | 5 |
| 4.0 Remedial Actions | 6 |
| 4.1 Remedy Selection | 6 |
| 4.2 Remedy Implementation..... | 9 |
| 4.3 System Operation/Operation and Maintenance | 10 |
| 4.3.1 MKT Location (OU1)..... | 10 |
| 4.3.2 MBS Location (OU2) | 10 |
| 5.0 Progress Since the Last Five-Year Review | 11 |
| 5.1 MKT Location | 14 |
| 5.2 MBS Location..... | 14 |
| 6.0 Five-Year Review Process | 16 |
| 6.1 Administrative Components | 16 |
| 6.2 Community Involvement | 16 |
| 6.3 Document Review | 17 |
| 6.4 Data Review..... | 17 |
| 6.4.1 MKT Location | 17 |
| 6.4.2 MBS Location..... | 18 |
| 6.5 Site Inspection | 19 |
| 6.5.1 MKT Location | 19 |
| 6.5.2 MBS Location..... | 20 |
| 7.0 Technical Assessment | 20 |
| 7.1 <i>Question A: Is the remedy functioning as intended by the decision documents?</i> | 20 |
| 7.2 <i>Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of remedy selection still valid?</i> | 22 |
| 7.3 <i>Question C: Has any other information come to light that could call into question the protectiveness of the remedy?</i> | 27 |
| 7.4 Technical Assessment Summary | 27 |
| 8.0 Issues | 28 |
| 9.0 Recommendations and Follow-up Actions | 28 |
| 10.0 Protectiveness Statement..... | 28 |
| 11.0 Next Review | 29 |

List of Tables

| <u>Table</u> | <u>Page</u> |
|--|-------------|
| 1 - Chronology of Site Events | 2 |
| 2 - Modified Performance Standards for Groundwater | 11 |
| 3 - Actions Taken Since the Last Five-Year Review | 13 |
| 4 - 2014 Groundwater Contaminants of Concern at MBS Location | 18 |
| 5 – Issues | 28 |
| 6 – Recommendations and Follow-up Actions | 28 |

Attachments

| | |
|---|--|
| ATTACHMENT 1: Site Location Map | |
| ATTACHMENT 2: Site Layout Map – MKT Location | |
| ATTACHMENT 3: Site Layout Map – MBS Location | |
| ATTACHMENT 4: List of Documents Reviewed | |
| ATTACHMENT 5: MKT Location – 2014 Annual Groundwater Sampling Results Summary with Historical Data | |
| ATTACHMENT 6: MBS Location – 2014 Annual Groundwater Sampling Result Summary | |
| ATTACHMENT 7: Applicable or Relevant and Appropriate Requirements | |
| ATTACHMENT 8: Evaluation of Protectiveness of Groundwater Performance Standards | |

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 |
| 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 |
| TBC | To Be Considered |
| 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 properties located approximately two miles from each other: the McAdoo Kline Township (MKT) location in Kline Township, Pennsylvania and the McAdoo Blaine Street (MBS) location 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 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.

MKT Location (OU1)

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

MBS Location (OU2)

The remedy at the MBS location is protective of human health and the environment in the short term. All exposure pathways that could result in unacceptable risks are being controlled. Institutional controls are in place to prohibit the potable use of groundwater. However, in order for the remedy to be protective in the long term, an alternative groundwater remedy should be proposed to address remaining groundwater contamination more effectively than the current remedy.

Site-wide

Because the remedial actions at both OUs are protective, the site is protective of human health and the environment.

Government Performance Results Act (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: Current Human Exposure Controlled

Groundwater Migration: Groundwater Migration Under Control

Sitewide RAU: The site was designated ready for reuse on July 20, 2011.

Five-Year Review Summary Form

| SITE IDENTIFICATION | | |
|---|--|--|
| Site Name: McAdoo Associates Superfund Site | | |
| EPA ID: PAD980712616 | | |
| Region: 3 | State: PA | City/County: McAdoo and Kline Twp, Schuylkill |
| SITE STATUS | | |
| NPL Status: Final | | |
| Multiple OUs? Yes | Has the site achieved construction completion? Yes | |
| REVIEW STATUS | | |
| Lead agency: EPA If "Other Federal Agency" selected above, enter Agency name: Click here to enter text. | | |
| Author name: Brad White | | |
| Author affiliation: U.S. EPA Region 3 | | |
| Review period: October 2014 – June 2015 | | |
| Date of site inspection: November 17, 2014 | | |
| Type of review: Statutory | | |
| Review number: 5 | | |
| Triggering action date: July 12, 2010 | | |
| Due date (five years after triggering action date): July 12, 2015 | | |

Issues/Recommendations

OU without Issues/Recommendations Identified in the Five-Year Review:

OU1 MKT Location

Issues and Recommendations Identified in the Five-Year Review:

| | | | | |
|--------------------------------------|---|---------------------------|------------------------|-----------------------|
| OU2 MBS Location | Issue Category: Operations and Maintenance | | | |
| | Issue: The selected remedy, manual bailing of free product and groundwater monitoring, is not expected to be sufficient to achieve performance standards within a reasonable amount of time. | | | |
| | Recommendation: Prepare and issue a proposed plan for an amended groundwater remedy and issue a decision document to record the selected remedy. | | | |
| Affect Current Protectiveness | Affect Future Protectiveness | Implementing Party | Oversight Party | Milestone Date |
| No | Yes | EPA | EPA | June 2017 |

Protectiveness Statement – OU1

Protectiveness Determination:
Protective

Addendum Due Date (if applicable):
Click here to enter date.

Protectiveness Statement:

The remedy at the MKT location is determined to be protective of human health and the environment. 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. Infiltration 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 the remedial action objectives. Operation and maintenance of the landfill cap and sampling and monitoring of groundwater and surface water will continue.

Protectiveness Statement – OU2

Protectiveness Determination:
Protective in the Short Term

Addendum Due Date (if applicable):
Click here to enter date.

Protectiveness Statement:

The remedy at the MBS location is determined to be protective of human health and the environment in the short term. All exposure pathways that could result in unacceptable risks are being controlled. Institutional controls are in place to prohibit the potable use of groundwater. However, in order for the remedy to be protective in the long term, an alternative groundwater remedy should be proposed to address remaining groundwater contamination more effectively than the current remedy.

Five-Year Review Report

1.0 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 §121 states:

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 October 2014 through June 2015. This report documents the results of the review.

This is the fifth five-year review for the Site. The triggering action for this review is the signature date of the last five-year review, dated July 12, 2010. 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.

2.0 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 for 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 Further 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 |
| July 12, 2010 | Fourth Five Year Review signed |
| June 14, 2011 | Local ordinance issued for OU2 restricting groundwater use |
| December 20, 2011 | Addendum to 4 th Five Year Review issued |

3.0 Background

Section 3 provides a brief summary of the Site background. For more information, please refer to previous FYR Reports and documents that are contained in the Administrative Record for the Site.

3.1 Physical Characteristics

The McAdoo Associates Site consists of two Operable Units (OUs) located approximately two miles from each other: the McAdoo Kline Township (MKT) location, designated as OU1 and the McAdoo Blaine Street (MBS) location designated as OU2. Because both locations were operated as one facility involving the same ownership and waste, they were combined and collectively called the McAdoo Associates Site.

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.

3.2 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 (PADER) 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. It should be noted that historical coal mining operations also took place in the vicinity of the MBS location. Strip mining was conducted immediately to the north, and voids from deep mining of coal under the MBS location have been encountered during the installation of groundwater monitoring wells. The presence of coal seams underlying the MBS location has likely impacted the overall quality of groundwater in the shallow aquifer.

EPA entered into a Prospective Purchaser Agreement (PPA) with Albert P. Mertz for the MBS location on 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 storage shed on the property for his business to store equipment.

While there are no residents adjacent to the MKT location, those nearest to the Site rely on private wells for potable water. The closest residents to the MKT location are about 1,200 feet away and upgradient in terms of groundwater flow. Residents near the MBS location are provided with municipal 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. The direction of groundwater flow at the MBS location is to the north/northwest, away from the water supply well.

3.3 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 scored according to the Hazard Ranking System and was placed on the National Priorities List (NPL) in September 1983.

3.4 Initial Response

Response activities at the Site began in 1979 when the Pennsylvania Department of Environmental Resources (PADER, predecessor to the Pennsylvania Department of Environmental Protection) 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.

3.5 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 and organic contaminants in the mine pool groundwater underlying the Site and in the Site fill. In addition, a one-acre resin-like sheet resulting from a spill was located on the surface in the northern section of the Site and contained 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 on the contamination of soils and wastes. 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. 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 VOCs including benzene, ethylbenzene, and toluene; chlorinated solvents; PAHs; and phthalate esters.

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 PAHs, phthalate esters, and total xylenes.

In 1992, as part a focused feasibility study, EPA installed four 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.

4.0 Remedial Actions

In accordance with CERCLA and the NCP, the overriding goals for any remedial action are protection of human health and the environment and compliance with applicable or relevant and appropriate requirements (ARARs). A number of remedial alternatives were considered for the criteria specified in Section 300.430(e)(9)(iii) of the NCP.

4.1 Remedy Selection

Remedy selected for the MKT location

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 infiltration to the mine pool and wind dispersal.

Remedy selected for MBS location:

There were several documents that selected the remedy for the MBS location including an interim ROD for removal of tanks; a no action ROD; a ROD amendment in 1993 for additional groundwater work; and two ESDs in 1995 and 2009 to modify the selected remedy and to continue groundwater monitoring.

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.

Groundwater sampling for the MBS location was performed as part of a new Focused Feasibility Study (FFS) by EPA in the spring of 1993. The results of the 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 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).

After drilling extraction wells and conducting a pump test 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.

EPA issued a second ESD for the MBS location in December 2009 that contained 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 clarified 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 an alternative remediation technology for the remaining contamination. Until that time, the manual extraction and offsite treatment of contaminated groundwater and free product will occur on an annual basis.

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.

On September 30, 1991, EPA issued a ROD based on the results of the focused RI/FS completed. The ROD stated that no further actions beyond those already implemented at the MKT and MBS locations were required. At the same time 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.

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.

4.2 Remedy Implementation

MKT Location (OU1)

A remedial action work plan was developed in February 1987 and incorporated into the Consent Decree, which was signed on June 3, 1988, 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 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 facility. The cap construction was initiated on July 20, 1991 and completed on November 14, 1991. The cap consisted of 18 inches of select low permeability compacted soil, 24-inch thick layer of compacted soil, and 12 inches of topsoil. 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 PRPs 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)

EPA completed the excavation of contaminated soil and removal of USTs in March 1985. The tanks were purged prior to removal. 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 was issued in July 1986.

The wells required 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 semivolatile organic compounds were present in the monitoring wells located down gradient of the former tank location.

EPA contracted the US Army Corps of Engineers (USACE) to perform construction of the groundwater extraction and treatment system. 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 without the wells going dry. The RA at the MBS location was terminated at that time.

4.3 System Operation/Operation and Maintenance

4.3.1 MKT Location (OU1)

The Operations and Maintenance Plan was amended in June 1998 to expand the groundwater monitoring program. Subsequently, annual groundwater monitoring was initiated by the PRPs 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 2010 Five Year Review of the Site, EPA has received annual reports summarizing groundwater monitoring and landfill inspection events.

4.3.2 MBS Location (OU2)

Monitoring data indicated the presence of some constituents of gasoline and fuel oil, namely benzene and ethylbenzene, at concentrations above the performance standards. Following a review of the monitoring data, EPA issued a Final Close-Out Report (FCOR) in August 2001 and deleted the Site from the NPL in December 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 hand bailing of free product would be discontinued, but groundwater monitoring would continue.

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)). 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.

As a result, EPA issued a second ESD for the MBS location in December 2009 that established Institutional Controls; established a groundwater monitoring schedule; and modified the performance standards for groundwater. EPA resumed manual extraction and annual sampling after the 2009 ESD was issued.

Additionally, the 2009 ESD clarified 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 an alternative remediation technology for the remaining contamination. Until that time, the manual extraction and offsite treatment of contaminated

groundwater and free product will occur on an annual basis. The modified performance standards for groundwater are shown below.

Table 2 - 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.

Institutional Controls

Institutional controls in the form of a local ordinance were put in place on June 14, 2011. The local ordinance prohibits the drilling of new wells for a source of potable water or the use of existing wells for potable purposes. The ordinance is in place for the area surrounding the plume of groundwater contamination. All local residents and businesses are connected to a municipal drinking water supply.

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 conducted annually.

5.0 Progress Since the Last Five-Year Review

This is the fifth (5th) Five-Year review for the Site and has been prepared in accordance with EPA's Comprehensive Five-Year Review Guidance (June 2001). The statements on protectiveness from the 4th Five-Year Review are provided below:

MKT Location

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. Infiltration 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

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.

Table 3 - Actions Taken Since the Last Five-Year Review

| Issues | Recommendations/ Follow-up Actions | Party Responsible | Action Taken and Outcome | Date of Action |
|--|--|------------------------------|---|--------------------------------------|
| MKT Location | | | | |
| Presence of 1,4-dioxane in groundwater unknown. | Add 1,4-dioxane, at low level of detection, to list of analytes sampled for | PRP | 1,4-dioxane added to list of analytes; not detected above method detection level of 0.5 ug/l | May 13, 2011 |
| MBS Location | | | | |
| ICs identified in 2009 ESD not yet in place. | 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 | Local ordinance passed by McAdoo Borough prohibiting the drilling or use of private groundwater wells for potable purposes; ICs put into place. | June 14, 2011 |
| Potential for vapor intrusion not fully evaluated. | Complete vapor intrusion investigation as part of FFS | EPA | EPA completed two rounds of a vapor intrusion investigation at nearby residence; vapor intrusion determined to not be an issue. | August 31, 2010 November 16, 2010 |
| Presence of 1,4-dioxane in groundwater unknown. | Add 1,4-dioxane, at low level of detection, to list of analytes sampled for. | EPA | 1,4-dioxane added to list of analytes, not detected above method detection level of 0.5 ug/l | May 24, 2011 |

On December 20, 2011, EPA issued an Addendum to the 2010 Five-Year Review that addressed the issues and recommendations described above. In the Addendum, EPA revised the protectiveness statement, based on the outcomes of the actions taken, to the following:

EPA has completed all of the recommendations listed in the July 2010 Five Year Review. Based on the results of the vapor intrusion investigation (OU1), sampling for 1,4-dioxane (OU1 and 2), and implementation of institutional controls (OU1), EPA has determined the remedy is protective of human health and the environment.

5.1 MKT Location

The PRPs continued to conduct operation and maintenance activities at OU1, which consisted of annual site inspections, mowing, annual monitoring well, lysimeter, and surface water (Silverbrook Discharge) sampling, in accordance with the June 3, 1988 Consent Decree. During each inspection, the following components of the remedy were evaluated:

- General Site conditions (fencing and security control devices)
- Cover (vegetative cover, signs of erosion, possible subsidence)
- Stormwater control system (integrity of berms, accumulation of debris, erosion)
- Groundwater monitoring wells and lysimeters (locks, access, integrity of casing and soil plug)

An annual report following each event was submitted to EPA. EPA conducted oversight of sampling activities on multiple occasions during this reporting period. To implement the recommendations of the 2010 FYR, samples collected during the May 2011 annual groundwater monitoring event were analyzed for 1,4-dioxane. The analyte was not detected in the samples.

There were no significant issues identified during the operation and maintenance inspections during this review period. Minor issues identified on two separate occasions included isolated holes in the topsoil from burrowing animals that were subsequently addressed.

5.2 MBS Location

During this review period, EPA implemented the recommendations from the 2010 Five Year Review, and continued with annual groundwater monitoring and bailing of LNAPL from the wells (if present). EPA also completed a focused feasibility study (FFS) at the Site.

Implementation of 2010 Five Year Review Recommendations

EPA implemented the recommendations that were provided in the 2010 Five Year Review, as shown in Table 4 above. This included the collection of groundwater samples for analysis of 1,4-dioxane, conducting a vapor intrusion evaluation of nearby residents, and implementing institutional controls.

Groundwater sampling for 1,4-dioxane, which EPA considers to be an emerging contaminant, was conducted because of the historical presence of 1,1,1-trichloroethane. Sampling was conducted on May 24, 2011. 1,4-Dioxane was not detected above the method detection limit (0.5 ug/l).

The basis for the recommendation to conduct a vapor intrusion investigation was due to the concern for possible vapor intrusion of VOC's into homes in the vicinity of MBS location. While there are no homes or businesses overlying the groundwater plume, a home is close enough to warrant an evaluation. EPA conducted a vapor intrusion investigation in the house nearest the plume of contaminated groundwater that included a review of groundwater data and

two rounds of subslab soil vapor, indoor air, and outdoor air sampling. Twenty-four hour samples were collected on August 30-31, 2010, and again on November 15-16, 2010. Based on an evaluation of the analytical results and the risk assessment performed by Region 3 toxicologists, it is EPA's determination that vapor intrusion is not an issue at the MBS location.

The basis for the recommendation to implement institutional controls restricting well drilling and the potable use of groundwater near the MBS location was because there was no such restriction in place. While the local community is currently served with a municipal water supply, there was no legal mechanism preventing someone from drilling a well for potable use if they chose to. EPA worked with the McAdoo Borough Council to have a local ordinance passed to prohibit well drilling and the potable use of groundwater in a geographically-described area surrounding OU2. This local ordinance was signed by McAdoo Borough on June 14, 2011.

Following implementation of these recommendations, EPA issued an Addendum to the 2010 Five Year Review that determined the remedy to be protective of human health and environment.

Focused Feasibility Study

EPA recently completed a FFS that evaluated the use of in-situ remedial techniques that may be more effective at removing remaining groundwater contamination. The objectives of the FFS were to 1) fully characterize the remaining contamination at the MBS location, and 2) identify and evaluate alternative remedial alternatives. The FFS included a detailed review of the local geology, collection of subsurface soil samples, installation of additional groundwater monitoring wells, groundwater sampling, and an evaluation of remedial alternatives to address the groundwater contamination remaining at the MBS location. A pilot study was conducted as part of the FFS to evaluate the effectiveness of in-situ chemical oxidation (ISCO) and in-situ enhanced bioremediation technologies as potential methods to address the remaining groundwater contamination.

The ISCO pilot study included injecting activated sodium persulfate into one monitoring well, followed by a period of groundwater monitoring. Observations included significant decreases in concentrations of organic contaminants after the injection in some of the surrounding monitoring wells, followed by a rebound of contaminant concentrations. The ISCO pilot study demonstrated that there is some degree of hydraulic connectivity between wells on site, and activated sodium persulfate will degrade the organic contaminants of concern. For an ISCO approach to be successful, repeated rounds of injections into numerous wells would be required.

The enhanced bioremediation pilot study included injecting buffered ferric sulfate into four monitoring wells. Buffered ferric sulfate was selected to serve as an electron acceptor and enhance the existing microbiological community found to be present in the subsurface environment. The use of this compound is also thought to allow the formation of insoluble sulfide compounds following sulfate reduction, thereby reducing the concentrations of dissolved metals (including the COC manganese). The microbes present are capable of degrading the contaminants, and the addition of the buffered ferric sulfate increased the native microbial

population resulting in increased levels of anaerobic degradation of organic contaminants. Manganese concentrations also decreased in numerous wells following these injections.

The overall findings of the pilot studies were that monitoring wells influenced by both the ISCO injection and the enhanced bioremediation injection showed the greatest reduction of the organic contaminants. EPA anticipates issuing a proposed plan with a preferred alternative to address the remaining groundwater contamination in a more reasonable amount of time than the current remedy.

6.0 Five-Year Review Process

6.1 Administrative Components

The McAdoo Site Five-Year Review Team was led by Brad White (EPA Remedial Project Manager), with EPA technical support staff William McKenty (hydrogeologist), Jeff Tuttle (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.

Beginning in October 2014 and extending through June 2015, 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.

6.2 Community Involvement

Public Notice

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 31, 2015.

Community Interviews

The RPM spoke to the McAdoo Borough Secretary and Kline Township Supervisor on March 31, 2015. While there were some general questions regarding the status of the Site, they were unaware of any particular concern or questions the residents of their communities had about the Site.

6.3 Document Review

A complete list of documents reviewed can be found in Attachment 4. Documents reviewed in the process of conducting this five-year review included the previous Five-Year Review report and Addendum, historical EPA decision documents (RODs, ROD Amendments, and ESDs), Consent Decree, annual reports for the MKT location, and groundwater monitoring trip reports for the MBS location, among others.

6.4 Data Review

6.4.1 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, more commonly referred to as semi-volatile organic compounds). 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), consultant for the PRPs, 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 the consultant for the PRPs. For the purpose of this Five-Year Review, EPA reviewed the 2010, 2011, 2012, 2013, and 2014 Annual Reports. Information summarized in the Annual Reports includes the findings of the annual Site inspections and groundwater sampling analytical results.

The 2014 Annual Report indicated the only VOC to exceed its MCL concentration of 5 parts per billion (ppb) was 1,2-dichloropropane detected at a concentration of 54 ppb. The only inorganic compound to exceed its MCL of 4 ppm was beryllium detected at a concentration of 5.3 ppb. Both of these compounds were found in well MW-9, which is just downgradient from the Site and screened in the same mine pool that flows beneath the MKT location. TOC was detected in

MW-5 at a concentration of 2.4 ppm, which is a monitoring well located within the fenced area of the MKT location and is screened in the mine pool. TOC was detected in MW-9 at 1.0 ppm. TOX was measured in MW-2 (81 ppb), MW-5 (73 ppb), and MW-9 (57). Other VOCs detected at the MKT location at low concentrations 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.

In summary, 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.

6.4.2 MBS Location

For each of the annual groundwater sampling events, samples were collected from six of the seven original monitoring wells; the seventh well, the only shallow (less than 25 feet deep) monitoring well on the site, has remained dry. EPA also collected groundwater samples from the two wells installed during the FFS.

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. Concentrations of manganese in these wells have ranged from approximately 250 ug/L to 1,000 ug/L.

Maximum COC concentrations detected during the 2014 groundwater sampling event, along with their respective performance standards, are shown below.

Table 4 - 2014 Groundwater Contaminants of Concern at MBS Location

| Compound | Performance Standard (ug/l) | MCL (ug/l) | Maximum Detection (ug/l) | Well ID |
|----------------------------|-----------------------------|---------------|--------------------------|---------|
| Benzene | 5 | 5 | 68 | MW9 |
| 1,2-dichloroethane | 5 | 5 | Not detected* | MW1 |
| Ethylbenzene | 280 | 700 | 400 | MW7 |
| bis(2-ethylhexyl)phthalate | 6 | 6 | Not detected | NA |
| Manganese (total) | Background | Not available | 16,200 | MW9 |

*Analyte not detected above the detection limit. However, the detection limit was reported as 13 ug/l because the sample was diluted 2.5 times. The detection limit is higher than the performance standard.

It should be noted that solvents historically observed in the groundwater at the MBS location, such as 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 no longer detected. The anaerobic (lack of available oxygen) conditions in the groundwater are likely promoting the dissolution of manganese, which is naturally occurring at the MBS location. Once the VOC and SVOC contaminants are eliminated, conditions are likely to return to a more aerobic environment in which manganese (and other metals) will precipitate out of solution and allow concentrations to return to more normal background conditions.

During the FFS, compounds detected in groundwater samples were compared to risk-based screening levels. A number of compounds that are not current COCs were detected in at least one well at concentrations above the screening levels during the 2014 sampling event. Those compounds include the following:

- Isopropylbenzene
- Naphthalene
- 2-Methylnaphthalene
- 1,1'-Biphenyl
- Cadmium
- Cobalt
- Iron

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

6.5 Site Inspection

6.5.1 MKT Location

On November 17, 2014, EPA met with PADEP and Clean Sites to inspect 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. The surface water drainages appeared to be intact and were not clogged with debris. All monitoring wells and lysimeters appeared to be intact.

On May 28, 2015, EPA met with Clean Sites to oversee the annual groundwater monitoring event. Sampling was conducted in accordance with the decision documents and Consent Decrees. No breeches were identified in the fencing, and the gates were functional and locked. The surface water drainages appeared to be intact and were not clogged with debris. All monitoring wells and lysimeters appeared to be intact. Two shallow holes in the topsoil were observed near one lysimeter from burrowing animals; Clean Sites subsequently filled the holes the same day.

In summary, the site inspections 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.

6.5.2 MBS Location

On November 17, 2014, EPA met with PADEP to conduct the inspection of the MBS location. The MBS location is about ¼ acre of mixed gravel and grass, with a small equipment 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. Some of the monitoring wells were observed to not be fully secured (ie missing bolts for the protective caps and locking well caps). EPA's sampling contractor is addressing the protective measures for the wells. No change in usage of the property was identified.

7.0 Technical Assessment

7.1 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, 1995 ESD, and 2009 ESD at the MBS location.

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. 1,2-Dichloropropane is detected above the MCL in one monitoring well screened in the mine pool and has remained fairly stable over time. Bis(2-ethylhexyl) phthalate has remained undetected in Site monitoring wells above the

MCL since May 2007; this compound was detected in a sample from the Silverbrook Discharge in 2014 at a concentration of 21 ug/l, however it was not detected in a duplicate sample. Beryllium is only detected in one monitoring well screened in the mine pool at concentrations above the MCL; it is detected in concentrations below the MCL in other Site-related monitoring wells.

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, and institutional controls.

Free product is sporadically present in two monitoring wells (MW5 and MW7). During annual sampling and bailing events, it was noted as either a sheen or at a maximum thickness of 0.02 feet (November 2010) in MW5, and either a sheen or maximum thickness of 0.16 feet (August 2014) in MW7. Historically, free product has been encountered in MW5 at thicknesses greater than one foot. Dissolved contaminants in the wells have somewhat decreased since the 2010 Five-Year Review, though benzene and ethylbenzene are still present above the performance goals. Much of this reduction is likely attributable to the pilot study. Those wells influenced by both the ISCO and enhanced bioremediation pilot study show the greatest decrease of COC concentrations.

While bailing the free product in these wells has reduced the overall volume that accumulates in the wells, it is unclear how long it will take to completely eliminate the free product and associated residual dissolved contaminants from the groundwater. EPA is evaluating the alternatives in the FFS and plans to propose a preferred alternative and eventually revise the groundwater remedy.

Institutional Controls

MKT Location

The ICs specified in the 1988 and 1998 Consent Decrees (CD) have been implemented. 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” (ie remain on the deed in the case of property sale).

1998 CD

- A copy of the CD is to 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

The institutional controls specified in the 2009 ESD are in place. EPA worked with the McAdoo Borough Council to have a local ordinance passed to prohibit well drilling and the potable use of groundwater in a geographically-described area. This local ordinance was signed by McAdoo Borough on June 14, 2011.

Optimization Opportunities

MBS Location

As described earlier, EPA is evaluating remedial techniques that would restore the groundwater more efficiently than the current remedy. EPA demonstrated that a combined ISCO and enhanced bioremediation approach will reduce the levels of groundwater contaminants. Free product removal through the use of skimmers is also one of the remedial techniques evaluated in the FFS and may prove to be more effective than periodic hand bailing. A decision document will be issued if a modified remedy is deemed necessary.

7.2 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 (TBC)

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 soil to groundwater leaching criteria at the time. However, there is no need to reevaluate these criteria since the soil has been capped, and changes in the cleanup criteria would not affect the protectiveness of this remedy. The cap prevents direct contact and surface water infiltration; 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. The mine pool was not considered to be a source for potable water given the technical difficulties with treating the water, including significant pH adjustments and metals reduction.

MBS Location

Table 4 in Section 6.4.2 lists the groundwater cleanup standards that were set in the 2009 ESD. This table also lists the current MCLs or non-zero MCLGs for these chemicals. It is clear that the ESD standards would still meet these groundwater cleanup standards. If EPA determines a modification to the current remedy is necessary to allow for the remediation of contaminants present in groundwater in a timely manner, a complete risk evaluation of all contaminants present will be conducted.

The protectiveness of the groundwater standards is 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.

An ecological route of exposure that has taken on increased significance over the past several years is the groundwater to surface water discharge. Shallow groundwater under the MKT location is comprised largely of former underground mine workings that are now flooded and collectively make up the "mine pool," as discussed earlier. This mine pool is extensive and drains an area much larger than the MKT location. Where the mine pool discharges is called the Silverbrook Discharge, which effectively serves as the headwaters of the Little Schuylkill River. The upper reaches of the Little Schuylkill River have historically been severely impacted by acid mine drainage to point where they were largely devoid of aquatic life. The quality of water draining from the Silverbrook Discharge has generally improved over the years, but elevated levels of some metals remain. While the groundwater moving through the

MKT location drains into the minepool, it is being mixed with massive quantities of water impacted from the former mine workings, making it difficult to determine the exact source of contaminants.

EPA will continue to monitor the performance of the remedy at the MKT location, including the integrity of the cap. Lysimeters are used to determine if rainwater or surface water infiltrates through the cap. If infiltration is suspected, additional sampling at the Silverbrook Discharge may be necessary to ensure contaminants are not leaching from the soil beneath the cap and discharged to surface water.

MBS Location

Since the original decision documents, a sewage pumping station has been installed near, and an equipment storage shed has been constructed on, the MBS location. The storage shed is not continuously occupied workers or residents. Institutional controls are in place for the MBS location.

There is a small surface water body located adjacent to the MBS location (referred to locally as Hunky Dory Creek). In 2007, EPA surveyed the elevation of the creek in relation to the water table in nearby monitoring wells and determined the creek is a “losing stream”, meaning groundwater does not discharge to the creek. Rather, the stream discharges to groundwater, so there is no groundwater to surface water discharge pathway at 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. There are no buildings within 100 feet of the groundwater containing VOCs so there is no need to evaluate the potential for vapor intrusion at this time.

MBS Location

Subsurface VOCs are present at the MBS location, and a residential vapor intrusion investigation was completed. Vapor intrusion was determined to not be occurring at the MBS location.

Are there newly identified contaminants or contaminant sources?

Groundwater at both the MKT and MBS locations was analyzed for 1,4-dioxane and it was not present above the instrument detection limit of 0.5 ug/l. EPA sampled for 1,4-dioxane because, as a solvent stabilizer, it 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 Site. 1,4-dioxane is of particular concern because it is not addressed by many of the cleanup methods that treat solvent VOCs.

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 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 condition, 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, measured concentrations in surface water result in a Hazard Quotient (HQ) of less than 1. EPA considers a HQ below 1 to be 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.

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. EPA did conduct subsurface soil sampling during the FFS. Based on the soil sampling conducted during the FFS, and a review of historical sampling, there does not appear to be any significant contamination remaining in the soil. Soil borings were advanced to refusal, the deepest of which was 26 feet. Sample locations were selected based on the use of a laser-induced fluorescence (LIF) probe attached to a direct-push device. VOCs and SVOCs were only detected in one sample at a depth of 26-28 feet in the vicinity of monitoring well MW-5 and were consistent with diesel- and gasoline-range organics. This well periodically contains free product; the water table in the vicinity of this well is typically around 28 feet. The residual VOCs detected in the soil sample near this well appear to be related to the contamination present in groundwater.

Groundwater: Groundwater cleanup standards were set in the 2009 ESD. As established, those performance standards would be protective when reached (See Attachment 8). The 2014 groundwater data show that most of these standards have not yet been reached. A review of the 2014 groundwater data also show that additional compounds exceeded RSLs. The completed FFS 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 risk methodology was used to determine protectiveness and to screen recent monitoring data (see Attachment 8).

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 infiltrate 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 for soil were not identified. Performance standards were established for groundwater, and the concentrations of contaminants have generally declined; some contaminants are no longer detected.

The groundwater performance standards will be protective when reached. The 2014 groundwater data show that these standards have been reached for 1,2-dichloroethane and bis(2-ethylhexyl)phthalate, but not for benzene, ethylbenzene, or manganese. A review of the 2014 groundwater data also show that additional compounds, including isopropylbenzene, naphthalene, 2-methylnaphthalene, and 1,1-biphenyl exceeded RSLs. The completed FFS will enable a reconsideration of the groundwater cleanup.

7.3 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.

7.4 Technical Assessment Summary

According to the data reviewed and the Site inspections, the remedy is functioning as intended by the decision documents. There have been no changes in the physical conditions at either the MKT location or the MBS location 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, and institutional controls are in place.

8.0 Issues

Table 5 – Issues

| Issues | Affects Current Protectiveness (Y/N) | Affects Future Protectiveness (Y/N) |
|--|--------------------------------------|-------------------------------------|
| OU2 - MBS Location | | |
| 1. The selected remedy, manual bailing of free product and groundwater monitoring, is not expected to be sufficient to achieve performance standards within a reasonable amount of time. | No | Yes |

9.0 Recommendations and Follow-up Actions

Table 6 – Recommendations and Follow-up Actions

| Issue | Recommendations and Follow-up Actions | Party Responsible | Oversight Agency | Milestone Date | Affects Protectiveness (Y/N) | |
|-------|--|-------------------|------------------|----------------|------------------------------|--------|
| | | | | | Current | Future |
| 1. | Prepare and issue a proposed plan for an amended groundwater remedy and issue a decision document to record the selected remedy. | EPA | EPA | 6/30/17 | No | Yes |

10.0 Protectiveness Statement

MKT Location (OU1)

The remedy at the MKT location is determined to be protective of human health and the environment. Exposure pathways that could result in unacceptable risks are being controlled, and institutional controls are in place. Infiltration of surface water through contaminated soil has been eliminated by the protective cap, and current data indicate that the remedy is functioning as required to achieve the RAOs. Operation and maintenance of the landfill cap and sampling and

monitoring of groundwater and surface water will continue.

MBS Location (OU2)

The remedy at the MBS location is determined to be protective of human health and the environment in the short term. All exposure pathways that could result in unacceptable risks are being controlled. Institutional controls are in place to prohibit the potable use of groundwater. However, in order for the remedy to be protective in the long term, an alternative groundwater remedy should be proposed to address remaining groundwater contamination more effectively than the current remedy.

Site-wide

Because the remedial actions at both OUs are protective, the site is protective of human health and the environment.

11.0 Next Review

The next FYR will be due within five years of the signature/approval date of this FYR.

Attachment 1: Site Location Map

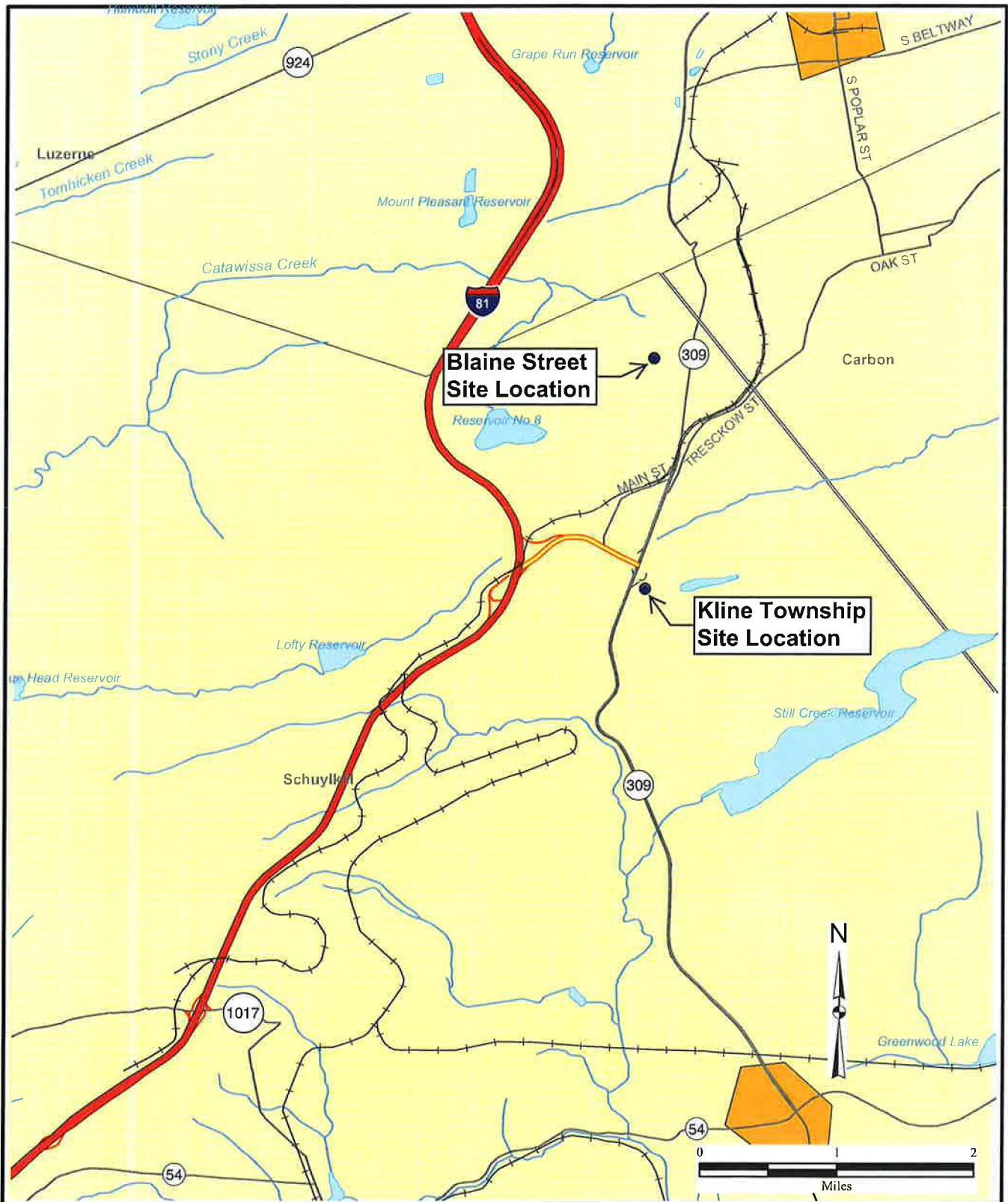


Figure 2.1
Site Location



Attachment 2: Site Layout Map, MKT Location

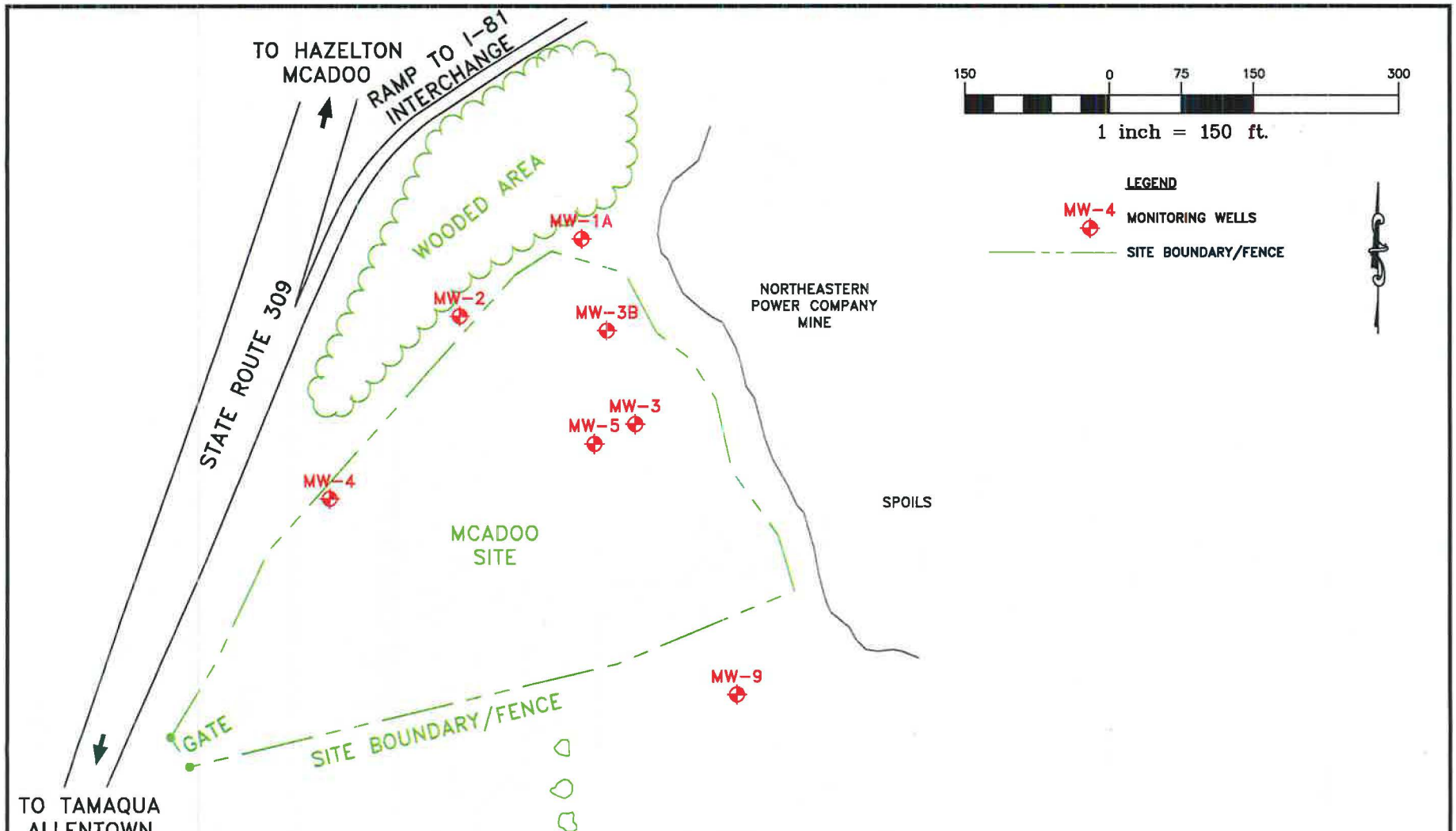



FIGURE 2
 MONITORING WELL LOCATION MAP
 MCADOO ASSOCIATES SITE
 MCADOO, PENNSYLVANIA

| | | | |
|-----------|-----------|-------|-----------|
| 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

Figure 1.2
Site Layout

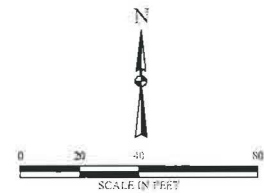


Legend

- Monitoring Well
- Soil Boring
- Parcel Boundary

Aerial Photo Date: 2008

Notes:
MW-10 and MW-11 were drilled in May 2010 at the same time as MW-8 and MW-9. However, these borings were dry and were not completed as monitoring wells.



Y:\McAdoo\F1070_27Remedial_Alternative_Screening_Docs\Site_Layout.mxd
10/23/10 CNL
Map Source: HGL GIS Database



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.
Five-Year Review Report, McAdoo Associates Site, U.S. EPA Region III, July 11, 2010.
2010 Annual Report, McAdoo Associates Site (Kline Township Location), Clean Sites Environmental Services, Inc., September.
Trip Report for 2010 Vapor Intrusion Sampling Events, McAdoo Associates OU2, Hydrogeologic Inc., February 15, 2011.
Dawn Ioven. "Vapor Intrusion Sampling, McAdoo." Email to Brad White. March 17, 2011.
Patricia Flores. "Vapor Intrusion Sampling, McAdoo, Amendment." Email to Brad White. March 22, 2011.
2011 Annual Report, McAdoo Associates Site (Kline Township Location), Clean Sites Environmental Services, Inc., October.
Five-Year Review Report Addendum, McAdoo Associates Site, U.S. EPA Region III, December 20, 2011.
2012 Annual Report, McAdoo Associates Site (Kline Township Location), Clean Sites Environmental Services, Inc., October.
2013 Annual Report, McAdoo Associates Site (Kline Township Location), Clean Sites Environmental Services, Inc., July.
Revised Draft Focused Feasibility Study Report, McAdoo Associates Blaine Street Site, Hydrogeologic, Inc., December 2013.
2014 Annual Report, McAdoo Associates Site (Kline Township Location), Clean Sites Environmental Services, Inc., November.

**ATTACHMENT 5: MKT Location – 2014 Annual Groundwater Sampling Results
Summary with Historical Data**

Table 1A
May 2014 Field Measurements Summary
McAdoo Associates Site

| Sampling Location | Volumes | Field Measurement Parameter | During Well Evacuation | | |
|-----------------------|--|---|------------------------|--------------|--------|
| | | | Initial | Intermediate | Ending |
| MW-1A | Standing Water (gal.) – 23 Actual Evacuation (gal.) – 69 | Temperature (°C) | 12.2 | 11.4 | 11.4 |
| | | Spec. Conductivity (umHOS/cm ²) | 1,944 | 2,039 | 2,074 |
| | | pH (Standard Units) | 4.82 | 4.79 | 4.80 |
| MW-2 | Standing Water (gal.) – 74 Actual Evacuation (gal.) - 222 | Temperature (°C) | 11.9 | 12.5 | 12.1 |
| | | Spec. Conductivity (umHOS/cm ²) | 1,470 | 1,636 | 1,789 |
| | | pH (Standard Units) | 4.39 | 4.56 | 4.87 |
| MW-3 | Standing Water (gal.) – 3 Actual Evacuation (gal.) – 0 (no purge) | Temperature (°C) | -- | -- | 11.4 |
| | | Spec. Conductivity (umHOS/cm ²) | -- | -- | 321.1 |
| | | pH (Standard Units) | -- | -- | 4.87 |
| MW-3B | Standing Water (gal.) – 7 Actual Evacuation (gal.) – 14 (dry) | Temperature (°C) | 12.9 | 11.6 | 11.5 |
| | | Spec. Conductivity (umHOS/cm ²) | 1,658 | 1,549 | 1,621 |
| | | pH (Standard Units) | 4.81 | 4.86 | 4.84 |
| MW-4 | Standing Water (gal.) – 14 Actual Evacuation (gal.) – 19 (dry) | Temperature (°C) | 12.9 | 12.0 | 12.3 |
| | | Spec. Conductivity (umHOS/cm ²) | 2,652 | 1,877 | 2,790 |
| | | pH (Standard Units) | 4.79 | 5.25 | 4.95 |
| MW-5 | Standing Water (gal.) – 13 Actual Evacuation (gal.) – 39 | Temperature (°C) | 12.4 | 12.2 | 12.0 |
| | | Spec. Conductivity (umHOS/cm ²) | 443.0 | 429.1 | 423.3 |
| | | pH (Standard Units) | 5.54 | 6.05 | 6.07 |
| MW-9 | Standing Water (gal.) – 13 Actual Evacuation (gal.) – 39 | Temperature (°C) | 13.1 | 13.0 | 13.0 |
| | | Spec. Conductivity (umHOS/cm ²) | 307.5 | 338.6 | 344.0 |
| | | pH (Standard Units) | 4.82 | 4.43 | 4.32 |
| Silverbrook Discharge | -- | Temperature (°C) | -- | -- | 11.0 |
| | | Spec. Conductivity (umHOS/cm ²) | -- | -- | 455.1 |
| | | pH (Standard Units) | -- | -- | 4.61 |

Table 1B
June 2014 Field Measurements Summary
McAdoo Associates Site

| Sampling Location | Volumes | Field Measurement Parameter | During Well Evacuation | | |
|-----------------------|--|---|------------------------|--------------|--------|
| | | | Initial | Intermediate | Ending |
| MW-2 | Standing Water (gal.) – 73 Actual Evacuation (gal.) – 219 | Temperature (°C) | 12.9 | 13.6 | 13.6 |
| | | Spec. Conductivity (umHOS/cm ²) | 982 | 1,116 | 1,656 |
| | | pH (Standard Units) | 5.50 | 6.01 | 5.51 |
| Silverbrook Discharge | -- | Temperature (°C) | -- | -- | 13.0 |
| | | Spec. Conductivity (umHOS/cm ²) | -- | -- | 378.1 |
| | | pH (Standard Units) | -- | -- | 5.87 |

Table 2
May/June 2014 Analytical Summary
McAdoo Associates Site

| PARAMETER | SAMPLE ID | | | | | | | | | | | | |
|---------------------------------------|-----------|--------|---------------------|--------|--------|--------|-------|--------|--------|--------|-------------------|-------|-------|
| | MW-1A | MW-2 | MW-2 ⁽²⁾ | MW-3 | MW-3B | MW-4 | MW-5 | MW-9 | SD | SD-1 | SD ⁽²⁾ | RB-1 | TB-1 |
| Total Organic Carbon (ppm) | NA | 0.57 J | NA | NA | NA | NA | 2.4 | 1.0 | 0.69 J | 0.47 J | NA | NA | NA |
| Total Organic Halides (ppb) | NA | 81 | NA | NA | NA | NA | 73 | 57 | ND | ND | NA | NA | NA |
| Total Cyanide (ppb) | ND | ND | NA | 3.9 J | ND | ND | ND | ND | NA | NA | NA | NA | NA |
| TCL VOCs⁽¹⁾ (ppb) | | | | | | | | | | | | | |
| 1,1,1-Trichloroethane | ND | ND | NA | ND | ND | ND | 7.1 | 22 | NA | NA | NA | ND | ND |
| 1,1-Dichloroethane | ND | ND | NA | ND | ND | ND | 12 | ND | NA | NA | NA | ND | ND |
| 1,1-Dichloroethene | ND | ND | NA | ND | ND | ND | 3.2 J | ND | NA | NA | NA | ND | ND |
| 1,2-Dichloropropane | ND | ND | NA | ND | ND | ND | ND | 54 | NA | NA | NA | ND | ND |
| Methylene Chloride | ND | 1.6 J | NA | ND | 1.3 J | 1.2 J | 1.5 J | 1.2 J | NA | NA | NA | 1.5 J | 1.7 J |
| 1,1,2-Trichloro-1,1,2-Trifluoroethane | ND | ND | NA | ND | ND | ND | ND | 2.7 J | NA | NA | NA | ND | ND |
| BNAs⁽¹⁾ (ppb) | | | | | | | | | | | | | |
| Acenaphthene | NA | 1.8 J | ND | NA | NA | NA | ND | ND | ND | 0.75 J | ND | NA | NA |
| Bis(2-Ethylhexyl) Phthalate | NA | ND | ND | NA | NA | NA | ND | ND | 21 | ND | ND | NA | NA |
| Carbazole | NA | 0.29 J | ND | NA | NA | NA | ND | ND | ND | ND | ND | NA | NA |
| Dibenzofuran | NA | 0.96 J | ND | NA | NA | NA | ND | ND | ND | ND | ND | NA | NA |
| 2,4-Dimethylphenol | NA | ND | ND | NA | NA | NA | ND | ND | ND | 3.4 J | ND | | |
| Fluorene | NA | 0.79 J | ND | NA | NA | NA | ND | ND | ND | 0.30 J | ND | NA | NA |
| 2-Methylphenol | NA | ND | ND | NA | NA | NA | ND | ND | ND | 3.2 J | ND | | |
| Methylphenol, 3 & 4 | NA | ND | ND | NA | NA | NA | ND | ND | ND | 13 | ND | | |
| 2-Methylnaphthalene | NA | 2.1 | ND | NA | NA | NA | ND | ND | ND | ND | ND | NA | NA |
| Naphthalene | NA | 18 | ND | NA | NA | NA | ND | ND | ND | 3.2 | ND | NA | NA |
| Phenol | NA | ND | ND | NA | NA | NA | ND | ND | ND | 8.3 J | ND | | |
| Phenanthrene | NA | 0.63 J | ND | NA | NA | NA | ND | ND | ND | ND | ND | NA | NA |
| Metals⁽¹⁾ (ppb) | | | | | | | | | | | | | |
| Beryllium | 2.0 J | 2.1 J | NA | 1.6 J | 1.4 J | 3.1 J | ND | 5.3 | NA | NA | NA | NA | NA |
| Cadmium | 1.3 J | 1.3 J | NA | 0.23 J | 1.0 J | 2.5 J | ND | 0.79 J | NA | NA | NA | NA | NA |
| Chromium | ND | 1.3 J | NA | ND | ND | 1.3 J | 1.3 J | 3.5 J | NA | NA | NA | NA | NA |
| Cobalt | 22 J | 19 J | NA | 120 | 49 J | 31 J | 320 | 99 | NA | NA | NA | NA | NA |
| Nickel | 34 J | 35 J | NA | 49 | 32 J | 65 | 24 J | 100 | NA | NA | NA | NA | NA |
| Lead | 2.2 J | 4.3 J | NA | 2.8 J | ND | ND | ND | 3.5 J | NA | NA | NA | NA | NA |
| Silver | 0.36 J | ND | NA | ND | 0.42 J | 0.60 J | ND | ND | NA | NA | NA | NA | NA |
| Zinc | 150 | 160 | NA | 130 | 140 | 210 | 27 | 290 | NA | NA | NA | NA | NA |

Notes:

(1) Only compounds that were detected are presented.

(2) Locations were resampled on June 24, 2014 to confirm previous BNA detections.

ND = Non-detect.

J = Value is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

B = The associated method blank contains the target analyte at a reportable level.

NA = Not Analyzed.

SD = Silverbrook Discharge.

SD-1 = Silverbrook Discharge Duplicate.

TB = Trip Blank.

RB-1 = Rinse Blank.

Shaded values exceed their respective MCL.

Table 3
Summary of Post-Closure Monitoring Results
September 1992 through June 2014
McAdoo Associates Site

| Parameter | Total Organic Carbon (TOC), ppm | | | | | Total Organic Halides (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 | |
| May-10 | NA | 1.8 | 1.6 | 0.76 J | 0.48 J | NA | 454 | 22.9 J | 41.2 | 182 | |
| May-11 | NA | 0.43 J | 2.0 | 0.70 J | 0.41 J | NA | 370 | 50.0 | 120 | 48 | |
| May-12 | NA | 0.57 J | 1.0 | 0.77 J | 0.45 J | NA | 67 | 31.0 | 30 | 14 | |
| May-13 | NA | 0.53 J | 1.4 | 0.70 J | 0.43 J | NA | 14 | 11.0 | 50 | 4.3 J | |
| May-14 | NA | 0.57 J | 2.4 | 1.0 | 0.69 J | NA | 81 | 73 | 57 | ND | |

Table 3 (continued)
Summary of Post-Closure Monitoring Results
September 1992 through June 2014
McAdoo Associates Site

| 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 | ND | NA | 3.0 | 10.0 | 5.0 | 4.0 |
| Mar-93 | ND | 2.0 | ND | ND | ND | ND | ND | 1.0 | 2.0 | ND | ND |
| Sep-93 | ND | 3.0 | 2.0 | ND | ND | ND | 3.0 | 4.0 | 2.0 | 3.0 | 2.0 |
| Mar-94 | ND | ND | ND | ND | ND | ND | 7.0 | 3.0 | 9.0 | 4.0 | 7.0 |
| Oct-94 | NA | ND | ND | ND | ND | ND | NA | ND | 3.0 | 3.0 | 2.0 |
| Apr-95 | NA | ND | ND | ND | ND | ND | NA | ND | ND | ND | ND |
| Oct-95 | NA | ND | 1.0 | 1.0 | ND | ND | NA | ND | 1.0 | 1.0 | ND |
| Apr-96 | NA | ND | ND | ND | ND | ND | NA | ND | ND | ND | ND |
| Nov-96 | NA | ND | ND | ND | ND | ND | NA | ND | ND | ND | ND |
| Apr-97 | NA | ND | ND | ND | ND | ND | NA | ND | ND | ND | ND |
| Oct-97 | NA | ND | ND | ND | ND | ND | NA | ND | ND | ND | ND |
| Oct-98 | NA | ND | ND | ND | ND | ND | NA | ND | ND | ND | ND |
| Jul-99 | NA | ND | ND | ND | ND | ND | NA | ND | ND | ND | ND |
| Jul-00 | NA | ND | ND | ND | ND | ND | NA | ND | ND | ND | ND |
| May-01 | NA | ND | ND | ND | ND | ND | NA | ND | ND | ND | ND |
| May-02 | NA | ND | ND | ND | ND | ND | NA | 6.9 J | ND | ND | 6.7 J |
| May-03 | NA | ND | ND | ND | ND | ND | NA | ND | ND | ND | ND |
| May-04 | NA | ND | ND | ND | ND | ND | NA | 1.3 J | ND | 2.3 J | 1.9 J |
| May-05 | NA | ND | ND | ND | ND | ND | NA | ND | ND | ND | ND |
| May-06 | NA | ND | ND | ND | ND | ND | NA | ND | ND | ND | ND |
| May-07 | NA | ND | ND | ND | ND | ND | NA | ND | ND | ND | ND |
| May-08 | NA | ND | ND | ND | ND | ND | NA | ND | ND | ND | ND |
| May-09 | NA | ND | ND | ND | ND | ND | NA | ND | ND | ND | ND |
| May-10 | NA | ND | ND | ND | ND | ND | NA | ND | ND | ND | ND |
| May-11 | NA | ND | ND | ND | ND | ND | NA | ND | ND | ND | ND |
| May-12 | NA | ND | ND | ND | ND | ND | NA | ND | ND | ND | ND |
| May-13 | NA | ND | ND | ND | ND | ND | NA | ND | ND | ND | ND |
| May-14 | NA | ND | ND | ND | ND | ND | NA | ND | ND | ND | ND |

Table 3 (continued)
Summary of Post-Closure Monitoring Results
September 1992 through June 2014
McAdoo Associates Site

| 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 | |
| May-10 | NA | ND | ND | ND | ND | NA | ND | ND | ND | ND | |
| May-11 | NA | ND | ND | ND | ND | NA | ND | ND | ND | ND | |
| May-12 | NA | ND | ND | ND | ND | NA | ND | ND | ND | ND | |
| May-13 | NA | ND | ND | ND | ND | NA | ND | ND | ND | ND | |
| May-14 | NA | ND | ND | ND | ND | NA | ND | ND | ND | ND | |

Table 3 (continued)
Summary of Post-Closure Monitoring Results
September 1992 through June 2014
McAdoo Associates Site

| Parameter | 1,2-Dichloropropane, ppb | Beryllium, ppb | | | | | | |
|-----------|--------------------------|----------------|--------|--------|--------|--------|---------|-------|
| | | Location | MW-1A | MW-2 | MW-3 | MW-3B | MW-4 | MW-5 |
| Date | MW-9 | | | | | | | |
| 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 |
| May-10 | 56 | 1.9 J | 1.9 J | 1.3 J | 1.3 J | 1.3 J | ND | 5.1 |
| May-11 | ND | 2.2 J | 2.3 J | 1.7 J | 1.9 J | 2.6 J | 0.29 J | 5.8 |
| May-12 | 26 | 2.1 JB | 2.1 JB | 1.7 JB | 1.8 JB | 2.5 JB | 0.63 JB | 5.6 B |
| May-13 | 63 | 2.0 J | 2.1 J | 1.7 J | 1.5 J | 2.2 J | 0.32 J | 5.5 |
| May-14 | 57 | 2.0 J | 2.1 J | 1.6 J | 1.4 J | 3.1 J | ND | 5.3 |

Notes:

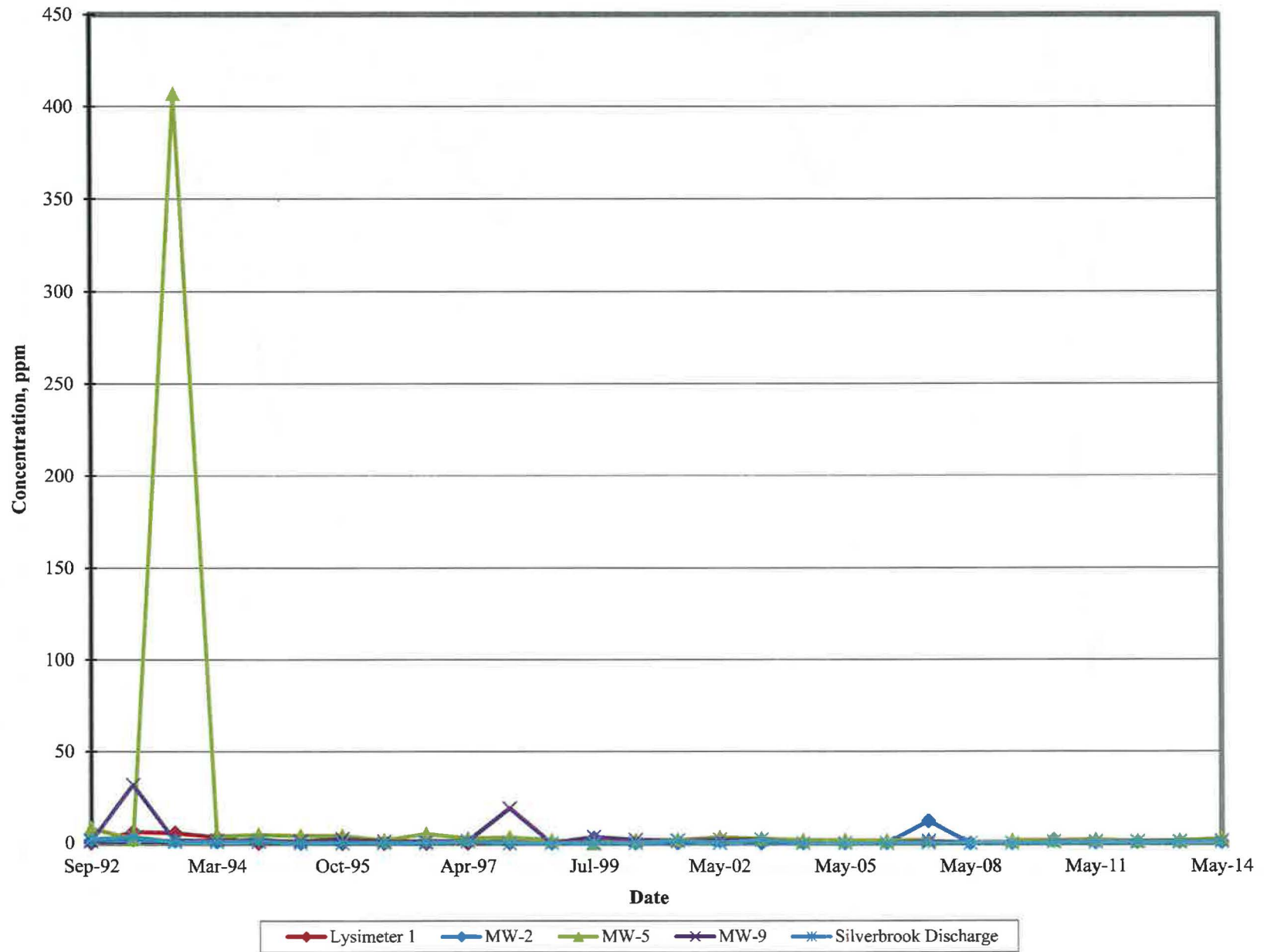
J = Value is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

B = The associated method blank contains the target analyte at a reportable level.

NA = Not Analyzed.

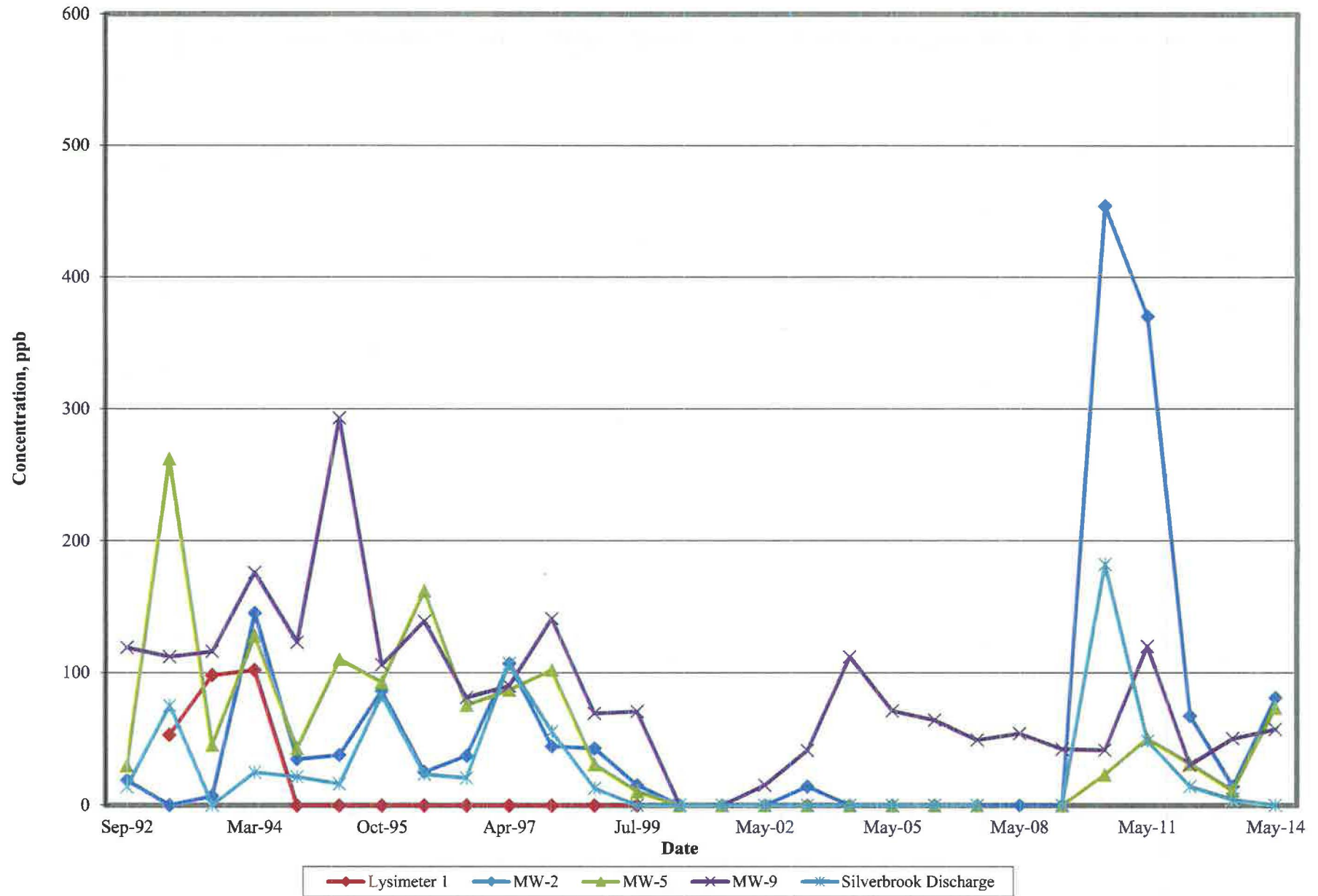
ND = Non-Detect.

Figure 3
Total Organic Carbon (TOC) Concentration Versus Time



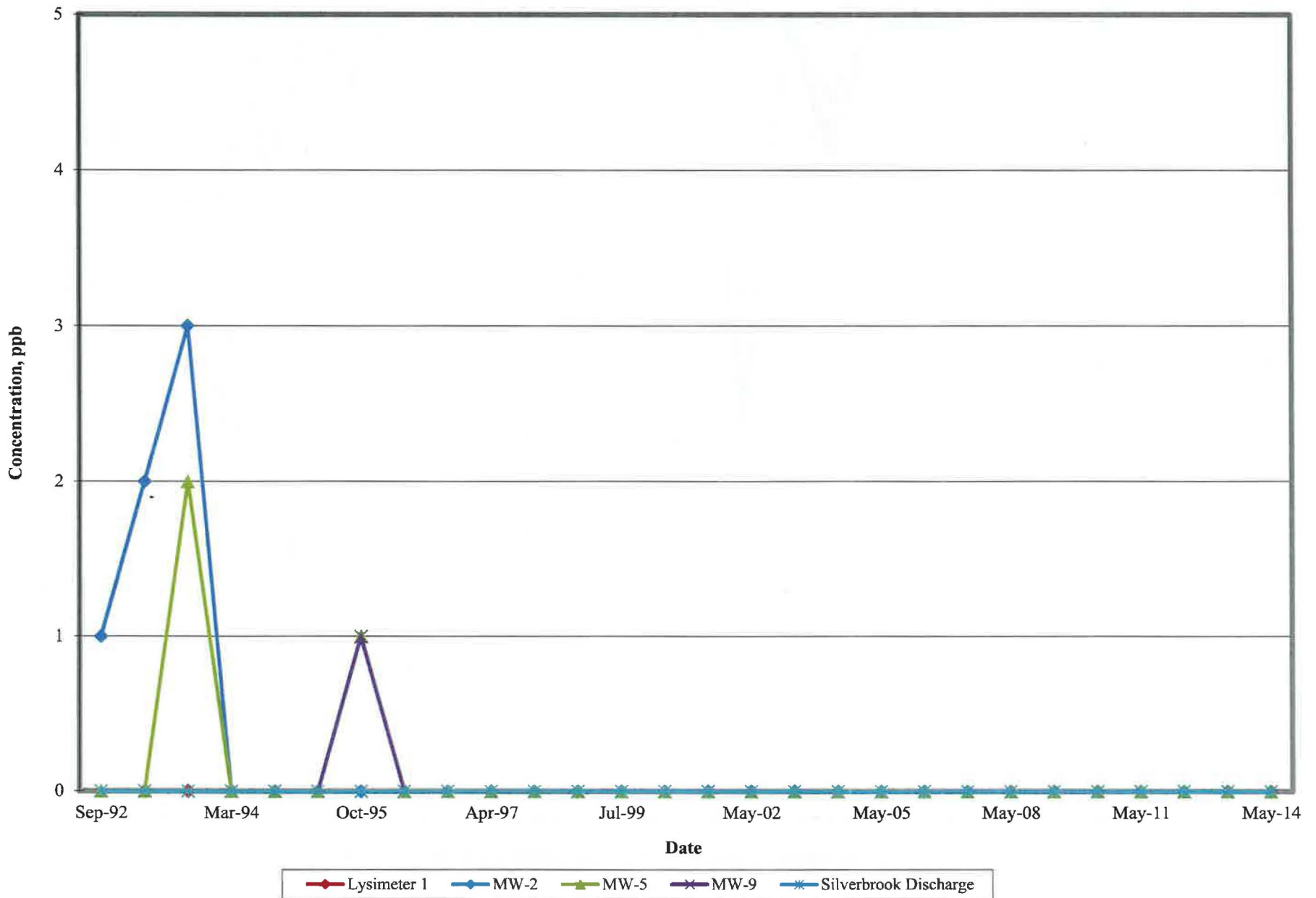
McAdoo Associates Site
Post-Closure Groundwater Monitoring

Figure 4
Total Organic Halides (TOX) Concentration Versus Time



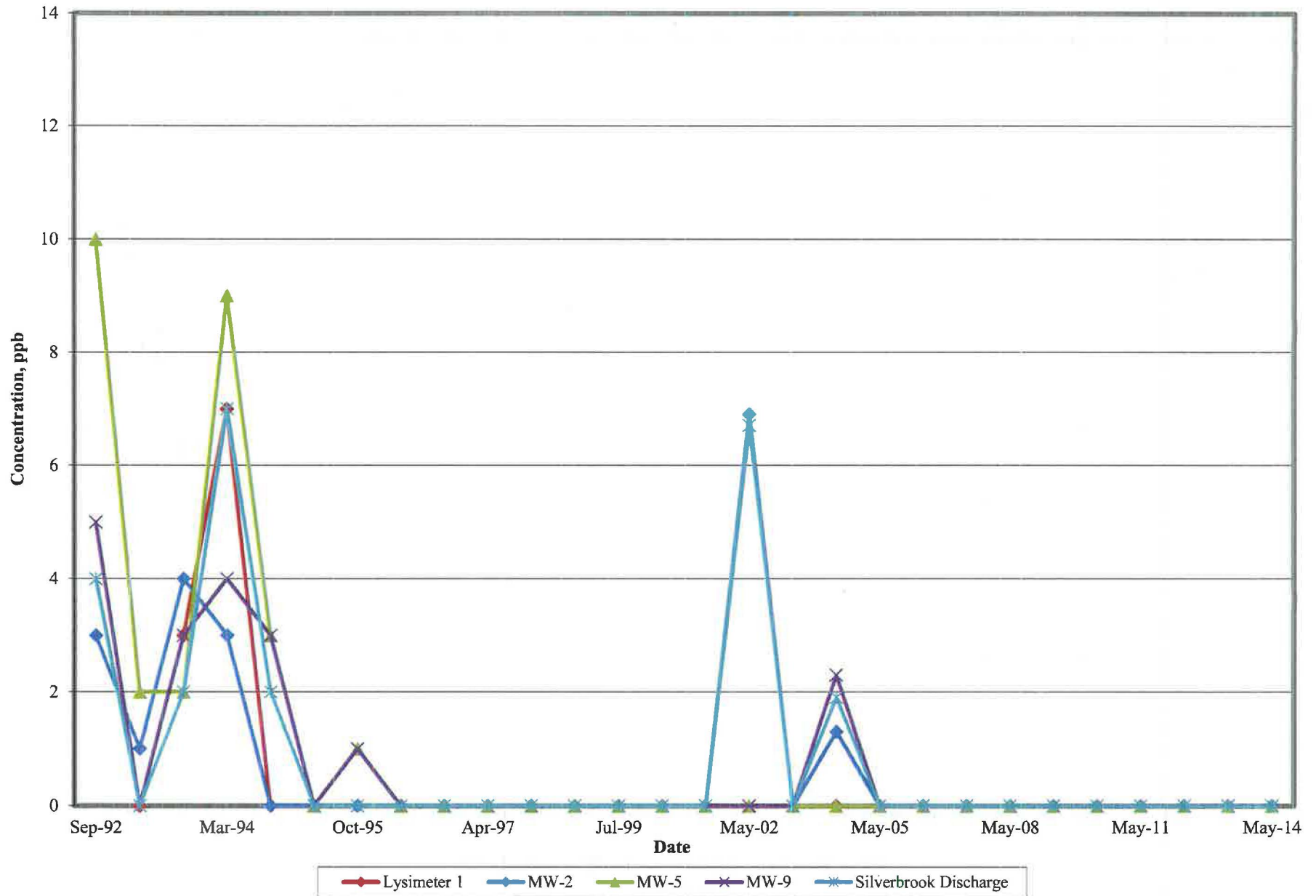
McAdoo Associates Site
Post-Closure Groundwater Monitoring

Figure 5
Diethylphthalate Concentration Versus Time



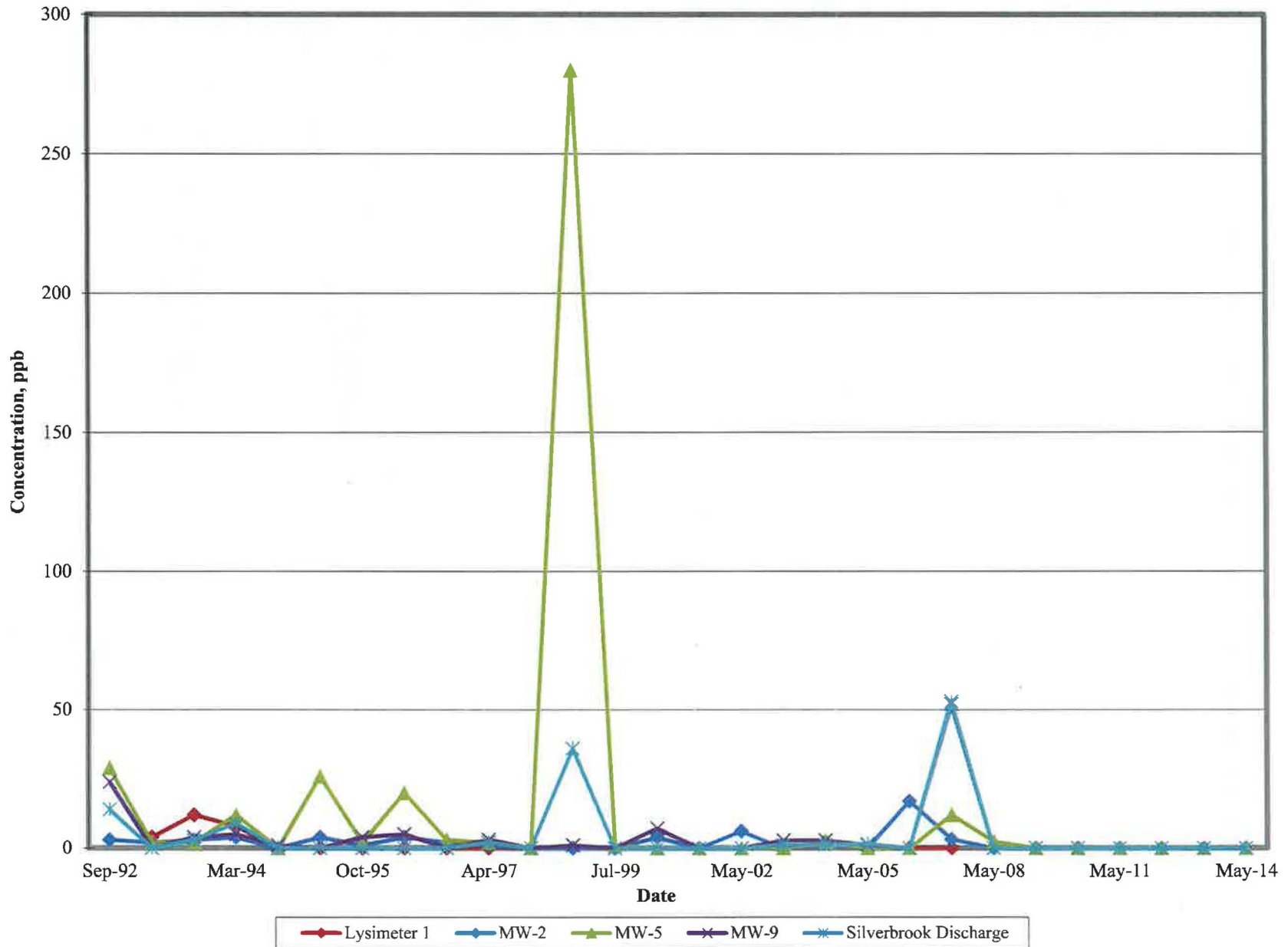
McAdoo Associates Site
Post-Closure Groundwater Monitoring

Figure 6
Di-n-butylphthalate Concentration Versus Time



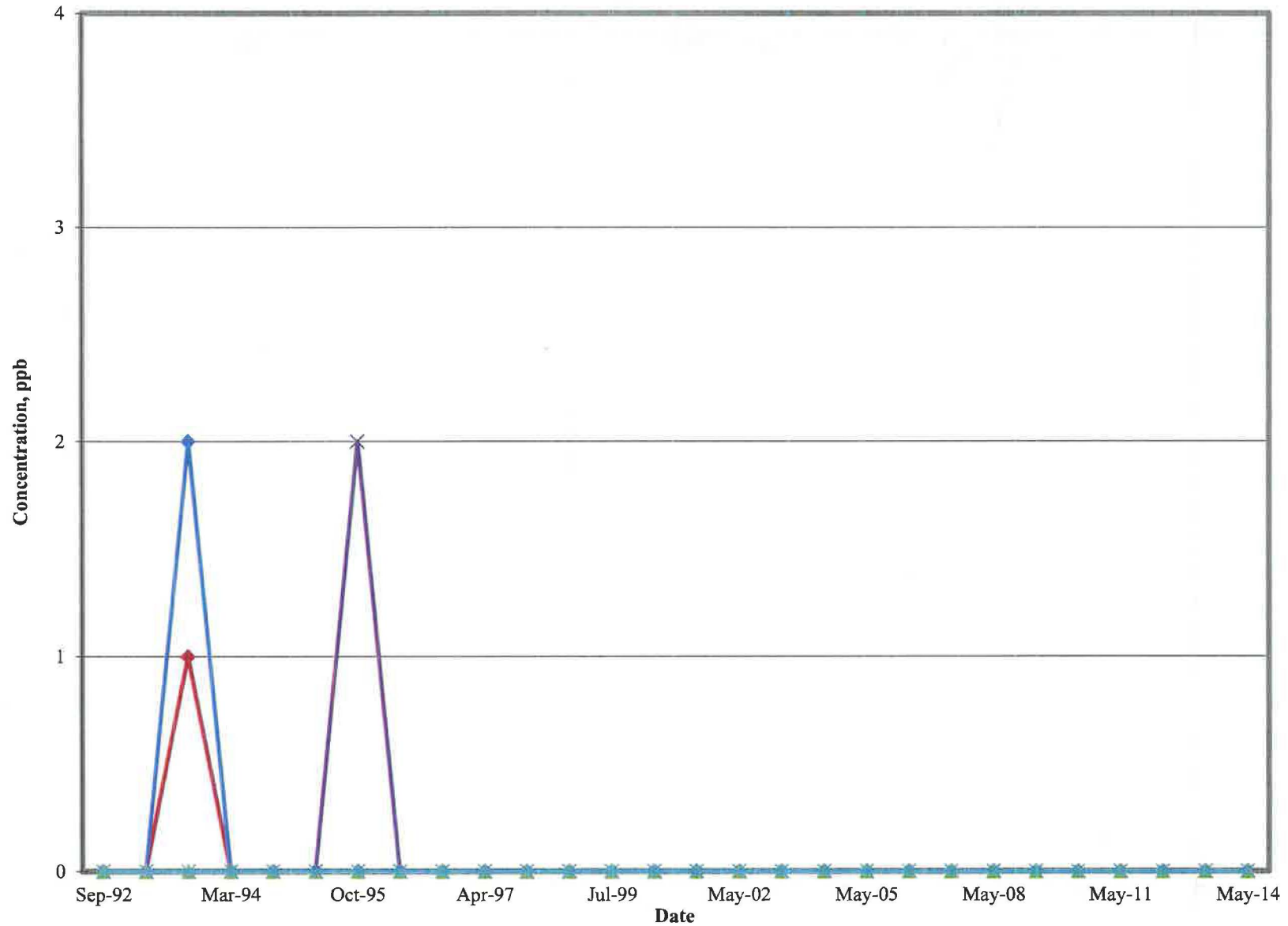
McAdoo Associates Site
Post-Closure Groundwater Monitoring

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



McAdoo Associates Site
Post-Closure Groundwater Monitoring

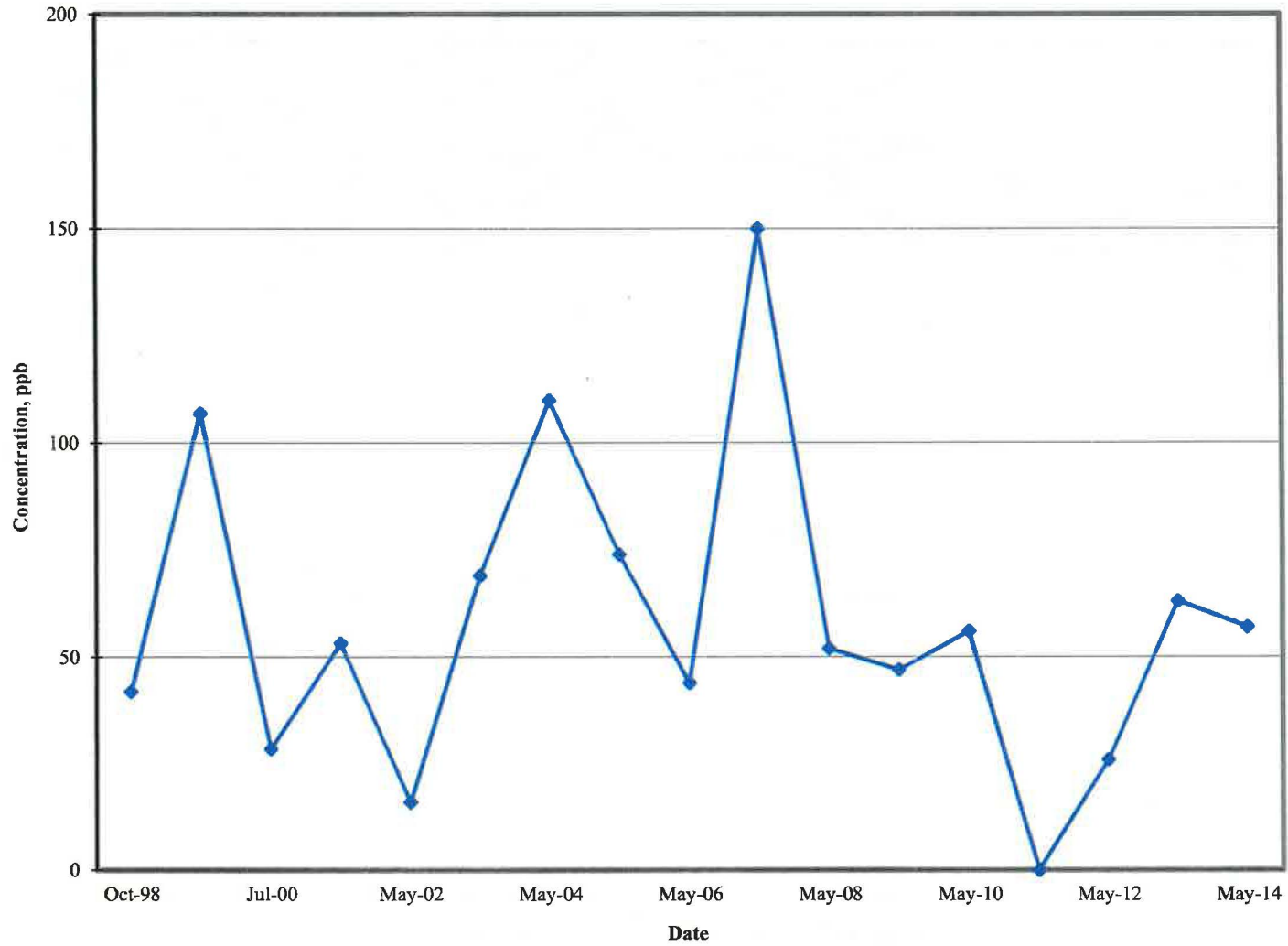
Figure 8
Phenol Concentration Versus Time



Legend: Lysimeter 1 (red line with diamond), MW-2 (blue line with diamond), MW-5 (green line with triangle), MW-9 (purple line with cross), Silverbrook Discharge (light blue line with asterisk)

McAdoo Associates Site
Post-Closure Groundwater Monitoring

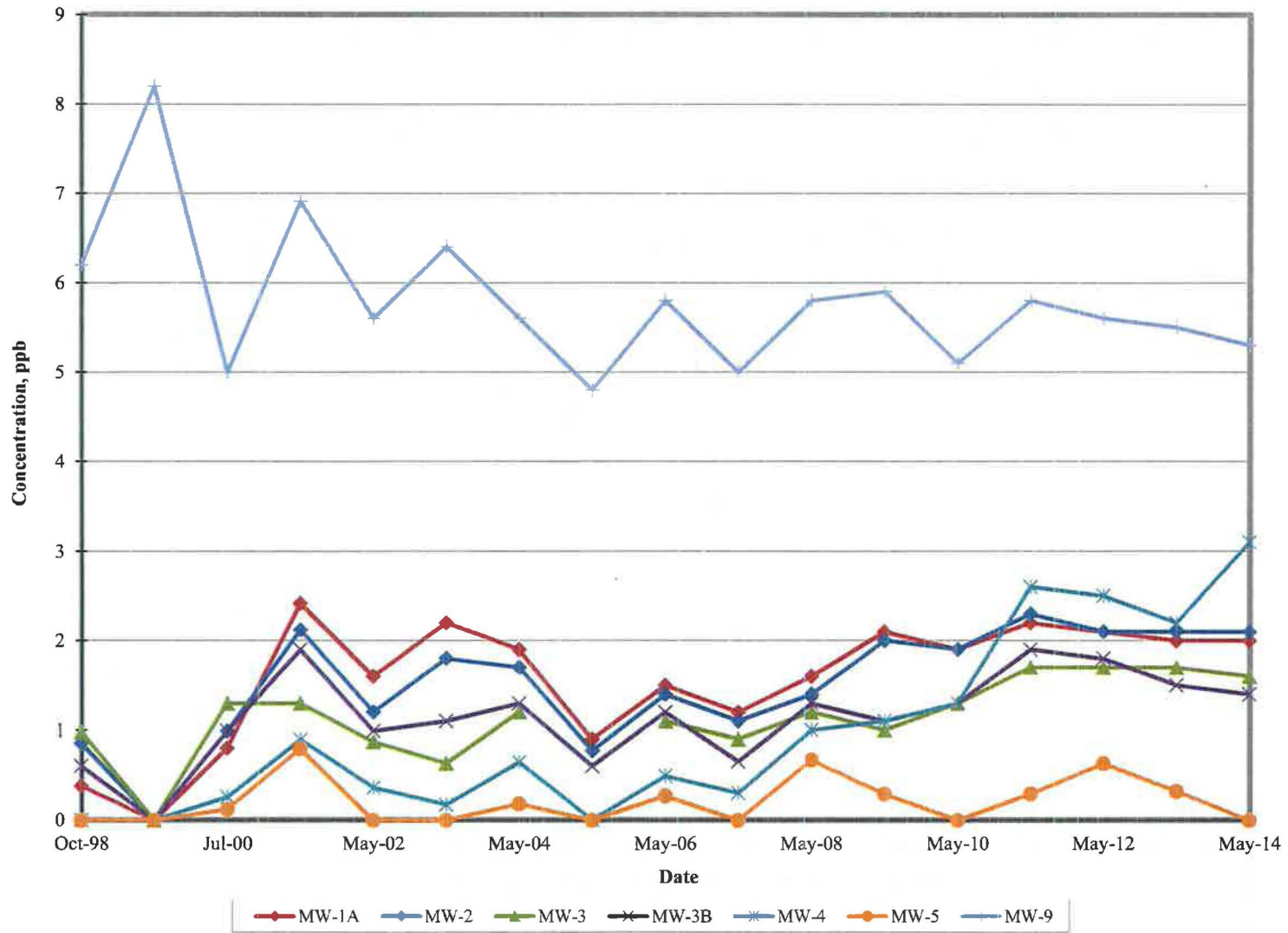
Figure 9
1,2-Dichloropropane Concentration Versus Time



—◆— MW-9

McAdoo Associates Site
Post-Closure Groundwater Monitoring

Figure 10
Beryllium Concentration Versus Time



McAdoo Associates Site
Post-Closure Groundwater Monitoring

**ATTACHMENT 6: MBS Location – 2014 Annual Groundwater Sampling Result
Summary**

McAdoo Associates - Blaine Street Location (OU2)
Summary of Detections: 2014 Annual Groundwater Sampling Event - Metals

| Sample Number : | | MC01A2 | MC01A6 | MC01A8 | MC01A9 | MC01B4 | MC01B6 | MC01B8 | MC01A4 | MC01B2 | | |
|--------------------------|------|-----------------|-----------------|--------------------|--------------------|-----------------|-----------------|-----------------|-----------------|-----------------|---------|--------|
| Sampling Location : | | MA14-MW1-080614 | MA14-MW4-080614 | MA14-MW5-080614 | MA14-MW5-2-080614 | MA14-MW7-080614 | MA14-MW8-080614 | MA14-MW9-080614 | MA14-MW2-080614 | MA14-MW6-080614 | | |
| Field QC : | | | | Duplicate of C01A9 | Duplicate of C01A8 | | | | | | | |
| Units : | | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | ug/L | | |
| Date Sampled : | | 8/6/2014 | 8/6/2014 | 8/6/2014 | 8/6/2014 | 8/6/2014 | 8/6/2014 | 8/6/2014 | 8/6/2014 | 8/6/2014 | | |
| TOTAL METALS | CRQL | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | |
| ALUMINUM | 200 | | | | | | | 33.9 J | | 41.5 J | 35.1 J | |
| BARIUM | 200 | 29.3 J | | 106 J | | 81.5 J | 80.5 J | 85.4 J | 43.3 J | 74.3 J | 15.3 J | 30.7 J |
| BERYLLIUM | 5 | | | | | | | 0.27 J | | | | |
| CADMIUM | 5 | 0.47 J | | 0.21 J | | 0.27 J | 0.29 J | | | 0.25 J | | |
| CALCIUM | 5000 | 10800 | | 11200 | | 10500 | 10400 | 13300 | 6400 | 9430 | 10900 | 23900 |
| COBALT | 50 | 6.5 J | | | | 6.5 J | 6.5 J | | 6.0 J | 16 J | 2.2 J | |
| COPPER | 25 | | | | | | | 4.4 J | | | | 5.9 J |
| IRON | 100 | 21100 | | 19700 | | 13200 | 12900 | 26700 | 1390 | 28200 | 215 | 106 |
| MAGNESIUM | 5000 | 3550 J | | 3500 J | | 2960 J | 2910 J | 4210 J | 5670 | 6700 | 1900 J | 2300 J |
| MANGANESE | 15 | 3980 | | 9930 | | 6570 | 6480 | 14400 | 683 | 16200 | 232 | 387 |
| NICKEL | 40 | | | | | 1.5 J | 1.5 J | | 14.3 J | 3.4 J | | 1.5 J |
| POTASSIUM | 5000 | | | | | | | 288 J- | | | 8020 J- | |
| SELENIUM | 35 | 5 J | | 3.5 J | | 10.3 J | 7.9 J | | 4.3 J | | | |
| SILVER | 10 | | | 0.46 J | | | 0.39 J | 0.42 J | | 0.43 J | | |
| SODIUM | 5000 | 93100 | | 25800 | | 28000 | 27700 | 16600 | 19600 | 19000 | 33500 | 21400 |
| ZINC | 60 | 9.2 J | | 7.4 J | | | 3.6 J | | 28.4 J | 9.3 J | 9.6 J | 11.8 J |
| DISSOLVED METALS: | | | | | | | | | | | | |
| ARSENIC | 10 | | | | | | | | | | | 2.2 J |
| BARIUM | 200 | 27.2 J | | 104 J | | 83.5 J | 81.3 J | 81.1 J | | 74.8 J | 14.1 J | 28.7 J |
| CADMIUM | 5 | 0.2 J | | 0.22 J | | 0.22 J | | 0.23 J | 43.2 J | 0.25 J | | |
| CALCIUM | 5000 | 10500 | | 10900 | | 10800 | 10700 | 12600 | 6270 | 9610 | 10700 | 23900 |
| COBALT | 50 | 6.4 J | | | | 7.4 J | 6.8 J | | 6.8 J | 16.7 J | 2.3 J | |
| COPPER | 25 | | | | | | | | 3.4 J | | | 4.5 J |
| IRON | 100 | 20300 | | 19200 | | 13100 | 12800 | 25200 | 1450 | 28700 | | |
| MAGNESIUM | 5000 | 3450 J | | 3410 J | | 3080 J | 2990 J | 3980 J | 5560 | 6860 | 1900 J | 2340 J |
| MANGANESE | 15 | 3860 | | 9690 | | 6730 | 6570 | 13700 | 792 | 16500 | 198 | 239 |
| NICKEL | 40 | | | | | 1.7 J | 1.4 J | | 14.8 J | 3.4 J | | |
| POTASSIUM | 5000 | | | | | | | | | | 8040 J- | |
| SELENIUM | 35 | 14.4 J | | 6.1 J | | 19.6 J | 13 J | 6.5 J | 4.5 J | | | 3.4 J |
| SILVER | 10 | | | 0.44 J | | | | 0.41 J | | 0.56 J | | |
| SODIUM | 5000 | 90400 | | 25200 | | 28800 | 28100 | 15600 | 19400 | 19300 | 33200 | 22100 |

McAdoo Associates - Blaine Street Location (OU2)
Summary of Detections: 2014 Annual Groundwater Sampling Event - VOCs and SVOCs

| Sample No. | C01A2 | | C01A6 | | C01A8 | | C01A9 | | C01B4 | | C01B6 | | C01B8 | | C01A4 | | C01B2 | |
|------------------------------|-----------------|------|-----------------|------|--------------------|------|--------------------|------|-----------------|------|-----------------|------|-----------------|------|-----------------|------|-----------------|------|
| Sample Location | MA14-MW1-080614 | | MA14-MW4-080614 | | MA14-MW5-080614 | | MA14-MW5-2-080614 | | MA14-MW7-080614 | | MA14-MW8-080614 | | MA14-MW9-080614 | | MA14-MW2-080614 | | MA14-MW6-080614 | |
| Field QC : | | | | | Duplicate of C01A9 | | Duplicate of C01A8 | | | | | | | | | | | |
| Units | ug/L | | ug/L | | ug/L | | ug/L | | ug/L | | ug/L | | ug/L | | ug/L | | ug/L | |
| Date Sampled | 8/6/2014 | | 8/6/2014 | | 8/6/2014 | | 8/6/2014 | | 8/6/2014 | | 8/6/2014 | | 8/6/2014 | | 8/6/2014 | | 8/6/2014 | |
| Trace Volatile Compound | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag | Result | Flag |
| Acetone | 91 | | | | 28 | | 24 | | 110 | | | | 33 | | | | | |
| Cyclohexane | 31 | | 9.3 | | 27 | | 26 | | 81 | | 6 | | 16 | | | | | |
| Benzene | 27 | | 50 | | 51 | | 49 | | 63 | | 25 | | 68 | | | | | |
| Methylcyclohexane | | | 3.6 J | | 11 | | 11 | | 37 | | 2.1 J | | | | | | | |
| Ethylbenzene | 280 | | 16 | | 72 | | 70 | | 400 | | 2.9 J | | 6.3 | | | | | |
| o-Xylene | | | | | 7.6 | | 7.8 | | | | | | 2.1 J | | | | | |
| m,p-Xylene | 17 | | 7.3 | | 92 | | | | 610 | | | | | | | | | |
| Isopropylbenzene | 48 | | 7.3 | | 12 | | 12 | | 64 | | 4.4 J | | 15 | | | | | |
| Semivolatile Compound | | | | | | | | | | | | | | | | | | |
| Phenol | | | | | | | | | | | | | 2.2 J | | | | | |
| Naphthalene | 20 | | 7.1 | | 19 | | 19 | | 110 | | | | 6.1 | | | | | |
| 2-Methylnaphthalene | 7.4 | | 2.0 J | | 14 | | 14 | | 160 | | | | | | | | | |
| 1,1'-Biphenyl | 2.3 J | | | | | | | | 8.2 | | | | | | | | | |
| Acenaphthylene | | | | | | | | | 4.7 J | | | | | | | | | |
| Fluorene | 1.3 J | | | | | | | | 5.2 | | | | | | | | | |
| Phenanthrene | 1.0 J | | | | | | | | 8.4 | | | | | | | | | |

ATTACHMENT 7: 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 8: 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 m³ (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 (C_{wd}, 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.