Peters Cartridge Facility

Hamilton Township, Ohio
Warren County

Record of Decision

United States
Environmental Protection Agency

Region 5

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LIST OF ACRONYMS AND ABBREVIATIONS

µg/L	Micrograms Per Liter
AOC	Area of Concern
ARAR	Applicable or Relevant and Appropriate Requirement
ATSDR	Agency for Toxic Substances and Disease Registry
BERA	Baseline Ecological Risk Assessment
bgs	Below Ground Surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Contaminants of Concern
COPC	Constituents of Potential Concern
COPEC	Chemicals of Potential Ecological Concern
CSF	Cancer slope factor
CSM	Conceptual Site Model
CTE	Central Tendency Exposure
DuPont	E. I. Du Pont de Nemours and Company
EC	Environmental Covenant
EPA	United States Environmental Protection Agency
EPC	Exposure Point Concentration
ERAGS	Ecological Risk Assessment Guidance for Superfund
ESL	Ecological Screening Levels
FML	Flexible Membrane Liner
FS	Feasibility Study
FSP	Field Sampling Plan
GeoSyntec	GeoSyntec Consultants
HHRA	Human Health Risk Assessment
HI	Hazard index
HQ	Hazard Quotient
ICs	Institutional Controls
KMOP	Kings Mills Ordnance Plant
LMRR	Little Miami Railroad
LOAEL	Lowest observed effect levels
MCL	Maximum Contaminant Level
mg/kg	Milligrams per kilogram
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
Ohio DNR	Ohio Department of Natural Resources
Ohio EPA	Ohio Environmental Protection Agency
O&M	Operation and Maintenance
PAHs	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyl
PEC	Probable Effects Concentration
PRGs	Preliminary Remediation Goals
PRP	Potentially Responsible Party
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act

RfC	Reference: Concentration
RfD	Reference Dose
RI	Remedial Investigation
RI/FS	Remedial Investigation and Feasibility Study
RME	Reasonable Maximum Exposure
RSL	Regional screening levels
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act of 1986
SLERA	Screening Level Ecological Risk Assessment
SOW	Statement of Work
SPLP	Synthetic Precipitation Leaching Procedure
SRI	Supplemental Remedial Investigation
SSL	Soil Screening Level
SVOC	Semi Volatile Organic Compounds
TBC	To Be Considered
TCLP	Toxicity Characteristic Leaching Procedure
TEC	Threshold Effects Concentration
TRV	Toxicity Reference Value
UCL	Upper Confidence Limit
UECA	Uniform Environmental Covenants Act
USFWS	US Fish and Wildlife Service
URS	URS Corporation
UU/UE	Unlimited use/unrestricted exposure
VOC	Volatile Organic Compound
XRF	X-Ray Fluorescence Spectroscopy

This Record of Decision (ROD) documents the remedy selected for the Peters Cartridge Facility (also referred to as "the site") located in Hamilton Township, Warren County, Ohio. The ROD is organized in three sections: Part I contains the *Declaration* for the ROD, Part II contains the *Decision Summary* and the *Responsiveness Summary* is included as Part III.

PART I: DECLARATION

This section summarizes the information presented in the ROD and includes the authorizing signature of the United States Environmental Protection Agency (EPA) Region 5 Superfund Division Director.

Site Name and Location

The Peters Cartridge Facility (CERCLIS # OHD 987051083) is an approximately 71-acre parcel of land located along the southern bank of the Little Miami River, in Warren County, Ohio. The site is located at 1415 Grandin Road, Kings Mills, 45034, Hamilton Township.

Statement of Basis and Purpose

This decision document presents the selected remedy for the Peters Cartridge Facility. The remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). Information used to select the remedy is contained in the Administrative Record file for the site. The Administrative Record file is available for review at the EPA Region 5 Records Center, 77 West Jackson Boulevard, Chicago, Illinois 60604; the Salem Township Library, 535 W. Pike Street, Morrow, OH 45152; and the Warren County Administration Building, 406 Justice Drive, Lebanon, Ohio 45036.

Assessment of the Site

The response action selected in this ROD is necessary to protect the public health or welfare or the environment from actual or threatened releases of pollutants or contaminants from this site which may present an imminent and substantial endangerment to public health or welfare.

Description of the Selected Remedy

The selected remedy specified in this ROD will serve as the final action for the Peters Cartridge Facility site. The selected remedy specifies response actions through excavation and on-site consolidation of contaminated soil and limited action for groundwater with use restriction

Institutional Controls (ICs). EPA believes the response actions outlined in this ROD, if properly implemented, will protect human health and the environment.

The major components of the selected remedy are:

- Excavate surface soil in the Former Process area to a depth of at least two feet below ground surface (bgs) in areas that exceed the EPA commercial standard for lead of 800 mg/kg; and excavate surface soil in the Lowland Area and on the Hamilton Township Property to a depth of at least two feet bgs in areas that exceed the EPA residential standard for lead of 400 mg/kg. The actual areas to be excavated and depths will be determined and evaluated during the remedial design (RD). The excavated areas will be backfilled with clean fill material to the existing grade;

- Clean out and remove debris and erosional material at drainage culvert and outfall areas. Excavate three identified shoreline sediment areas to a depth of approximately six inches and backfill shoreline sediment areas with clean fill material;

- Consolidate impacted soil, sediment, and erosional material in an on-site consolidation cell. The cell will be constructed with an impermeable composite liner and cap system developed to be consistent with state regulations. A flexible membrane liner with a geotextile cushion will be installed as the main component of the cell liner system;

- Cap the cell with a composite cap system consisting of a 6-inch thick vegetative support layer, a 2-foot thick layer of compacted low-permeability clay, a geocomposite drainage layer, a flexible geomembrane (FML) and a low-permeability clay layer beneath the geomembrane. The final cap design will be developed to be compliant with state regulations during the RD phase of the project. During the RD phase it will be determined whether an access restriction will be required based on future use of the area;

- Monitor groundwater to ensure that there is no migration of contaminants from the cell;

- Institutional controls in the form of deed restrictions will be required to: restrict land use to nonresidential purposes; limit future site activities to prevent intrusive activities that could compromise the cell; and restrict on-site groundwater use to prevent ingestion exposures by a future resident with groundwater used as a domestic water supply; and

- A review will be conducted within five years after initiation of the remedial action and every five years thereafter to ensure that the selected remedy is still protective of human health and the environment.

Statutory Determinations

The selected remedy is protective of human health and the environment, complies with federal and state requirements that are applicable or relevant and appropriate to this remedial action, is cost-effective, and utilizes permanent solutions to the maximum extent practicable. There are no

source materials constituting principal threats addressed within the scope of this action because the contaminants are not liquid, highly toxic or highly mobile. This remedy satisfies the statutory preference for engineering controls of low long-term threat pollutants and contaminants through containment. Institutional controls that restrict land use and prevent or limit exposure to remaining on-site pollutants or contaminants will also be used to supplement the engineering controls.

After this remedial action is completed, pollutants or contaminants will still be present on-site above levels that allow for unlimited use and unrestricted exposure. Therefore, pursuant to section 121(c) of CERCLA, 42 U.S.C. § 9621(c), a review will be conducted within five years after initiation of the remedial action and every five years thereafter to ensure that the selected remedy is still protective of human health and the environment.

Data Certification Checklist

The following information is included in the Decision Summary section (Part II) of this ROD. Additional information can be found in the Administrative Record file for this site.

- Contaminants of concern and their respective concentrations (Section E);
- Current and reasonably anticipated future land use assumptions used in the baseline risk assessment and ROD (Section F);
- Baseline risk represented by the contaminants of concern (Section G);
- How source materials are considered a principle threat (Section K);
- Cleanup levels established for contaminants of concern and the basis for these levels (Section L);
- Key factors that led to selecting the remedy (Section L.1);
- Estimated total present worth costs and the number of years over which the remedy cost estimates are projected (Section L.3); and
- Potential land use that will be available at the site as a result of the selected remedy (Section L.4).

Support Agency Acceptance

The State of Ohio has indicated its intention to concur with the selected remedy. The Letter of Concurrence will be added to the Administrative Record once it is received.

Authorizing Signature

Richard C Karl

Richard C. Karl, Director
Superfund Division
United States Environmental Protection Agency, Region 5

9-28-09

Date

PART II: DECISION SUMMARY

A. SITE NAME, LOCATION, AND BRIEF DESCRIPTION

The Peters Cartridge Facility is an approximately 71-acre parcel of land located along the southern bank of the Little Miami River, in Warren County, Ohio. The site is located at 1415 Grandin Road, Kings Mills 45034, Hamilton Township.

The CERCLIS identification number for the Peters Cartridge Facility is OHD 987051083.

EPA is the lead agency for this site, and the Ohio Environmental Protection Agency (Ohio EPA) is the support agency. DuPont is the only potentially responsible party (PRP) to sign an Administrative Order on Consent (AOC) with EPA to perform remedial investigation and feasibility study (RI/FS) activities. To date, EPA has used only PRP monies (i.e. from DuPont) to perform the RI/FS at the Peters Cartridge Facility.

Previous investigations, reports and correspondence have referred to several overlapping, albeit distinct areas of the former operating facility as the site. Generally historical references to the site referred to the portion of the property that includes only the former manufacturing structures. The site boundaries are provided as Figure 1.

In the RI/FS, the current limits of what is referred to as the site were defined as the former operational areas of the facility. This definition included storage and handling locations for products and materials used in support of ordnance manufacturing. The AOC defines the site as two distinct areas, Area A and Area B. Area A is a fifteen-acre parcel of improved land, with approximately six buildings, on which the Peters Cartridge Company operated. Area A encompasses the production portion of the site, where most manufacturing associated with the Peters Cartridge process took place. Area A also encompasses a smaller distinct area, the Little Miami Scenic Trail, formerly the Little Miami Railroad (LMRR). Current and past use, as well as ownership for this area is distinct from the larger, former manufacturing portion of Area A. Predating the existence of the facility, the LMRR, now redeveloped and deeded to the Ohio Department of Natural Resources (Ohio DNR) for recreational use, was separate from operations of the Peters Cartridge Facility. The LMRR service existed even before the Peters Cartridge Facility was constructed and operated.

Area B consists of a 56-acre parcel of unimproved wooded land on the southern and southwestern boundaries of Area A. Area B was used primarily for storage of finished product from the facility.

B. SITE HISTORY AND ENFORCEMENT ACTIVITIES

1. Site History

Developed by Gershom Moore Peters, the son-in law of Joseph Warren King who was the founder of the King Powder Company, the Peters Cartridge Company began production during 1887 (Schiffer, 2002). The decision to build an ordnance manufacturing facility at this location was influenced by the site's proximity to the Kings Mills Powder Company. Equally as important as the short distance to a material supplier was the presence of a fully developed and operational rail line at this location, the LMRR, established at this location in 1845 (Black, 1940).

From 1887 to 1934, the Peters Cartridge facility produced ordnance and shot shell ammunition. In 1934, the Remington Arms Company, Inc. (Remington) purchased the Peters Cartridge Company and continued the production of shot shell and cartridge ammunition at the facility. During the Second World War, Remington produced .30 and .45-caliber carbine ammunition for the U.S. Government, until 1944, after which operations at the facility were discontinued.

Since 1944, the Peters Cartridge Facility has been divided into multiple land parcels that have been owned and occupied by various non-ammunition making entities. However, none of these companies were responsible for any of the contamination currently at the site.

Today, Area A includes property parcels owned by Kings Mills Technical Center, Inc., Little Miami, Inc., Ohio DNR and Warren County Commissioners. Portions of Area A are currently occupied and/or in use by commercial or industrial businesses (main building area), as a public bike trail (historic railroad right-of-way), or as a parking lot (east of Grandin Road).

Area B, which is currently vacant, was transferred to Hamilton Township in 2007. The Township plans to retain this area as open space.

2. Previous Investigations and Enforcement

Since 1987, a series of environmental investigations, with varying data quality objectives and work scopes, have been conducted at the site. These investigations were primarily focused in the main manufacturing portion of the site (Area A).

A site assessment was conducted in 1987 by QSource Environmental Inc. to support a property transfer (QSource, 1987). Additional investigations were conducted beginning in 1990 to evaluate the release of Freon-113 by LensCrafters to an on-site septic system. These investigations were conducted between 1990 and 1993 by Foppe, Thelen, Group, Inc. (FTG) for LensCrafters. The release of Freon-113 was reportedly limited to the septic system on-site. Clean-up actions, including removal of the septic system facilities (i.e., tanks, piping) and excavation of impacted soils were completed by LensCrafters in 1993 under a closure plan approved by the Ohio EPA (Ohio EPA, 1992).

In 1991, the Ohio EPA became involved with the Peters Cartridge Facility. The site was listed by Ohio EPA as a discovery site in 1992, and subsequently reported to the EPA. The Peters Cartridge Facility was the subject of a Preliminary Assessment (PA) conducted by Ohio EPA in 1993. Several site-screening investigations/evaluations were conducted for EPA by PRC Environmental Management, Inc. (PRC) in 1994, 1996, and 1999. These investigations included the following:

- Installation and sampling of 9 trenches and 19 soil borings;
- Installation and sampling of six groundwater monitoring wells;
- Sampling of one irrigation well at the site;
- Shallow soil sampling for metals analysis using x-ray fluorescence spectroscopy (XRF); and
- Fish tissue study of the Little Miami River (Ohio EPA, 1999).

During these historic investigations, soil, sediment, and groundwater samples were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, and metals. Some SVOCs and pesticides were detected in sediment samples from the Little Miami River; however, these compounds were not detected in soils/sediment samples from the site (Ohio EPA, 1999). These numerous historic investigations concluded that the site has been impacted by copper, lead, and mercury, which were associated with the former munitions manufacturing operations. These impacts are generally confined to surface soils in the former manufacturing and storage areas.

The site was proposed to the National Priorities List (NPL) in 2003 but was never listed because the E.I. du Pont de Nemours Company (DuPont) entered into an AOC for the RI/FS with EPA in July 2004. As an alternative to listing on the NPL, the Agency has agreed that site clean up activities will be conducted pursuant to the Superfund alternative approach if DuPont agrees to perform the remedial activities.

C. COMMUNITY PARTICIPATION

The RI/FS Report and Proposed Plan for the Peters Cartridge Facility were made available to the public in June 2009. They can be found in the Administrative Record file maintained at the EPA Region 5 Records Center in Chicago, Illinois, and the local Information Repositories located at the Salem Township Library, 535 W. Pike Street, Morrow, Ohio 45152 and the Warren County Administration building located at 406 Justice Drive, Lebanon, Ohio 45036. The notice of the availability of these two documents was published in the Pulse-Journal, Little Miami/Kings Mills Edition and the Western Star, Lebanon, Ohio on July 2, 2009. A public comment period was held from July 6, 2009 through August 6, 2009. In addition, a public meeting was held on July 15, 2009 to present the Proposed Plan to a broader community audience than those that had already been involved at the site. At this meeting, representatives from the EPA and Ohio EPA answered questions about contamination at the site and the remedial alternatives. EPA also used

this meeting to solicit a wider cross-section of community input on the reasonably anticipated future land use of the site. Roughly 20 people were in attendance at this meeting, including representatives from the Little Miami River Group and Hamilton Township. EPA's response to the comments received during this period is included in the Responsiveness Summary, which is part of this ROD. These comments were considered prior to selection of the final remedy described in this ROD for the Peters Cartridge Facility.

EPA developed a Community Involvement Plan (CIP) in 2009. The Remedial Investigation and Feasibility Study (RI/FS) and Proposed Plan were also posted to the EPA Region 5 website at http://www.epa.gov/region5/sites/peterscartridge/index.htm.

D. SCOPE AND ROLE OF RESPONSE ACTIONS

EPA addressed the site in its entirety in the RI Report dated February 25, 2009 and the FS dated June 23, 2009. EPA has identified soil, which includes the depositional materials and sediment at the culvert and drainage outfalls along the Little Miami River, as the media of concern in which chemical contaminants exceed human health or ecological risk-based cleanup levels at the Peters Cartridge Facility.

The June Proposed Plan presented EPA's recommended clean up for the impacted soil. The recommendation included consolidation and containment of the soil and ICs for soil and groundwater. Institutional Controls (ICs) shall be implemented and maintained to prohibit all inappropriate uses at the site for areas that do not support unlimited use/unrestricted exposure (UU/UE). ICs are an important component of the response action and necessary to achieve and maintain the performance standards and the effectiveness of the remedy. The ICs will serve to inform of potential risks, prevent or minimize uses of the site that may pose an unacceptable risk to human health or to the environment or that could interfere with or adversely affect the implementation, integrity, or protectiveness of the remedial measures. The ICs shall restrict the future uses of the site to non-residential uses (unless additional actions are taken). The ICs shall also prohibit interference with the containment cell or other remedial components. ICs are also required for groundwater[1] to inform future users of the potential risks and prevent unacceptable exposures through ingestion. For the proprietary controls, consideration shall be given to using an environmental covenant (EC) pursuant to the Ohio's version of the Uniform Environmental Covenants Act (UECA) found at Ohio Revised Code §§ 5301.80 to 5301.92. The EC includes many statutory benefits including a standard process for creating, modifying, transferring, enforcing and recording ECs. Any proposed use of the site, including groundwater, shall be provided in a plan and approved in writing by EPA.

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1 Based upon a limited investigation, levels of arsenic in groundwater have been reported above the MCL in two areas of the site. These detections of arsenic indicate that there are potential carcinogenic risks to users of groundwater. Therefore, it is recommended that ICs be implemented as a limited action to assure and enhance the protectiveness of the remedy. The ICs should remain in place across the site unless additional groundwater studies indicate that arsenic is no longer present in the groundwater. Additionally, ICs should be restricted across the containment cell area to protect the remedial action component.

This ROD addresses the entire site and the selected response actions herein are for the impacted soil that EPA will address under its remedial authority under CERCLA. EPA expects the remedy described in this ROD to be the final clean up for the Peters Cartridge Facility.

E. SITE CHARACTERISTICS

1. Conceptual Site Model (CSM) for the Peters Cartridge Facility

The CSM provides a structured view of potential sources, migration pathways, potential receptors, and environmental transport mechanisms and is used to explain the migration mechanisms and pathways, exposure pathways and receptors on and off-site. (See Figure 2) The site soils are considered to be the main source of site-related contaminants of concern (COC) potentially impacting other media. The primary migration mechanisms are:

- Potential erosion of impacted soil to on-site drainage features, and other soils adjacent to the Little Miami River Scenic Trail, and ultimately the Little Miami River;

- Potential leaching of site COC from impacted soil to shallow groundwater and migration of the potentially impacted groundwater off-site; and

- Airborne emissions of dust created from impacted soils.

In each of the above mentioned transport mechanisms, there are several site-specific factors that were considered in order to understand the fate and transport of site related contaminants. The CSM indicates the potential for complete pathways; the data has indicated limited impact on environmental media such as the groundwater, surface water and sediments both on and off-site from the source areas. Primary impacts are to on-site surface soils and shallow subsurface soils.

Soil

Potential Sources - Surface soils and shallow subsurface soils have been impacted with copper, lead, and mercury. Slightly elevated priority pollutant list (PPL) PAHs and PPL metals (namely arsenic) were also identified as COC in soils where ash-like fill materials were present.

Migration Pathways - The current potential for migration from soils to other media is limited but includes the following:

• Airborne transport of particulates, generated by wind erosion of site surface soils and physical disturbance of site surface and subsurface soils, to downwind locations;

• Overland runoff of site COC from surface soil and sediment to down gradient surface water bodies (including sediment of the Little Miami River) during precipitation events; and

• Leaching of constituents in site soil (surface/swale-soil and subsurface) to shallow groundwater.

Because the majority of Area A is paved with asphalt/concrete or covered by landscaped grasses, the areas where impacted soils are exposed to erosion in Area A are small. Thus, the erosion of soils and airborne and overland transport of this medium is an unlikely mechanism of migration at this site. For Area B, the heavily incised nature of the on-site ephemeral streams confines the erosion to narrow, discrete areas of the site and focuses erosion and transport of sediment to areas immediately within and adjacent to the channels. There is a potential for transport of erosional material and/or sediment within the incised streams to the Little Miami River.

Soil geochemistry data from the RI indicate that a combination of neutral pH and high cation exchange capacity of soils results in metals at the site being strongly bound to silt and clay sized particles within the native soils. Similarly, the organic content of the ash-like fill and surficial soils coupled with the low solubility and high sorption coefficients of PAHs has resulted in PAHs being bound strongly within the soil matrix. As a consequence, leaching of these constituents into groundwater and/or dissolution into surface water is very limited. Leaching to groundwater is further inhibited at the site by the extent of impermeable surfaces within Area A, along with the low vertical permeabilities of soils in this area. The topmost soils (surface to 10 feet) at the site have been characterized as being predominately silts and clays. Geotechnical testing of these soils during the RI revealed vertical permeabilities that were typically less than 1×10^{-6} cm/s. As a consequence, even in the absence of paving, infiltration of water though native soils at this site is limited. However, there is a potential for transporting material/sediments within the incised streams to the Little Miami River.

Potential Receptors - Current/future on-site receptors have the potential to contact contaminants in soil via ingestion, dermal contact, and inhalation of volatiles and particulates. The potential for exposure to COC in surface soil is low for most receptors under current conditions because the principal areas of surface soil contamination have limited access (former process areas in Area A); are covered by gravel, asphalt or an established vegetative cover and/or are located in remote/undeveloped portions of the site that are not easily accessible (southern portions of the Area B).

With the exception of a current on-site utility worker, the day-to-day operations of the current receptors do not include intrusive activities; therefore, exposure to subsurface soil under current conditions is considered an incomplete exposure pathway. However, potential exposure to subsurface soil was conservatively evaluated for all future receptors since future construction/excavation may bring deeper soil to the surface, theoretically mixing it with surface soil. Therefore, future receptors have the potential to contact contaminants in surface soil and subsurface soil.

Swale-soil, defined as solid media collected from the unlined portions of the on-site drainage swales, was only present in Area B. Based on site observations during the RI, swale-soil within Area B was judged to share similar physical characteristics with soil in Area B and likely to be encountered by the same receptors.

Current/future utility workers, future construction workers, current/future youth trespassers, and current/future recreational users were also conservatively assumed to have the potential to contact contaminants in erosional material in the concrete-lined culverts.

Sediment

Potential Sources - Impacted soil within the immediate vicinity of the drainage channels is considered to be a potential source of contaminants to sediment along the shoreline of the Little Miami River. The likely sources of sediment impacts at the site are the trash/debris within the upper portions of the drainage channel, materials and former operational areas (the mix houses) and the ash-like fill materials in the lower portions of each ephemeral stream.

Migration Pathways - The combination of paving and vegetative cover limits surface water contact with soils over the majority of the site. Further, the heavily incised nature of the on-site ephemeral streams confines surface water flows to narrow, discrete areas of the site and focuses erosion and transport of sediment to areas immediately within and adjacent to the drainage channels.

The physical properties of metals and PAHs and the geochemical properties of the soils result in these constituents being strongly bound within the soil and sediment, with limited potential to leach to groundwater and/or dissolve into surface water. Soil and sediment transport is a potentially complete pathway by which contaminants can be transported from the site to the Little Miami River. Flow in the ephemeral streams is periodic in nature; however, during long periods of the year these streams have no flow. As a consequence, potential sediment discharges from the site are likely to be limited to periods during and immediately following rainfall events. The periodic, infrequent, and miniscule discharge of COC into the Little Miami River from surface runoff may cause contaminants to concentrate in sediment at the three discharge locations along the bank of the river and surface water flow within the river may further move sediment downstream. While surface water itself is not recognized as a mass-transfer mechanism for site contaminants (dissolved phase), it is identified as the physical mode of transport for soil and sediment to the Little Miami River.

Sediments at the site may be affected by groundwater discharge. Groundwater from the site discharges to the Little Miami River. During dry periods, the Little Miami River is a gaining stream; during flood periods, it is a losing stream and serves to recharge the surficial aquifer in the immediate vicinity of the flood-stage riverbank. Based on the low concentrations of soluble metals detected in groundwater, site geochemistry and limited groundwater flow through the site, groundwater discharge to the Little Miami River is not expected to have a measurable effect on the river sediments. This point is further supported by the lack of COC detected in downgradient monitoring wells, located between the site and the river, at concentrations greater than their screening levels.

Sediment data collected downstream indicates that sediment concentrations are essentially at background levels along most of the site frontage. The potential for exposure to COC in sediment at the discharge points of the on-site drainage features along the shoreline of the Little

Miami River is low for most receptors due to the steep banks and dense vegetation which characterize this area.

Surface Water

Potential Sources - Impacted soil within the immediate vicinity of the drainage channels is considered to be a potential source of COC to surface water. The likely sources of impacts at the site are from the trash/debris within the upper portions of the AOC 9 drainage channel, materials and former operational areas (the mix houses) near the AOC 8 drainage channel, and the ash-like fill materials in the lower portions of each ephemeral stream.

Migration Pathways - Surface water discharges from the site are periodic in nature. Flow within the channels is typically limited to periods during and immediately following rainfall events. As a result, potential surface water and sediment discharges from the site are limited and intermittent in nature. The surface water contribution from the site is marginal compared with the flow of the Little Miami River. Based on rainfall data and the size of the catchment area, the site contributes less than 0.03% of the flow to the Little Miami River via surface water discharge.

Extremely limited impacts have been detected in surface water samples collected at the site, reflecting the low mobility in the soluble phase for both metals and polycyclic aromatic hydrocarbons (PAHs). Surface water samples collected downstream of the swale discharge points in the Little Miami River exhibited concentrations similar to upstream background samples. Therefore, surface water was not considered to be a potential significant migration pathway.

Potential Receptors - Surface water data from the site indicated there is little or no difference between background COC concentrations taken upgradient of the site and those taken along the site's frontage to the Little Miami River, downstream from the swale/river confluence. The potential for exposure to COC in surface water within the culverts and at their discharge points along the shoreline of the Little Miami River is low for most receptors due to the steep banks and dense vegetation which characterize this area. However, there is a potential for current/future recreational fishermen to be exposed to surface water via incidental ingestion and dermal contact while at the site.

Groundwater

Potential Sources - Leaching of COC from surface and subsurface soils is a potential source of groundwater impacts. Slight groundwater impacts were identified in the central portion of Area A. However, no dissolved COC metals associated with site operations (copper, lead and mercury) were detected in any of the groundwater monitoring wells at concentrations greater than their screening levels. In addition, no dissolved COC metals were detected in any of the downgradient groundwater monitoring wells at concentrations greater than their screening levels.

Groundwater was encountered in Area B; however based on previous investigations its presence in the unconsolidated material may be spatially discontinuous and seasonal. In Area A,

groundwater is generally encountered at a depth of approximately 20 feet bgs. Site groundwater is not in direct contact with constituents detected in shallow soils.

Migration Pathways - The potential migration pathway of contaminants leaching from the soil to the underlying groundwater was evaluated and showed that soil samples collected throughout Area A and at three sample locations in Area B exceeded their soil screening levels (SSLs). However, actual groundwater samples collected below and downgradient of the Area A soil samples did not show a significant impact. Since there were no monitoring wells in Area B at the time of the soil leachability evaluation, additional soil samples were collected and analyzed using synthetic precipitation leaching procedure (SPLP) to further evaluate whether these impacted soils had the potential to affect the underlying groundwater. The soil samples collected had SPLP leachate lead concentrations ranging from non-detect to 3.48 mg/L. While the maximum SPLP lead leachate concentration is greater than both the lead MCL (0.015 mg/L) and the lead MCL assuming a 20 to 1 dilution; the groundwater sample collected from the downgradient monitoring well showed no metals impact. The soil samples had SPLP leachate mercury concentrations ranging from non-detect to 0.00057 mg/L (0.57 µg/L), which is below the mercury screening level for groundwater of 11 µg/L.

Groundwater from the site is in direct communication with the Little Miami River. During dry periods, the Little Miami River is a gaining stream; during flood periods, it is a losing stream and serves to recharge the surficial aquifer in the immediate vicinity of the flood-stage riverbank. Aquifer testing conducted at the site indicates that groundwater flows through the site to the Little Miami River at a rate of approximately 3236 gallons per day.

Based on the low concentrations of soluble metals detected in groundwater and limited groundwater flow through the site, groundwater discharge to the Little Miami River is not considered a significant transport mechanism.

Potential Receptors - Under current conditions, shallow groundwater is not used on site for potable or industrial uses, including irrigation. Drinking water for the site and surrounding area is provided by the Warren County Water District. In addition, shallow groundwater is at a depth where direct contact during intrusive activities would likely not occur. As a result, there is little or no potential for human exposure to this medium.

Although Warren County currently operates the East Well Field located approximately 600 feet down river of the westernmost site boundary, this well field does not appear to intercept groundwater from the site. This well field is located within the Little Miami River bed and is designed to extract groundwater from the highly conductive glacio-alluvial sediments. Further, information provided by Warren County confirms that the site has not affected the groundwater quality at their adjacent well field. Due to concerns associated with potential contaminant migration from the Kings Mills Ordnance Plant and Diversified Products sites, Warren County has implemented routine sampling of groundwater extracted from the well field. Since 2001, only trace levels of COC have been detected in samples collected from this well field and no COC have been detected in the well field samples at concentrations greater than the MCLs or PRGs.

2. Site Overview

The Peters Cartridge Facility is approximately 71 acres located west of Grandin Road along the southern bank of the Little Miami River, in Hamilton Township, Warren County, Ohio. Approximately one acre of the site is located east of Grandin Road. The site consists of two distinct areas, Area A and Area B.

Area A includes approximately 15 acres along the southern bank of the river, and is relatively flat. The main site buildings and the Little Miami Scenic River Trail are located in Area A. The ground surface in the eastern section of Area A is predominantly covered by asphalt and/or concrete. The remainder of the unpaved portion of Area A is characterized by steep terrain and mature deciduous vegetation. The Little Miami Scenic Trail that runs along the frontage of the Peters Cartridge Facility is paved with asphalt. Mature deciduous vegetation is present along the trail. A storm water utility line also runs along the trail.

Area B occupies approximately 56 acres of steeply sloping ridges and rolling topography, also with dense vegetation. Several small outbuildings, bunkers, concrete supports, foundations, conveyance structures, and other facilities historically used by the Peters Cartridge Company are located throughout Area B.

a. Areas of Concern and Exposure Areas

Fourteen areas of concern were identified during the Remedial Investigation (RI) study. The site was subsequently divided into three Exposure Areas on the basis of habitat cover types, current land use, land parcel ownership, and anticipated future redevelopment, as depicted in Figure 3.

Former Process Area - The Former Process Area, in Area A in the northern portion of the site, includes the main facilities historically used by the Peters Cartridge Company. Discontinuous areas of ash-like fill are present around the existing buildings. The majority of the Former Process Area is relatively flat and covered by concrete/asphalt paving, buildings, and small landscaped grass areas. Portions of the Former Process Area are currently used by commercial or industrial businesses; future land use is expected to remain commercial/industrial.

The Lowland Area - The Lowland Area is included in Area A and includes the portions of the site along the southern bank of the Little Miami River, within the Little Miami River floodplain. Steel fencing, thick vegetation, and steep topography along the southern border of the Scenic Trail effectively differentiate the Lowland Area from the remainder of the site. The Little Miami River Scenic Trail (historical railroad right-of-way redeveloped as a bike and walking path) is included within the Lowland Area. North of the trail, the Lowland Area includes some historical manufacturing areas which are characterized by the presence of ash-like fill, concrete foundations, masonry structures, and concrete box culverts that drain surface water from the upgradient portions of the site ("culvert outfalls"). The Lowland Area is characterized by steep banks and dense vegetation including a variety of woody and herbaceous species. In addition, the Lowland Area includes a narrow strip of the Little Miami River shoreline characterized by local bedrock outcropping and a shale limestone bottom substrate. Future land use in the Lowland Area is expected to remain recreational/open space.

The Hamilton Township Property - The Hamilton Township Property, formerly the Lewis Property, includes Area B and a southwestern portion of Area A. It consists of steeply sloping bedrock ridges and rolling topography with dense vegetation. The Hamilton Township property contains bunkers, concrete supports, foundations, conveyance structures, and other facilities historically used by the Peters Cartridge Company. The salvage area at the northwestern portion of the Hamilton Township Property (i.e., in Area A) is unpaved and surrounded by steel fencing and mature woody and herbaceous vegetation. This area features buildings original to the former salvage yard, and discontinuous areas of ash-like fill are present in the salvage area. The Hamilton Township Property is currently vacant; future land use is expected to be recreational.

3. Sampling Strategy

Historical site data, summarized in the RI/FS Work Plan, dated March 2005, were used to identify data gaps that were addressed during the RI.

The initial RI field activities were conducted between May 3, 2005 and March 29, 2006. During the initial RI field investigation, environmental samples were collected from the following:

- 431 soil boring locations;
- 28 sediment /erosional depositional material sampling locations;
- 22 surface water sampling locations; and
- 6 groundwater monitoring wells.

Additional field activities were performed in April and May 2007. During the supplemental field activities, environmental samples were collected from the following:

- 9 shallow surface soil borings;
- 13 subsurface soil borings; and
- 11 groundwater monitoring wells.

In January 2008, three additional sediment samples were collected from the unnamed creek located east of Grandin Road, in order to fill identified data gaps.

On-site and background soil samples collected during the RI were analyzed for copper, lead, and mercury. On-site soils which contained ash-like fill materials were also analyzed for PPL metals and PPL PAHs. Background samples were also analyzed for arsenic, as it was identified as naturally occurring in soils in southern Ohio. Samples collected along the Little Miami Scenic Trail as part of the supplemental remedial investigation (SRI) were analyzed for PPL metals, tin, polychlorinated biphenyls (PCB), PPL PAHs and a total petroleum hydrocarbon fingerprint.

Soil samples, defined as either surface/swale soil (≤2 ft bgs) or subsurface soil (>2 ft bgs) were collected. Surface/swale-soil was collected from 29 locations within the Hamilton Township

Property. Soil was also collected from 380 boring locations: 112 in the Former Process Area; 69 in the Lowland Area; and 199 in the Hamilton Township Property. Note that swale-soil was not present at the Former Process Area or Lowland Area.

Erosional material, defined as solid media collected from within the concrete-lined portions of the on-site drainage features (culverts), was collected from six locations within the Former Process Area and one location within the Lowland Area. Due to the contents of these materials, which included eroded soils as well as miscellaneous debris and detritus materials, erosional materials were independent of soil/swale-soil.

Sediment samples, defined as solid media collected from areas inundated with water, were collected from seven on-site locations located near the discharge points of the on-site drainage features and in close proximity to the Little Miami River. Unlike swale-soil and erosional material sampling locations, conditions at the sediment sampling locations were judged to be capable of supporting benthic macro invertebrates (which may or may not have been present).

4. Source of Contamination

The Peters Cartridge Facility operated from 1887 to 1944. During its operational period, the production of paper shot shell ammunition was the primary function of the facility. Metal cartridge ammunition was also produced during brief periods, primarily to support military efforts during World War I and World War II. Site operations included primer mixing and wad production, cupping and drawing of shell heads and casing cartridges, and shell/cartridge packing and assembly. Metals likely used in the manufacturing process included lead for shot and slugs, mercury (also called fulminate of mercury) for the primary ignition powder, and to a lesser extent copper and possibly nickel for plating casings.

The RI data indicate that the manufacturing of shot shell and ammunition is the main source of contamination in the soils at the site. There is limited impact to sediment, surface water, and groundwater. Contaminants, such as copper, lead, and mercury were identified based on historical site operations and the results of the previous investigations.

5. Types of Contaminants and Affected Media

Copper, lead, and mercury were identified within the native soil for the site. For areas where ash-like fill is known or suspected to be present, EPA PPL metals and PPL PAHs were also identified as COC (see Table 1).

The results of the RI indicated that the highest concentrations of metals on-site occur in surface soils, and concentrations typically decline with depth. The same contaminants were also detected above site specific background concentrations in ash-like fill. The majority of ash-like fill was encountered in the Former Process Area; however, discrete-ash-like fill was also encountered in the Lowland Area and northern portions of the Hamilton Township Property. Contaminants in surface water and sediment were at low levels and limited groundwater impacts were observed.

Table 1 – Range of Soil concentrations of Primary Contaminants of Interest

Contaminant of Interest	**Former Process Area (mg/kg)**	**Lowland Area (mg/kg)**	**Hamilton Township Property (mg/kg)**
Copper	13.55 - 1,770	0.941 - 8,230	10.68 - 53,900
Lead	17.7 - 156,000	4.16 - 15,500	12.7 - 217,000
Mercury	0.0946 - 83.1	0.05 - 10.1	0.03635 - 846

As part of the RI, samples were tested using the toxicity characteristic leaching procedure (TCLP) method to determine whether soils were hazardous pursuant to the Resource Conservation and Recovery Act (RCRA). Lead was not detected in any of the samples above the TCLP limit. Based on the analytical results, site soil is not RCRA hazardous waste. However because the soil is contaminated at levels above acceptable health risk, remedial action is necessary.

6. Extent of Contamination

a. Soil

Manufacturing, storage and handling, and waste disposal practices led to soil contamination at the site. The current potential for migration of site-related contaminants from soils to other media is limited but includes the following:

• Airborne transport of particulates to downwind locations. generated by wind erosion of site surface soils and physical disturbance of site surface and subsurface soils;

• Overland transport of soil and sediment (including sediment of the Little Miami River) to downgradient surface water bodies during precipitation events: and

• Leaching of site-related contaminants from surface/swale-soil and subsurface soil to shallow groundwater.

Airborne or overland transport of soil are unlikely mechanisms of migration at the site because the majority of Area A is paved. In Area B, overland transport is confined to the narrow channels of deeply-incised ephemeral streams and is unlikely to move much material annually. Leaching is also an unlikely mechanism of migration at the site. Soil geochemistry data from the RI indicate that a combination of neutral pH and high cation exchange capacity of soils results in metals at the site being strongly bound to silt and clay sized particles within the native soils. Similarly, the organic content of the ash-like fill and surficial soils coupled with the low solubility and high sorption coefficients of PAHs has resulted in PAHs being bound strongly within the soil matrix. As a consequence, leaching of these contaminants into groundwater and/or dissolution into surface water is very limited. Leaching to groundwater is further inhibited

at the site by the extent of impermeable surfaces within Area A, along with the low vertical permeabilities of soils in this area. The topmost soils (surface to 10 feet) at the site have been characterized as being predominately silts and clays. Geotechnical testing of these soils during the RI revealed vertical permeabilities that were typically less than 1×10^{-6} cm/s. As a consequence, even in the absence of paving, infiltration of water through native soils at this site is limited.

b. Sediment

As is the case with soils, overland or airborne transport are unlikely mechanisms of migration of sediments. Sediments in the river may be affected by surface water discharge. Overland runoff causes infrequent and miniscule discharge of contaminants into the river. Surface water flow within the river may further move sediment downstream. While surface water itself is not recognized as a mass-transfer mechanism for dissolved phase contamination from the site; is identified as the physical mode of transport for soil and sediment to the Little Miami River.

Groundwater discharge to the Little Miami River was evaluated to determine whether there was an impact to sediments in the River from this type of transport. Groundwater from the site discharges to the Little Miami River. During dry periods, the Little Miami River is a gaining stream; during flood periods, it is a losing stream and serves to recharge the surficial aquifer in the immediate vicinity of the flood stage riverbank. Aquifer testing conducted at the site groundwater indicates that flow through the site to the Little Miami River is approximately 3,236 gallons per day. Based on site geochemistry, limited groundwater flow through the site, and the low concentrations of soluble metals detected in downgradient monitoring wells located between the site and the river, groundwater discharge to the Little Miami River is not expected to have a measurable effect on the river sediments.

c. Surface Water

Surface water is not considered to be a significant potential migration pathway for site-related contaminants. Extremely low concentrations of metals and PAHs have been detected in surface water samples collected at the site, reflecting the low mobility in the soluble phase for both metals and PAHs. For surface water samples, concentrations of total metals analysis were generally much higher than the corresponding dissolved metals analyses at each location. This suggests that the site-related contaminants are bound to solids that are suspended in the surface water. Surface water samples collected downstream of the swale discharge points in the Little Miami River exhibited concentrations similar to upstream background samples.

In 2007 Ohio EPA conducted a Biological and Water Quality Study of the Little Miami River to determine whether the Peters Cartridge Factory contaminants had an impact on the river or the aquatic community. The major findings of the study were as follows:

Sediment Quality:

Sediment samples were collected at five locations in the Little Miami by the Ohio EPA on August 2, 2007. Sampling locations were co-located at biological sampling sites. Of

the metal parameters tested in this study, only lead was detected above the Threshold Effect Concentration (TEC) guideline. This elevated lead value, located adjacent to the Peters Cartridge site, was below the Ohio Sediment Reference Value (SRV) of 47 mg/kg. Overall, lead measurements in the Little Miami River were within levels protective of river biology. Two metal parameters (mercury and cadmium) were slightly above Ohio SRV guidelines, but below TEC values. Silver was measured slightly above the Ohio SRV guideline (no TEC value) at two sampling locations. Mercury, cadmium, and silver were within acceptable levels for protection of ecological integrity. Aside from lead, all other parameters which were measured above ecological screening levels had qualified results (J).

Physical Habitat:

The Qualitative Habitat Evaluation Index scores for the Little Miami River sites ranged between 85.0 and 89.5. These scores are indicative of excellent river habitat, and are adequate for supporting Exceptional Warmwater Habitat biological communities.

Fish Community:

The 2007 fish results revealed an improvement in the fish community compared with 1998. Two comparable sites sampled in the Little Miami River during 1998 (RMs 32.0 and 28.3) reported fish community results within the exceptional range, with IBI scores of 48 and MIwb values of 10.1 and 10.2. Higher exceptional conditions were noted during 2007.

Macroinvertebrate Community:

The macroinvertebrate communities from all five of the Little Miami River sampling locations were evaluated as exceptional, indicative of attainment of the Exceptional Warmwater Habitat use designation. The macroinvertebrate community ICI scores ranged from 50 to 54, with no apparent impacts from the Peters Cartridge property.

d. Groundwater

Groundwater discharge is not considered to be a significant migration pathway for site-related contaminants. Groundwater flow through the site is limited, and no contaminants were detected in downgradient monitoring wells located between the site and the river.

Under current conditions, shallow groundwater is not used on-site for potable or industrial uses, including irrigation. The RI Report provided hydrogeologic data indicating that groundwater yield for a well installed on-site would be insufficient for a potable, industrial or irrigation well. In addition, shallow groundwater is at a depth where direct contact during intrusive activities would not occur. As a result, the potential for human exposure to this medium is limited. The target-organ non-cancer hazard indices for site-related contaminants of concern in groundwater are below the EPA threshold Hazard Index (HI) of 1. However, there are potential carcinogenic risks which are driven by detections of arsenic at levels below the MCL. Therefore, limited

action for groundwater in the form of ICs is recommended at the site to prevent ingestion exposures by a future resident with groundwater used as a domestic water supply.

F. CURRENT AND POTENTIAL FUTURE LAND AND WATER USES

For purposes of the human health and ecological risk assessments for this site, current and reasonably anticipated future land uses and current and potential beneficial groundwater uses were identified.

This baseline Human Health Risk Assessment (HHRA) provided cumulative cancer risk estimates and non-cancer hazard indices for potential receptors under current and reasonably anticipated future land uses, namely on-site commercial/industrial workers, utility workers, construction workers, trespassers, and recreators.

In addition, a hypothetical residential scenario was evaluated in the Former Process Area and Hamilton Township Property to provide an upper-bound estimate of potential risk to assist in future on-site land use decisions. With its steep slopes and position in the Little Miami River flood plain, significant redevelopment of the Lowland Area is not expected to occur; therefore, residential redevelopment was not considered a reasonably foreseeable future land use.

The results of the HHRA indicated that surficial soil was the primary medium of concern for the site: human health risks from groundwater and subsurface soil were limited to hypothetical future residential scenarios.

The site is zoned M-2 Heavy Industry. Adjacent properties are also zoned M-2, with the exception of one boundary parcel on the southeast side of the site, which is zoned R-1 Single Family Residential, and one parcel directly to the east, which is zoned M-1 Light Industrial. Current industrial properties in the vicinity of the site include the Warren County water treatment facility, the Lebanon regional wastewater treatment plant, and the former KMOP government plant paint manufacturing facility (now the U.S. Army Reserve Center) which is listed in State and Federal environmental databases as a hazardous waste treatment, storage, and disposal facility, and is designated as a high priority corrective action site.

Thus, the site setting and zoning designations indicate that uses other than residential are more appropriate land use at the site. The assumed land use for each exposure area and its basis are as follows:

Former Process Area - Portions of the Former Process Area are currently occupied in use by commercial or industrial businesses (main building area) or as a parking lot (east of Grandin Road). Business occupants/tenants include an acetylene tank reconditioning business located in the west end of Building R-3, and a cabinet manufacturer and an artist's studio are located on the first and second floors, respectively, of Building R-9. The Kings Mills Technical Center property manager's office is located in Building R-2. A metals scrapping/salvage company has operations in the outdoor area adjacent to the western end of Building R-1 and in a portion of Building R-1. Given the site's industrial setting and the fact that commercial/industrial businesses are currently present, the probability that the Former Process Area will support residential land use in the

future is small. Therefore, commercial/ industrial land use is considered the scenario with the highest level of exposure and risk that can reasonably be expected to occur at present. However, given its close proximity to the Little Miami River, the Little Miami River Scenic Trail bikepath, and the Hamilton Township greenspace area, the land use in the Former Process Area may change in the future. Land use evaluations will be conducted during five-year reviews following remediation to ensure that this area remains protective of future receptors.

Lowland Area - The Lowland Area includes the portions of the site along the southern bank of the Little Miami River, within the Little Miami River floodplain. The Little Miami River Scenic Trail (historical railroad right-of-way redeveloped as a bike and walking path) is included within the Lowland Area. Given its narrow dimensions, steep slopes, and position within the Little Miami River floodplain, large-scale redevelopment (including residential or commercial/ industrial redevelopment) of the Lowland Area is unlikely to occur. In addition, the adjacent commercial/industrial land use also tends to preclude residential land use. Therefore, future land use in the Lowland Area is expected to remain recreational/open space; a recreational exposure scenario is the scenario with the highest level of exposure and risk that can reasonably be expected to occur.

Hamilton Township Property - The Hamilton Township Property is currently vacant. One boundary parcel located southeast of the Hamilton Township Property is zoned R-1 Single Family Residential; however, similar to the Former Process Area and Lowland Area, the surrounding industrial land use and historical industrial operations tend to preclude residential redevelopment. Hamilton Township has indicated that this property will remain as recreational/ open space. A recreational exposure scenario is the scenario with the highest level of exposure and risk that can reasonably be expected to occur.

G. SUMMARY OF SITE RISKS

A baseline risk assessment was performed to estimate the probability and magnitude of potential adverse human health and environmental effects from exposure to contaminants associated with the site assuming no remedial action was taken. It provides the basis for taking action and identifies the contaminants and exposure pathways that need to be addressed by the remedial action. The baseline health risk assessment followed a four step process: 1) hazard identification, which identified those hazardous substances, which, given the specifics of the site were of significant concern; 2) exposure assessment, which identified actual or potential exposure pathways, characterized the potentially exposed populations, and determined the extent of possible exposure; 3) toxicity assessment, which considered the types and magnitude of adverse health effects associated with exposure to hazardous substances; and 4) risk characterization and uncertainty analysis, which integrated the three earlier steps to summarize the potential and actual risks posed by hazardous substances at the site, including carcinogenic and non-carcinogenic risks and a discussion of the uncertainty in the risk estimates. A summary of those aspects of the human health risk assessment which support the need for remedial action is discussed below followed by a summary of the environmental risk assessment.

1. Human Health Risk Assessment

A baseline HHRA was completed for the site to evaluate the likelihood and magnitude of potential human health effects associated with historical releases. For the purposes of the HHRA, the upland portion of the site was divided into three Exposure Areas on the basis of habitat cover type, historical operations, current land use, land parcel ownership, and anticipated future redevelopment. These areas are: the Former Process Area; the Lowland Area; and the Hamilton Township Property as described above. Potential effects from exposure to soil/swale-soil, erosional material (depositional material associated with concrete culverts/outfalls), sediment, and surface water were evaluated as relevant for each exposure area. Potential effects from exposure to groundwater were evaluated on a site-wide basis.

a. Identification of Chemicals of Concern

Twenty-two of the approximately 30 chemicals detected at the site were selected for evaluation in the HHRA as chemicals of potential concern. The chemicals of potential concern (COPC) were selected to represent potential site-related hazards based on toxicity, concentration, frequency of detection, and mobility and persistence in the environment and can be found in Tables J-4 through J-13 of the risk assessment. Additionally, COPC screening for protection of groundwater is presented in Tables J-25 through J-30 and COPC screening for groundwater is in Table J-31. From this, a subset of the chemicals were identified in the FS as presenting a significant current or future risk and are referred to as the chemicals of concern (COC) in this ROD and summarized in Appendix A, Tables G-1 through G-3 for surface/swale soil, subsurface soil, and site-wide groundwater, respectively. These tables contain the exposure point concentrations used to evaluate the reasonable maximum exposure (RME) scenario in the baseline risk assessment for the chemicals of concern. Estimates of average or central tendency exposure concentrations for the chemicals of concern and all chemicals of potential concern can also be found in Tables J-39a through J-39c (soil) and J-40 (site-wide groundwater) of the baseline HHRA.

b. Exposure Assessment

Current and potential future site-specific pathways of exposure to chemicals of concern were determined. The extent, frequency, and duration of current or future potential exposures were estimated for each pathway. From these, exposure parameters, a daily intake level for each site-related chemical was estimated.

Portions of the Former Process Area are currently occupied and/or used by commercial or industrial businesses (main building area); future land use is expected to remain commercial/ industrial. The Lowland Area includes the portions of the site along the southern bank of the Little Miami River, within the Little Miami River floodplain. Steel fencing, thick vegetation, and steep topography along the southern border of the Scenic Trail effectively differentiate the Lowland Area from the remainder of the site. The Little Miami River Scenic Trail (historic railroad right-of-way redeveloped as a bike and walking path) is included within the Lowland Area. North of the trail, the Lowland Area includes some historical manufacturing areas which are characterized by the presence of ash-like fill, concrete foundations, masonry structures, and

concrete box culverts that drain surface water from the upgradient portions of the site ("culvert outfalls"). The Lowland Area is characterized by steep banks and dense vegetation including a variety of woody and herbaceous species. Future land use in the Lowland Area is expected to remain recreational/open space. The Hamilton Township Property consists of steeply sloping bedrock ridges and rolling topography, also with dense vegetation. The Hamilton Township Property contains bunkers, concrete supports, foundations, conveyance structures, and other facilities historically used by the Peters Cartridge Company. The salvage area at the northwestern portion of the Hamilton Township Property is unpaved and surrounded by steel fencing and mature woody and herbaceous vegetation. The Hamilton Township Property is currently vacant; future land use is expected to be recreational.

Access to the majority of the site is limited by chain link fencing which surrounds the Hamilton Township Property and the portion of the Former Process Area west of Grandin Road. Public access to the fenced areas of the site may be gained through the gates located at the northeast corner of Grandin Road and off the Little Miami Scenic Trail. There are portions of the site where the fence is down, thereby allowing access at these locations. The Hamilton Township Property is accessible via a few steep, unpaved paths located south and west of Building R-9. Trespassers have previously gained access to the site by cutting fencing and/or locks on gates.

The majority of the Former Process Area is paved with asphalt/concrete or covered by landscaped grasses and the remainder of the site is densely vegetated. The combination of paving and heavy vegetation limits potential surface water contact with soils over the majority of the site. The heavily incised nature of the on-site ephemeral culverts/swales confines surface water flows to small discrete areas of the site and focuses erosion and transportation of sediment to areas immediately within and adjacent to the channels. Surface water discharges from the site are only periodic in nature. Flow within the channels is typically limited to periods during and immediately following rainfall events. As a result, potential surface water and sediment discharges from the site are limited and intermittent in nature. The surface water contribution from the site is marginal compared with the flow of the Little Miami River. Groundwater from the site is in direct communication with the Little Miami River. Off-property land use is a mixture of residential, open space/recreational and industrial/commercial use. Future land use adjacent to the site is expected to remain unchanged. In addition, impacted soils are contained within the site. Likewise, there are currently no downgradient human receptors of groundwater.

The following is a brief summary of the exposure pathways that were found to present a risk at the site. A more thorough description of all exposure pathways evaluated in the risk assessment including estimates for an average exposure scenario, can be found in Section 4 and on Tables J-34 through J-38 of the baseline HHRA.

The following current/future exposure pathways were found to present a risk at the site:

- Commercial/industrial worker with exposure to surface soil (by ingestion, dermal contact and inhalation of volatile compounds and fugitive dust) at the Former Process Area;[2]

[2] For current/future commercial/industrial worker soil exposures, an exposure duration of 25 years and an exposure frequency of 250 days/year was presumed. Dermal contact was assumed with 3,300 cm^2 of surface area along with an adherence factor of 0.2 mg/cm^2. An ingestion rate of 100 mg/day was assumed.

- Utility worker with exposure to surface/swale soil (by ingestion, dermal contact and inhalation of fugitive dust) at the Hamilton Township Property;[3]

- Adolescent trespasser with exposure to surface/swale soil (by ingestion, dermal contact and inhalation of fugitive dust) at the Hamilton Township Property;[4] and

- Commercial/industrial worker (Former Process Area), utility worker (all three exposure areas), adolescent trespasser (Former Process Area and Hamilton Township Property), and recreational user (Lowland Area) with exposure to lead in surface and/or swale soil.[5]

The following future exposure pathways were found to present a risk at the site:

- Resident (adult and young child) with exposure to soil (by ingestion, dermal contact and inhalation of volatile compounds and fugitive dust) at the Former Process Area;[6]

- Commercial/industrial worker with exposure to surface/swale soil (by ingestion, dermal contact and inhalation of fugitive dust) at the Hamilton Township Property;[7]

- Construction worker with exposure to surface/swale soil (by ingestion, dermal contact and inhalation of fugitive dust) at the Hamilton Township Property;[8]

- Recreational user with exposure to surface/swale soil (by ingestion, dermal contact and inhalation of fugitive dust) at the Hamilton Township Property;[9]

- Resident (adult and young child) with exposure to surface/swale soil (by ingestion,

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[3] For current/future utility worker soil exposures, an exposure duration of 25 years and an exposure frequency of 30 days/year was presumed. Dermal contact was assumed with 3,300 cm^2 of surface area along with an adherence factor of 0.3 mg/cm^2. An ingestion rate of 330 mg/day was assumed.

[4] For current/future adolescent trespasser soil exposures, an exposure duration of 10 years and an exposure frequency of 75 days/year was presumed. Dermal contact was assumed with 4,100 cm^2 of surface area along with an adherence factor of 0.2 mg/cm^2. An ingestion rate of 100 mg/day was assumed. Mutagenic effects were accounted for on an age- and chemical-specific bas s

[5] As appropriate for each receptor, lead exposures in soil were evaluated using either the Integrated Exposure Uptake Biokinetic (IEUBK) Model for children, or EPA's Adult Lead Model (ALM), assuming a female of child-bearing age is exposed. Default EPA assumptions and an arithmetic mean exposure point concentration were used as inputs to the model.

[6] For future residential soil exposures, exposure durations of 24 years and 6 years, respectively, were presumed for an adult and young child. Dermal contact was assumed with 5,700 cm^2 of surface area for the adult and 2,800 cm^2 for the child. Future soil exposures were assumed to occur 350 days/year. Ingestion rates of 200 and 100 mg/day were assumed for the child and adult, respectively. Mutagenic effects were accounted for on an age- and chemical-specific basis.

[7] For future commercial/industrial worker soil exposures, an exposure duration of 25 years and an exposure frequency of 250 days/year was presumed. Dermal contact was assumed with 3,300 cm^2 of surface area along with an adherence factor of 0.2 mg/cm^2. An ingestion rate of 100 mg/day was assumed.

[8] For future construction worker soil exposures, an exposure duration of 1 year and an exposure frequency of 120 days/year was presumed. Dermal contact was assumed with 3,300 cm^2 of surface area along with an adherence factor of 0.3 mg/cm^2. An ingestion rate of 330 mg/day was assumed.

[9] For future recreational user soil exposures, exposure durations of 30 years and 6 years, respectively, were presumed for an adult and young child. Dermal contact was assumed with 3,300 cm^2 of surface area for the adult and 2,800 cm^2 for the child. Future soil exposures were assumed to occur 195 days/year. Ingestion rates of 200 and 100 mg/day were assumed for the child and adult, respectively. Mutagenic effects were accounted for on an age- and chemical-specific basis.

dermal contact and inhalation of fugitive dust) at the Hamilton Township Property;[10]

- Commercial/industrial worker (Hamilton Township Property), construction worker (Former Process Area and Hamilton Township Property), and recreational user (Hamilton Township Property) with exposure to lead in surface and/or swale soil;[11]

- Resident (adult and young child; Former Process Area and Hamilton Township Property) with exposure to lead in surface and subsurface soil;[12] and

- Resident (adult and young child) exposure to untreated groundwater (by ingestion) from site-wide monitoring wells.[13]

c. Toxicity Assessment

EPA assessed the potential for cancer risks and non-cancer health effects.

The potential for carcinogenic effects is evaluated with chemical-specific cancer slope factors (CSFs) and inhalation unit risk values. A weight of evidence classification is available for each chemical. CSFs have been developed by EPA from epidemiological or animal studies to reflect a conservative "upper bound" of the risk posed by potentially carcinogenic compounds. That is, the true risk calculated using the CSF is unlikely to be greater than the risk predicted. A summary of the cancer toxicity data relevant to the chemicals of concern is presented in Table G-4.

The potential for non-cancer health effects is quantified by reference dose (RfD) for oral exposure and reference concentrations (RfCs) for inhalation exposures. RfDs and RfCs have been developed by EPA and represent an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily exposure that is likely to be without an appreciable risk of deleterious health effects during a lifetime. RfDs and RfCs are derived from epidemiological or animal studies and incorporate uncertainty factors to help ensure that adverse health effects will not occur. A summary of the non-carcinogenic toxicity data relevant to the chemicals of concern at the site is presented in Appendix A, Table G-5.

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[10] For future residential soil exposures, exposure durations of 24 years and 6 years, respectively, were presumed for an adult and young child. Dermal contact was assumed with 5,700 cm^2 of surface area for the adult and 2,800 cm^2 for the child. Future soil exposures were assumed to occur 350 days/year. Ingestion rates of 200 and 100 mg/day were assumed for the child and adult, respectively. Mutagenic effects were accounted for on an age- and chemical-specific basis.

[11] As appropriate for each receptor, lead exposures in soil were evaluated using either the Integrated Exposure Uptake Biokinetic (IEUBK) Model for children, or EPA's Adult Lead Model (ALM), assuming a female of child-bearing age is exposed. Default EPA assumptions and an arithmetic mean exposure point concentration were used as inputs to the model.

[12] As appropriate for each receptor, lead exposures in soil were evaluated using either the Integrated Exposure Uptake Biokinetic (IEUBK) Model for children, or EPA's Adult Lead Model (ALM), assuming a female of child-bearing age is exposed. Default EPA assumptions and an arithmetic mean exposure point concentration were used as inputs to the model.

[13] For future residential exposures to groundwater, calculations were performed by utilizing the ratio of EPA's Regional Screening Levels (RSLs) and appropriate cancer or non-cancer threshold. Therefore, exposure assumptions are the same as those used to develop the RSLs and consider the ingestion of groundwater as drinking water as well as the inhalation of volatile compounds released from groundwater during household water use.

d. Risk Characterization

Risk characterization combines estimates of exposure with toxicity data to estimate potential health effects that might occur if no actions were taken.

Excess lifetime cancer risks were determined for each exposure pathway by multiplying the daily intake levels (see *Section b: Exposure Assessment*) by the CSF or by comparison to the unit risk value. These toxicity values are conservative upper bound estimates, approximating a 95% upper confidence limit, on the increased cancer risk from a lifetime exposure to a chemical. Therefore, the true risks are unlikely to be greater that the risks predicted. Cancer risk estimates are expressed as a probability, e.g., one in a million. Scientific notation is used to express probability. One in a million risk (1 in 1,000,000) is indicated by 1×10^{-6} or 1E-06. In this example, an individual is not likely to have greater than a one in a million chance of developing cancer over a lifetime as a result of exposure to the concentrations of chemicals at a site. All risks estimated represent an "excess lifetime cancer risk" in additional to the background cancer risk experienced by all individuals over a lifetime. The chance of an individual developing cancer from all other (non-site related) causes has been estimated to be as high as one in three. EPA's generally acceptable risk range for site related exposure is 10^{-4} to 10^{-6}. Current EPA practice considers carcinogenic risks to be additive when assessing exposure to a mixture of hazardous substances.

In assessing the potential for adverse effects other than cancer, a hazard quotient (HQ) is calculated by dividing the daily intake by the RfD or RfC. A HQ $\leq$ 1 indicates that an exposed individual's dose of a single contaminant is less than the RfD or RfC and that a toxic effect is unlikely. The HI is generated by adding the HQs for all chemical(s) of concern that affect the same target organ (e.g., liver) within or across those media to which the same individual may reasonably be exposed. A HI $\leq$ 1 indicates that toxic non-carcinogenic effects are unlikely.

The following is a summary of the media and exposure pathways that were found to present a risk exceeding EPA's cancer risk range and non-cancer threshold at the site. Only those exposure pathways deemed relevant to site conditions are presented in this ROD. Readers are referred to Section 6 and tables in Attachment J-1 of the baseline HHRA for a more comprehensive risk summary of all exposure pathways evaluated for all chemicals of potential concern and for estimates of the central tendency risk.

Current/Future Commercial/Industrial Worker - Former Process Area

Tables G-6 (current) and G-7 (future) in Appendix A, depict the carcinogenic risk summary for the chemicals of concern in surface soil evaluated to reflect potential current and future commercial/industrial worker exposure corresponding to the RME scenario. For both the current and future commercial/industrial worker at the Former Process Area, carcinogenic risk exceeded the EPA acceptable risk range of 10^{-4} to 10^{-6}. The exceedance was due primarily to the presence of carcinogenic polycyclic aromatic hydrocarbons (benzo(a)pyrene toxicity equivalents [TEQ]), naphthalene, and arsenic in soil.

Future Resident - Former Process Area

Tables G-8 and G-9 in Appendix A, depict the carcinogenic and non-carcinogenic risk summary for the chemicals of concern in soil evaluated to reflect potential future residential exposure corresponding to the RME scenario. For the future young child and adult resident at the Former Process Area, carcinogenic and non-carcinogenic risks exceeded the EPA acceptable risk range of 10^{-4} to 10^{-6} and/or a target organ HI of 1. The exceedance was due primarily to the presence of carcinogenic polycyclic aromatic hydrocarbons (benzo(a)pyrene TEQ), naphthalene, antimony, arsenic, and mercury in soil.

Future Commercial/Industrial Worker - Hamilton Township Property

Tables G-10 and G-11 in Appendix A, depict the carcinogenic and non-carcinogenic risk summary for the chemicals of concern in surface/swale soil evaluated to reflect potential future commercial/industrial worker exposure corresponding to the RME scenario. For the commercial/industrial worker at the Hamilton Township Property, carcinogenic and non-carcinogenic risks exceeded the EPA acceptable risk range of 10^{-4} to 10^{-6} and/or a target organ HI of 1. The exceedance was due primarily to the presence of carcinogenic polycyclic aromatic hydrocarbons (benzo(a)pyrene TEQ) and arsenic in surface/swale soil.

Current/Future Utility Worker - Hamilton Township Property

Tables G-12 and G-13 in Appendix A, depict the carcinogenic and non-carcinogenic risk summary for the chemicals of concern in surface/swale soil evaluated to reflect potential current/ future utility worker exposure corresponding to the RME scenario. For the utility worker at the Hamilton Township Property, carcinogenic and non-carcinogenic risks exceeded the EPA acceptable risk range of 10^{-4} to 10^{-6} and/or a target organ HI of 1. The exceedance was due primarily to the presence of arsenic in surface/swale soil.

Future Construction Worker - Hamilton Township Property

Table G-14 in Appendix A, depicts the non-carcinogenic risk summary for the chemicals of concern in surface/swale soil evaluated to reflect potential future construction worker exposure corresponding to the RME scenario. For the construction worker at the Hamilton Township Property, non-carcinogenic risks exceeded the EPA acceptable target organ HI of 1. The exceedance was due primarily to the presence of antimony and arsenic in surface/swale soil.

Current/Future Trespasser - Hamilton Township Property

Tables G-15 and G-16 in Appendix A, depict the carcinogenic and non-carcinogenic risk summary for the chemicals of concern in surface/swale soil evaluated to reflect potential current/future trespasser exposure corresponding to the RME scenario. For the trespasser at the Hamilton Township Property, carcinogenic and non-carcinogenic risks exceeded the EPA acceptable risk range of 10^{-4} to 10^{-6} and/or a target organ HI of 1. The exceedance was due primarily to the presence of arsenic in surface/swale soil.

Future Recreational User - Hamilton Township Property

Tables G-17 and G-18 in Appendix A, depict the carcinogenic and non-carcinogenic risk summary for the chemicals of concern in surface/swale soil evaluated to reflect potential future recreational user exposure corresponding to the RME scenario. For the future young child and adult recreational user at the Hamilton Township Property, carcinogenic and non-carcinogenic risks exceeded the EPA acceptable risk range of 10^{-4} to 10^{-6} and/or a target organ HI of 1. The exceedance was due primarily to the presence of carcinogenic polycyclic aromatic hydrocarbons (benzo(a)pyrene TEQ), antimony, and arsenic in surface/swale soil.

Future Resident - Hamilton Township Property

Tables G-19 and G-20 in Appendix A, depict the carcinogenic and non-carcinogenic risk summary for the chemicals of concern in surface/swale soil evaluated to reflect potential future residential exposure corresponding to the RME scenario. For the future young child and adult resident at the Hamilton Township Property, carcinogenic and non-carcinogenic risks exceeded the EPA acceptable risk range of 10^{-4} to 10^{-6} and/or a target organ HI of 1. The exceedance was due primarily to the presence of carcinogenic polycyclic aromatic hydrocarbons (benzo(a)pyrene TEQ), antimony, arsenic, and mercury in surface/swale soil.

Future Residential Groundwater Use

Table G-21 in Appendix A, depicts the carcinogenic risk summary for the chemicals of concern in future residential wells evaluated to reflect potential future potable water exposure corresponding to the RME scenario, under the assumption that groundwater underneath the property migrates to potable wells in the future. For the future resident using untreated groundwater as household water, carcinogenic risk exceeded the EPA acceptable risk range of 10^{-4} to 10^{-6}. The exceedance was due primarily to the presence of arsenic in site-wide groundwater.

Lead Evaluation

Lead in soil was evaluated in the baseline human health risk assessment by comparing site soil concentrations to screening levels, developed based on EPA models. The Integrated Exposure Uptake Biokinetic Model was used to develop the residential screening level of 400 mg/kg, protective of young child soil lead exposures. This screening level was also used to evaluate recreational users. The Adult Lead Model was used to develop screening levels for commercial/industrial workers, trespassers, and shoreline fishermen (710 to 1,712 mg/kg), and construction and utility workers (355 to 856 mg/kg). These screening levels are protective of all adult subpopulations including pregnant women. Because lead concentrations in site soils exceed screening levels, lead in soil poses a risk in excess of EPA risk management criteria for the following exposure scenarios:

- Former Process Area

- Current/Future Commercial/Industrial Worker (surface soil)
- Current/Future Utility Worker (surface soil)
- Current/Future Adolescent Trespasser (surface soil)
- Future Construction Worker (surface soil)
- Future Resident (surface and subsurface soil)

- Lowland Area
  - Current/Future Utility Worker (surface soil)
  - Current/Future Recreational User (surface soil)

- Hamilton Township Property
  - Current/Future Adolescent Trespasser (surface/swale soil)
  - Current/Future Utility Worker (surface/swale soil)
  - Future Commercial/Industrial Worker (surface/swale soil)
  - Future Construction Worker (surface/swale soil)
  - Future Recreational User (surface/swale soil)
  - Future Resident (surface/swale soil)
  -

e. Uncertainties

The absence of toxicity values for some of the COC may underestimate risks and hazards. However, use of chronic reference doses during evaluation of subchronic construction worker exposures may overestimate risks and hazards. These uncertainties will be periodically reviewed to address changes in and the availability of toxicity values for site COC.

Adjustment factors were applied to slope factors of carcinogens that act through a mutagenic mode of action (such as the carcinogenic PAHs). These adjustments are combined with corresponding age-specific estimates of exposure to assess cancer risk. The effect of these adjustments on estimated lifetime cancer risk is small relative to the overall uncertainty of such estimates. This uncertainty will be periodically reviewed as the methodology and recommendations for assessing chemicals with mutagenic modes of action evolve.

Groundwater risks and hazards were estimated via comparison to EPA's Regional Screening Levels (RSLs). This may result in an overestimate of potential risk from groundwater consumption due to conservative ingestion exposure parameters. However, as the RSLs do not include the dermal exposure pathway, there is also the possibility of underestimating potential risk.

2. Ecological Risk Assessment

A baseline ecological risk assessment (BERA) was completed for the Former Peter's Cartridge site including off-site and on-site study areas. The site was divided into four ecological exposure areas based on current and future land use and habitat areas to facilitate the evaluation: Former Process Area, Lowland Area (including the shoreline deltas along the Little Miami River), Hamilton Township Property, and the unnamed creek. The BERA evaluated potential ecological risks for current/future soil invertebrates, mammalian herbivores, mammalian invertivores, and

avian carnivores exposed to soil/swale soil in the terrestrial portions of the Peters Cartridge Facility and sediment in the unnamed creek (Figure 4). Ecological exposure to materials in the concrete-lined culverts and at their outfalls (referred to herein as the shoreline deltas) along the Little Miami River was evaluated in the Screening Level Ecological Risk Assessment (SLERA).

a. Identification of Contaminants of Potential Ecological Concerns

Chemicals of Potential Ecological Concern (COPEC) identified in the SLERA using effects-based screening involving the comparison of maximum contaminant concentrations to ecological benchmarks for each medium and exposure area. Data used to identify COPEC are summarized in Appendix A, Tables G-22, and G23 (surface water in outfalls and upgradient concrete culverts. respectively), Tables G-24 and 25 (sediment), and Tables G 26, and G-27, 28, and 29 (soil).

The SLERA screening of COPEC identified potential for adverse ecological effects to terrestrial receptors from metals and PAHs in the soils of the Former Process Area, Lowland Area and Hamilton Township Property. Screening of sediments from the unnamed creek identified six metals and two PAHs above screening criteria. These exposure pathways in the unnamed creek and terrestrial soils were further evaluated in the BERA.

A potential for adverse ecological effects to terrestrial receptors from metals and PAHs in erosional materials and in the surface water associated with concrete-lined culverts were identified in the SLERA (Appendix A, Tables G-22, G-23, G-25, and G-26). Although the concrete-lined culverts do not represent significant ecological habitat, the potential for transport of site-related contaminants to the Little Miami River was further evaluated in the Feasibility Study. The 1999 and 2007 studies on the little Miami River by the Ohio EPA indicated that site-related constituents did not have a measured impact on ecological receptors in this reach of the Little Miami River.

b. Exposure Assessment

The site occupies approximately 71 acres west of Grandin Road in Hamilton Township. The site is bordered to the north by the Little Miami River (designated as a State and National Scenic River). For the purposes of the risk assessment, the upland portion of the site was divided into three exposure areas on the basis of habitat cover types, current land use and ownership. These are the Former Process Area, the Lowland Area and the Hamilton Township Property.

The Former Process Area includes the main facilities used by the Peters Cartridge Facility. Areas of ash-like fill are present around the existing buildings. The majority of the Former Process Area is relatively flat and represents limited habitat, covered by concrete/asphalt paving, buildings, and landscaped grass areas. The Lowland Area includes the southern bank of the Little Miami River, the Little Miami River Scenic Trail and some historical manufacturing areas north of the trail. The Lowland Area is characterized by steep banks and dense vegetation. The third upland habitat area is the Hamilton Township Property. It consists of steeply sloping bedrock ridges and rolling topography, also with dense vegetation. It also contains some historic man-made structures used by the Peters Cartridge Facility.

There are no aquatic habitats on the Peters Cartridge Facility. However, there are three narrow ephemeral drainage features that intermittently channel stormwater runoff from the forested hillside of the Hamilton Township Property and through the Former Process Area. Stormwater from the site ultimately discharges to the Little Miami River via three outfalls in the Lowland Area. The risks associated with the outfalls were addressed separately in the Feasibly Study. However, there is a limited portion of one drainage feature that briefly traverses east of Grandin Road where it converges with an unnamed stream originating from the forested Ohio DNR property to the east. This small section of natural stream is the only aquatic habitat that represents a complete exposure pathway and is addressed in the BERA; it is referred to as the "unnamed creek."

The BERA focused on the on-site complete terrestrial pathways and the complete exposure pathways for aquatic receptors in the unnamed creek. Sediment samples from the unnamed creek were evaluated in the BERA exposure assessment.

As noted in the BERA, no threatened, endangered or rare species were observed in the vicinity of the site during the RI or previous site assessments. However, the U.S. Fish and Wildlife Service (USFWS) was contacted regarding the presence of federally listed, proposed, threatened or endangered species or critical habitat in the vicinity of the site. The USFWS responded that the site is potentially within the range of four protected species. Two of these (the Eastern massasauga and Rayed bean mussels) are known to occur in habitats not present or affected by the site (the Little Miami River and wetland bordering the river). The other two species include the federally endangered Indiana bat and the federally endangered running buffalo clover. Due to the habitat conditions, the site is not likely to provide habitat for either species. Based on evaluation of the habitat present on site, the potential for exposure of either species to site-related contaminants is unlikely and the risk to endangered species is negligible.

Based on the conceptual site model, complete exposure pathways were identified, sampled, tested, and evaluated in each habitat area separately. Consistent with the site conceptual model, exposure pathways, assessment endpoints, and measurement endpoints are summarized in Appendix A, Table G-30.

Based on the evaluation in the BERA, COPEC with complete exposure pathways were identified for terrestrial invertebrates exposed directly to site-related contaminants in soil or swale soil. Complete exposure pathways also included terrestrial invertivores, herbivores, and carnivores exposes directly or through food-chain exposures in the three terrestrial habitat exposure areas including the Former Process Area, Lowland Area, and Hamilton Township Property. Species representing these potential receptors include earthworms, meadow vole, northern short-tailed shrew, and American kestrel (Appendix A, Table G-30).

c. Ecological Effects

Table G-30 provides the assessment and measurement endpoints chosen in the BERA to evaluate the potential adverse ecological effects resulting from the exposure to COPEC in on-site soil or sediments. Potential effects on benthic invertebrates in the unnamed creek exposed to sediments

were evaluated and receptors in terrestrial habitats exposed to contaminants in soils including earthworms, meadow vole, northern short-tailed shrew, and American kestrel were evaluated in the BERA.

The sediment chemistry evaluation for the unnamed creek assessed the potential for effects on invertebrates based on the comparison to effects-based benchmarks. Evaluation of risks to benthic macroinvertebrates was based comparison of maximum sediment concentrations and published TEC (Threshold Effects Concentration) and PEC (Probable Effects Concentration) values (MacDonald et al., 2000).

Concentrations of COPEC measured in soils and swale soils were utilized to calculate exposures to potential receptors. Exposures point concentrations (EPCs) for species with larger home ranges (American kestrel) were calculated based on site-wide 95% UCL concentrations in soil. EPCs for wildlife with smaller home ranges were calculated for each of the three exposure areas (Former Process Area, Lowland Area, and Hamilton Township Property) separately using the maximum concentrations for each COPEC for the exposure area. The concentration of COPEC in prey items were calculated in the BERA using uptake models. These estimated concentrations in prey items, along with estimates of daily intake of food, dietary preferences, and soil ingestion rates were used to calculate daily intake of COPEC in the diet. The calculated intake rates were compared to literature-based toxicity reference values (TRVs), to produce a Hazard Quotient (HQ) and evaluate the potential toxicity to exposed wildlife. For this assessment, TRVs based on Lowest observed effect levels (LOAEL) were used; when a constituent has a LOAEL HQ greater than 1.0, it indicates that the potential for adverse effects is present.

Results from a study of the Little Miami River conducted by Ohio EPA concluded that the Peters Cartridge facility is currently not causing measurable impairment to the LMR. However, results of the SLERA indicated that there is a potential for ecological risks at the drainage feature outfalls along the shore of the LMR. These risks were not further evaluated in the BERA, but because the on-site drainage feature have the potential to transport site-related constituents to the LMR, this transport pathway was addressed in the FS to prevent migration of contaminants to the sediment and surface water of the LMR.

d. Ecological Risk Characterization

The evaluation of the benthic invertebrate community indicated that the invertebrate community of the unnamed creek is not at risk due to COPEC potentially related to the site. The only COPEC with risks above the PEC benchmark was mercury, with a hazard quotient of 1. Based on this evaluation, no unacceptable ecological risks were identified in the unnamed creek sediments.

Terrestrial invertebrates were assumed to be directly exposed to COPEC in soil/swale soil at the site. Potential risks to wildlife were assessed by calculating HQs for each of the selected ecological receptors for each COPEC. Based on the risk evaluation there was risk to terrestrial receptors from exposure to antimony, arsenic, cadmium, nickel, selenium, thallium, and zinc on a limited spatial scale. The concentrations of these metals with the highest probability of resulting in adverse effects to ecological receptors are generally associated with the Former

Salvage Area. Due to the limited spatial extent of elevated soil concentrations of antimony, arsenic, cadmium, nickel, selenium, thallium and zinc, populations-level effects resulting from exposure to metals in site soil/swale soil are unlikely. However, hot spots for antimony, arsenic, and zinc were identified and will be addressed in the selected remedy.

Based on magnitude and spatial extent, copper, lead, and mercury in site soil/swale soil were identified as the metals contributing to significant ecological risk to terrestrial receptors at the site. For copper and lead, the most protective ecological PRGs were associated with risks to short-tailed shrews; for mercury, the lowest PRGs were based on risks associated with meadow vole exposures to on-site soils (Appendix A, Table G-31).

Ecological risks as a result of direct exposure to environmental media at the culvert outfalls along the shore of the Little Miami River were not quantitatively evaluated in the BERA. However, based on the potential for adverse effects to aquatic receptors at the culvert outfalls associated with depositional material and the potential for this material to be transported to the Little Miami River, removal of the depositional areas (culvert material and shoreline deltas) was proposed. In order to set the limits of the proposed remedial action for these small shoreline deltas, PRGs were established for the constituents identified in the depositional materials as exceeding ecologically-based risk levels (Appendix A, Table G-32).

e. Uncertainties

Ecological risk assessments are subject to a variety of uncertainties as the result of both the assumptions used to describe the site conditions, habitats, and estimated receptor exposures, plus variability in receptor exposure and toxicological response. As a result, the assessment must estimate or infer the information concerning individuals to reach a conclusion about risk at the population level. Population-level effects are difficult to assess using food-chain modeling. As a conservative evaluation, potential risks are presented as point-estimates for ecological receptors with limited home ranges. However, elevated point risk may have little impact on population dynamics if the area of elevated risk is small relative to the site. Therefore, the potential risks presented are conservative estimates of population-level risks for these receptors across the entire site.

The BERA provided an evaluation of potential sources of uncertainty in the calculation of risk. These uncertainties include a lack of medium- and species-specific benchmarks and toxicity data for some of the COPEC. Extrapolation of toxicity data among species and limited data on the bioavailability of COPEC in each medium are factors that contribute to significant uncertainty in the use of benchmarks.

3. Risk Assessment Conclusions

The risk to human health and the ecological risk due to copper, lead, and mercury will drive the clean up of surface soils (0-2 ft bgs) at the site. The response action selected in this ROD is necessary to protect the public health or welfare or the environment from actual or threatened releases of pollutants or contaminants from this site into the environment.

The results of the HHRA, SLERA, and BERA were used to provide information for the FS to support decisions concerning the need for further evaluation or action at individual Areas of Concern at the site based upon current and reasonably anticipated future land use. The main findings of these evaluations are as follows:

- The HHRA indicated that there are no unacceptable cancer or non-cancer human health risks under current or future land use scenarios for the Little Miami River Scenic Trail in the Lowland Area. However, average levels of lead in Lowland Area surface soil exceed acceptable levels for relevant receptors (e.g., utility workers and recreators). Potential unacceptable cancer and non-cancer risks were identified for several current and future receptors in surface soil and subsurface soil at the Former Process Area and surface soil/swale soil at the Hamilton Township Property. In addition, average lead concentrations in surface soil exceed acceptable levels for current/future receptors in the Former Process Area and Hamilton Township Property. Cancer risks at the site were generally driven by arsenic and benzo(a)pyrene; non-cancer risks were generally driven by arsenic and antimony. Areas of unacceptable risks were primarily associated with the Former Process Area and the AOC9 drainage feature.
- Under current conditions, shallow groundwater is not used on-site for potable or industrial uses, including irrigation. In addition, shallow groundwater is at a depth where direct contact during intrusive activities would likely not occur. As a result, the potential for human exposure to this medium is limited. Cumulative non-cancer risk estimates for groundwater for site-related contaminants (ranging from 0.1 to 0.7) are below a threshold hazard index of 1. However, there are potential carcinogenic risks which are driven by detections of arsenic at levels below the stipulated maximum contaminant level (MCL).

The SLERA and BERA identified potential ecological risks at the site based on exposure to soil/swale soil in the upland terrestrial portions of the site, erosional material and surface water in the concrete-lined culverts, and sediment and surface water at the culvert outfalls along the shoreline of the Little Miami River. The 1999 and 2007 Ohio EPA Little Miami River studies demonstrated that site-related contaminants are not impacting ecological receptors in the River; however, the on-site drainage features have the potential to transport site-related contaminants to the sediment and surface water of the Little Miami River.

H. REMEDIAL ACTION OBJECTIVES and ARARS

1. Remedial Action Objectives (RAO)

RAO are general descriptions of the goals established for protecting human health and the environment, to be accomplished through remedial action. RAO identify the medium of concern, COC, allowable risk levels, potential exposure routes, and potential receptors. The identification of RAO for the site was based on the requirements of CERCLA (as amended by SARA), the NCP, and the Statement of Work (SOW) for the RI/FS. The SOW for the RI/FS provided preliminary RAO for the site. These preliminary RAO were refined after completion of the RI, HHRA, and BERA to reflect the specific conditions at the site. In accordance with the

risk-based approach of CERCLA, the refined RAO do not allow unacceptable risk levels for potential exposure scenarios.

Additionally, to the extent practicable, remedial actions must comply with the requirements of federal, state, and local environmental laws. These requirements are referred to as Applicable or Relevant and Appropriate Requirements (ARARs). ARARs are identified on a site-specific basis by determining whether a regulation is applicable. Those considered applicable would include remedial standards and promulgated requirements or limitations that address a specific problem or situation at the site. If it is not applicable, then it is determined whether it is relevant and appropriate. While not applicable to site conditions, the requirements may be sufficiently similar to warrant their use, hence, relevant and appropriate.

In addition to ARARs, state and federal advisories may exist. Since these are not binding as promulgated regulations, they are referred to as "to be considered" (TBCs). TBCs are not required to be complied with, but may be considered in the absence of specific requirements.

The results of the HHRA indicated that surficial soil was the primary medium which requires remedial action because potential cumulative non-cancer hazards exceed 1 and potential cumulative cancer risks exceed 1×10^{-4}. Human health risks from groundwater and subsurface soil were limited to hypothetical future residential scenarios. RAO focus on preventing human exposure to COC at concentrations that pose unacceptable risk based on current and anticipated future land use.

The data reviewed indicated that lead is the most prevalent risk-driver at the site. Because site-related contaminants tend to be co-located, addressing lead will also tend to address the unacceptable risks associated with other COC. The general remediation process to be followed is to use lead as a sentinel compound for identifying areas for targeted remediation and then assess what additional remedial actions will be required to meet the RAO for human health COC and then to protect populations of ecological receptors.

Site-Specific RAO for Groundwater - Prevent ingestion exposures by a future resident with groundwater used as a domestic water supply having an arsenic concentration that exceeds its MCL. However ICs to restrict groundwater use at the site will be implemented as part of the selected remedy.

Under current conditions, shallow groundwater is not used on-site for potable or industrial uses, including irrigation. The RI Report provided hydrogeologic data indicating that groundwater yield for a well installed on-site would be insufficient for a potable, industrial or irrigation well. In addition, shallow groundwater is at a depth where direct contact during intrusive activities would not occur. As a result, the potential for human exposure to this medium is limited. The target-organ non-cancer HIs for site-related contaminants of concern in groundwater are below the EPA threshold HI of 1. However, there are potential carcinogenic risks which are driven by detections of arsenic at levels below the MCL. The RAO for groundwater focuses on preventing human ingestion of groundwater with concentrations of arsenic that could cause a risk to health. Thus, limited remedial actions in the form of ICs are recommended to address exposures by a future resident with groundwater used as a domestic water supply.

Site-Specific RAO for On-Site Soil - Prevent direct human exposure to surface/swale soil having COC concentrations which result in cumulative excess cancer risk greater that 1 $x10^{-4}$ or a non-cancer hazard index greater than 1.

Prevent direct human exposure to surface and subsurface soil with lead concentrations greater than EPA's residential standard (i.e., 400 mg/kg) or if an institutional control restricts residential development, prevent human exposure to surface/swale soil with lead concentrations greater than EPA's commercial standard (i.e., 800 mg/kg).

Prevent ecological receptor exposures to on-site surface soil/swale soil with copper, lead, and mercury concentrations creating unacceptable levels of risk.

Site-specific RAO for Shoreline Sediments - Prevent exposure of aquatic receptors to contaminants of ecological concern in the Little Miami River by limiting migration of site-related contaminants in depositional material in the channelized outfalls and deltas bordering the Little Miami River. Elevated concentrations of site-related contaminants in the culvert outfalls will be addressed by removing on-site sources that contribute to elevated concentrations in surface water discharged from the site.

The table below presents the soil COC for the scenario with the highest level of exposure and risk that can reasonably be expected to occur.

Table 2 - Soil Contaminant Risk

Area	**Assumed Receptor**	**Media**	**COC**
Former Process Area	Commercial/ Industrial Worker	Surface Soil (0-2 ft bgs)	Arsenic, Benzo(a)pyrene, Naphthalene, Lead
Lowland Area	Child/Adult Recreator	Surface Soil (0-2 ft bgs)	Lead
Hamilton Township Property	Child/Adult Recreator	Surface soil (0-2 ft bgs)	Antimony, Arsenic, Benzp(a)pyrene, Lead
Terrestrial Habitats	Ecological Receptors	Surface Soil (0-2 ft bgs)	Antimony, Arsenic, Cadmium, Copper, Lead, Mercury, Nickel, Selenium, Thallium, Zinc

The identified depth of remediation for the excavation alternatives is 2 ft bgs for soil and 0.5 ft bgs for shoreline sediment; however the actual areas to be excavated and depths will be determined and evaluated during the Remedial Design. Assuming excavation to these depths, the total identified area and volume to be remediated is:

Table 3 - Estimated Soil and Sediment Remediation Volume Total

Area	Total Area to be Remediated (ft^2)	Total Volume to be Remediated (yd^3)
Former Process Area	169,500	12,600
Lowland Area	86,400	6,400
Hamilton Township Property	175,600	13,000
Little Miami River Shoreline	1,400	30
TOTAL	**432,900**	**32,000**

2. Applicable or Relevant and Appropriate Requirements (ARARs)

Applicable Requirements - These requirements are, "...those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, constituent, remedial action, location or other circumstances at a CERCLA site" (EPA 1988 [RI/FS Guidance]). Therefore, in order for a requirement to be applicable, the requirement must satisfy all of the legal prerequisites for application of the requirement standing on its own. In other words, a requirement will be applicable if and only if it would legally apply to the remedial action not withstanding the fact that the cleanup is proceeding under CERCLA.

Relevant and Appropriate Requirements - These requirements are those standards that "...address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site" (40 CFR Part 300). The term "relevant and appropriate" therefore requires that the requirement: (1) be a promulgated law or regulation; and (2) be particularly well suited to address the cleanup issue at the site. In addition, the nature of the constituents prevalent at the site, the characteristics of the site, the circumstances of the release, the ability of the action to address the release, the purpose of the requirement versus the goals of remediation, the similarity of the action regulated by the requirement to the action in the remediation, and waivers from the requirement and their applicability to site conditions are considered in the analysis. Most importantly, however, a determination of the exposure level regulated by the requirement versus the exposure level at the CERCLA site must be compared.

To-be-Considered Criteria - These criteria include non-promulgated advisories or guidance documents issued by the Federal or state government that are not legally binding and do not have the status of potential ARARs. In determining the necessary level of cleanup for protection of human health or the environment, TBC criteria may be used where no specific ARARs exist for a chemical or situation, or where such ARARs are not sufficient to afford protection. The identification of site-specific ARARs is based on specific constituents at a site, the various

response actions proposed, and the general site characteristics. As such, ARARs are classified into three general categories:

Chemical-specific ARARs - Chemical-specific requirements set health or risk-based concentration limits or ranges for specific hazardous substances in various environmental media. These ARARs provide site PRGs or a basis for calculating PRGs for COPC. Chemical-specific ARARs are also used to indicate an acceptable level of discharge, to determine treatment and disposal requirements for a particular remedial activity, and to assess the effectiveness of a remedial alternative

Action-specific ARARs - Action-specific requirements set controls or restrictions on the design, implementation, and performance of remedial actions. These ARARs specify performance levels, actions, or technologies and specific levels for discharge of residual chemicals. They also provide a basis for assessing the feasibility and effectiveness.

Location-specific ARARs - Location-specific requirements set restrictions on the types of remedial activities that can be performed based on specific site characteristics or location. Location-specific ARARs provide a basis for assessing restrictions during the formulation and evaluation of site-specific remedies. Remedial alternatives may be restricted or precluded based on citing laws for hazardous waste facilities and based on proximity to wetlands, floodplains, or man-made features such as landfill, disposal area, and/or local historic buildings.

Potentially applicable federal, state and local ARARs and TBCs are summarized in Appendix B.

I. Description of Alternatives

Following development of the RAO, a screening and evaluation of potential remedial alternatives was conducted in accordance with CERCLA and the NCP in the FS Report.

When reviewing anticipated land use, under the assumption that land use restrictions will be implemented given the site's industrial setting, the FS concluded that the residual risk at the site is limited to COC in soil in the 0 to 2 foot horizon and the 0 to 0.5 foot horizon for shoreline sediment and deltas. Surface water does not pose unacceptable ecological or human health risks. COC in groundwater are below MCLs and therefore no active remedial action is required for groundwater. The results of the BERA showed that there is no ecological risk associated with the unnamed creek. However, the SLERA indicated that sediment and surface water along the shoreline of the Little Miami River associated with the culvert outfalls has the potential to result in adverse ecological effects to benthic receptors.

There is a potential for site-related contaminants in upland soil/swale soil and erosional/ depositional material to migrate off-site to the Little Miami River via the on-site drainage features. Therefore, transport of these materials to the sediment and surface water of the River will be addressed to prevent exposure of aquatic receptors to contaminants of ecological concern in the Little Miami River by limiting migration of site-related contaminants in depositional material in the channelized outfalls and deltas bordering the Little Miami River. Elevated concentrations of site-related contaminants in the culvert outfalls will be addressed by removing

on-site sources that contribute to elevated concentrations in surface water discharged from the site.

Since contaminants will still be present on-site above levels that allow for UU/UE, five-year reviews will be conducted in accordance with the NCP after this remedial action is completed to ensure that the selected remedy is still protective of human health and the environment. Five-year reviews will include the determination of whether land use changes have occurred or will likely occur (within the next five years) and an associated evaluation of the protectiveness of the remedy for current and future receptor populations.

Accordingly, the technology screening was limited to soil remediation technologies. Technologies that are clearly not applicable based on Peters Cartridge Facility conditions or are inappropriate for achieving the RAO were screened out at this level and not retained for further technology screening. The screening for soil focuses on remediation of lead because it is the most prevalent and extensive COC, and remediation of lead will result in remediation of other COC. The technologies retained were then screened further using the following criteria: effectiveness, implementability, and relative cost. Technologies or process options that are clearly not effective or implementable were screened out at this level and not retained for further technology screening.

The terrain at the site varies widely. For the purpose of evaluating the implementability of the remedial alternatives listed above, the following three terrain types were considered:

1. Upland soil - The upland soil areas include portions of the site in and around the former plant buildings as well as the steep banks with local bedrock outcropping. The upland soil areas are generally densely vegetated with a variety of woody and herbaceous cover.

2. Upland depositional/erosional soil - Portions of the upland area of the site are characterized by intermittent tributary drainages or ravines that drain the steep upland slopes north toward the Little Miami River. There are three main drainage areas that convey flows into three manmade culverts that pass under the Former Process Area and discharge to the Little Miami River at three outfall locations.

3. Shoreline sediment and deltas - The culverts discharge into eroded gullies that convey flow from the culvert outfall to the Little Miami River. The shoreline sediment and delta areas consist of the drainage channels downstream of the three culverts and the adjacent river shoreline.

Each of the process options that were retained have been assembled into remedial alternatives for the media of concern at the site (soil). The No Action alternative is retained as required by the NCP as a baseline comparison for other remedial alternatives. With the exception of the No Action alternative, the assembled remedial alternatives are protective of human health and the environment.

1. Remedy Components

Each of the alternatives is briefly described below. More detailed information about each of the alternatives can be found in the FS report, which is included in the Administrative Record for the site.

For soil, the primary risk is direct exposure to lead impacted soil and remediation of lead will result in remediation of other COC. Therefore the selected remedy is protective of health and the environment. The retained process options were assembled into remedial alternatives that eliminate exposure to the lead impacted soil and, therefore, are protective of human health and the environment. The remedial alternatives (except no action) include institutional controls (easements, building permit restrictions, and land use zoning restrictions) for future commercial uses. Additionally, Alternatives 2, 3 and 4 all include excavation of shoreline sediment areas at culvert discharge pipes along the Little Miami River and the removal of bottles and debris in stormwater culverts on the property.

Alternative 1; No Action - no cleanup or control measures would be implemented nor would contaminant levels be monitored.

Alternative 2; Isolation/soil capping and containment - a soil layer consisting of 2 feet of clean fill would be placed over 10 acres where contaminant levels exceed cleanup goals. Clean soil would be brought to the site, and the upper 6 inches would be topsoil to support vegetation growth. ICs would be used to limit exposure to contaminated soil, including implementing deed restrictions requiring the property only be used for nonresidential purposes, and limiting future invasive activities where contaminated soil has been capped; and to restrict groundwater uses on-site to prevent ingestion exposures by a future resident with groundwater used as a domestic water supply having an arsenic concentration that exceeds its MCL. Excavation of shoreline sediment areas at culvert discharge pipes along the Little Miami River and the removal of bottles and debris in stormwater culverts on the property.

Since contaminants will still be present on site above levels that allow for UU/UE, five-year reviews will be conducted in accordance with the NCP after this remedial action is completed to ensure that the selected remedy is still protective of human health and the environment. Five-year reviews will include the determination of whether land use changes have occurred or will likely occur (within the next five years) and an associated evaluation of the protectiveness of the remedy for current and future receptor populations.

Alternative 3; Excavation and on-site consolidation - excavation of surface soil, where contaminant concentrations exceed the cleanup goals, as presented in this ROD. An estimated 32,000 cubic yards of soil would be excavated. The excavated areas would be backfilled with clean material and seeded. Excavation of shoreline sediment areas at culvert discharge pipes along the Little Miami River and the removal of bottles and debris in stormwater culverts on the property. The consolidation area would be about 3 acres in size and would be located on the flat section in the southwest portion of the Hamilton Township property. A 2-foot-thick low-permeable soil cover, an impermeable synthetic material cover, and a 6-inch-thick vegetation support layer would be placed above the excavated material. An impermeable liner would be

placed below the excavated material. In addition, monitoring wells located downgradient of the consolidation area would be installed as part of the remedy to determine whether or not any leaching is occurring. The final grade of the consolidation area would be approximately 1 foot or less above the level of the existing surface. Like Alternative 2, institutional controls would be required to restrict land use to nonresidential purposes and limiting site activities where contaminated soil has been capped; and to restrict groundwater uses on-site to prevent ingestion exposures by a future resident with groundwater used as a domestic water supply. During the Remedial Design phase, access restrictions would be determined based on future use of the area.

Since contaminants will still be present on site above levels that allow UU/UE, five-year reviews will be conducted in accordance with the NCP after this remedial action is completed to ensure that the selected remedy is still protective of human health and the environment. Five-year reviews will include the determination of whether land use changes have occurred or will likely occur (within the next five years) and an associated evaluation of the protectiveness of the remedy for current and future receptor populations.

Alternative 4; Excavation and Off-Site Disposal - surface soil, where contaminant concentrations exceed the cleanup goals, would be excavated and transported off-site for disposal. The volume of soil to be excavated would be about 32,000 cubic yards. As in Alternative 3, the excavation areas would be backfilled with clean material, leveled with the surface and seeded. Excavation of shoreline sediment areas at culvert discharge pipes along the Little Miami River and the removal of bottles and debris in stormwater culverts on the property. Institutional controls would restrict land use to nonresidential purposes and restrict groundwater uses on-site to prevent ingestion exposures by a future resident with groundwater used as a domestic water supply.

Since contaminants will still be present on site above levels that allow for UU/UE, five-year reviews will be conducted in accordance with the NCP after this remedial action is completed to ensure that the selected remedy is still protective of human health and the environment. Five-year reviews will include the determination of whether land use changes have occurred or will likely occur (within the next five years) and an associated evaluation of the protectiveness of the remedy for current and future receptor populations.

2. Common Elements and Distinguishing Features of Each Alternative

Alternatives 2, 3 and 4 include excavation of shoreline sediment areas at culvert discharge pipes along the Little Miami River. This will limit pollution from entering the river and protect aquatic wildlife. Additionally, Alternatives 2, 3 and 4 include the removal of bottles and debris in the drainage channels. Alternatives 2 and 3 will require ICs to ensure that capped areas or the consolidation cell are not disturbed. Additionally, Alternatives 2, 3 and 4 will result in the removal and possible future loss of trees, understory, shrubs, forbs, wildflowers and other vegetative features. Alternatives 2, 3 and 4 would require ICs to restrict land use to non-residential purposes and to restrict groundwater uses on-site to prevent ingestion exposures by a future resident with groundwater used as a domestic water.

Alternatives 2, 3 and 4 would require a review be conducted within five years after initiation of the remedial action and every five years thereafter to ensure that the selected remedy is still protective of human health and the environment. Five-year reviews will include the determination of whether land use changes have occurred or will likely occur (within the next five years) and an associated evaluation of the protectiveness of the remedy for current and future receptor populations.

Alternative 2 differs from 3 and 4 in that it does not provide as much flexibility for redevelopment because Alternative 2 neither consolidates the contaminated soil into one area on-site, nor removes the impacted soil from the site.

Although Alternative 4 would need to transport excavated soils to an off-site and 2 and 3 would not require soil to be transported off-site, all three alternatives would take approximately the same amount of time. However, Alternative 4 would have increased health and safety risks off-site associated with increased truck traffic. The roads servicing the site are not well suited to large construction vehicles.

The activities associated with Alternatives 3 and 4 would result in a larger metric ton carbon footprint than Alternative 2 because they require a greater area of disturbance associated with land clearing. While excavation vehicles used in all alternatives contribute additional metric ton to the carbon footprint, in Alternative 3 the excavated material will be consolidated on site, so the carbon footprint associated with contaminated material transport is negligible. Alternative 4 requires a greater amount of waste material transport that the other alternatives resulting in an increase of its carbon footprint.

3. Expected Outcomes of Each Alternative

Alternative 1, No Action, would not protect human health and the environment and does not comply with ARARs. Alternative 2 would comply with ARARs and provides the same degree of long-term protection from exposure as Alternative 3. Implementing and maintaining the cap, however, would be much more difficult due to the steep slopes and rugged terrain at the site. Alternative 4 would protect human health and the environment and comply with ARARs, but is more expensive than Alternative 3 and would be more disruptive to the local community due to increased truck traffic. Alternative 1 will not cause any ecosystem disturbances and has no carbon footprint but will negatively impact the ecosystems due to risks associated with exposure to contaminants. Alternatives 2, 3, and 4 will benefit the ecosystem by eliminating the exposure to the contaminants but will cause ecosystem disturbances in the excavated areas and by covering contaminated areas with a compacted soil cap.

J. Comparative Analysis of Alternatives

This section of the ROD explains the EPA's rationale for selecting the preferred alternative. The EPA has developed nine criteria to evaluate remedial alternatives to ensure that important considerations are factored into remedy selection decisions. These criteria are derived from the statutory requirements of Section 121 of CERCLA, the NCP, as well as other technical and policy considerations that have proven to be important when selecting remedial alternatives.

When selecting a remedy for a site, EPA conducts a detailed analysis of the remedial alternatives consisting of an assessment of the individual alternatives against each of the nine evaluation criteria and a comparative analysis focusing upon the relative performance of each alternative against those criteria.

The nine evaluation criteria are described in more detail below.

Threshold Criteria

Threshold criteria are standards that an alternative must meet to be eligible for selection as a remedial action. There is little flexibility in meeting the threshold criteria. If ARARs cannot be met, a waiver may be obtained where one or more site exceptions occur as defined in the NCP.

1. Overall Protection of Human Health and the Environment.

Protectiveness is the main requirement that remedial actions must meet under CERCLA. It is an assessment of whether each alternative achieves and maintains adequate protection of human health and the environment. A remedy is protective if it eliminates, reduces, or controls all current and potential risks posed by the site through each exposure pathway. Adequate engineering controls, institutional controls, or some combination of the two can be implemented to control exposure and thereby ensure reliable protection of human health and the environment over time. In addition, implementation of a remedy cannot result in unacceptable short-term risks or cross-media impacts on human health and the environment.

2. Compliance with ARARs.

Compliance with ARARs is a statutory requirement of remedy selection. This criterion is used to determine whether the selected alternative would meet the federal, state, and local ARARs identified in Appendix B. A discussion of the compliance of each alternative with chemical, location, and action-specific ARARs is included.

Primary Balancing Criteria

Balancing criteria are used to weigh tradeoffs between alternatives. These represent the standards upon which the detailed evaluation and comparative analysis of alternatives are based. A high rating on one generally can compensate for a low rating on another.

3. Long-Term Effectiveness and Permanence.

Long-term reliability and effectiveness reflects CERCLA's emphasis on implementing remedies that will protect human health and the environment in the long term. Under this criterion, results of a remedial alternative are evaluated in terms of the risk remaining at the site after response objectives are met. The primary focus of the evaluation is the extent and effectiveness of the actions or controls that may be required to manage the risk posed by treatment residuals or untreated wastes.

Factors to be considered and addressed are magnitude of residual risk, adequacy of controls, and reliability of controls. Magnitude of residual risk is the assessment of the risk remaining from untreated waste or treatment residuals after remediation. Adequacy and reliability of controls is the evaluation of the controls that can be used to manage treatment residuals or untreated wastes that remain on site.

4. Reduction of Toxicity, Mobility or Volume through Treatment.

This criterion addresses the statutory preference for remedies that employ treatment to significantly reduce the toxicity, mobility or volume of the hazardous substances. That preference is satisfied when treatment is used to reduce the principal threats at a site by destroying toxic chemicals or reducing the total mass or total volume of affected media. This criterion is specific to evaluating only how the treatment reduces toxicity, mobility and volume. Specifically, the analysis will examine the magnitude, significance and irreversibility of reductions. It does not address containment actions, such as capping.

5. Short-Term Effectiveness.

This criterion examines the short-term impacts associated with implementing the alternative. Implementation may affect workers, the neighboring community, or the surrounding environment. Short-term effectiveness also includes potential threats to human health and environment associated with excavation, treatment and transportation of hazardous substances; potential cross-media impacts of the remedy; and the time required to achieve protection of human health and the environment.

6. Implementability.

Implementability considerations include technical and administrative feasibility of the alternatives, as well as the availability of goods and services (including treatment, storage or disposal capacity) associated with the alternative. Implementability considerations often affect the timing of remedial actions (for example, limitations on the season in which the remedy can be implemented, the number and complexity of material handling steps, and the need to secure technical services). On-site activities must comply with the substantive parts of applicable permitting regulations.

7. Cost.

The detailed cost analysis of alternatives includes capital and annual O&M costs incurred over a period of 30 years in accordance with EPA guidance *Guide to Developing and Documenting Cost Estimates During the Feasibility Study*. The focus during the detailed analysis is on the net present worth of these costs. Costs are used to select the most cost-effective alternative that will achieve the remedial action objectives.

The cost estimates are prepared to have accuracy in the range of –30 to +50 percent. The exact accuracy of each cost estimate depends upon the assumptions made and the availability of

costing information. Present worth will be calculated assuming the current discount rate established by the Office of Management and Budget.

Modifying Criteria

Modifying criteria are evaluated by addressing comments received after the regulatory agencies and the public have reviewed the FS and Proposed Plan. This evaluation is presented in the Responsiveness Summary, found in Part III of this document.

8. State Acceptance.

This criterion evaluates the technical and administrative issues and concerns the state may have regarding the alternatives. This was addressed upon receiving comments on the RI/FS Report and the Proposed Plan.

9. Community Acceptance.

This criterion evaluates the issues and concerns the public may have regarding the alternatives. This was addressed upon receiving comments documented during the public comment period.

The full text of the detailed analysis of the remedial alternatives against the nine evaluation criteria (including both the individual analysis and the comparative analysis) is contained in the FS Report for the Peters Cartridge Facility, which is part of the Administrative Record for the site. Because the two Modifying Criteria cannot be fully evaluated until the public comment is closed, they were not evaluated in the FS. The Responsiveness Summary of this ROD contains a more detailed discussion of public comments received.

A comparative analysis of the remedial alternatives presented for the site is also included in this section of the ROD. The purpose of the comparative analysis is to identify the relative advantages and/or disadvantages of each remedial action alternative. The NCP is the basis for the detailed comparative analysis. The following table summarizes the comparative analysis.

Table 4
Comparative Analysis of Remedial Alternatives

Alternative Number	Remedial Alternative Name	Protective of Human Health and the Environment	Compliance with ARARs	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility and Volume through Treatment	Short-Term Effectiveness	Implementability	Present Worth Cost
1	**No Action**	Not protective	Not applicable	Low degree of long-term effectiveness	Not reduced	Not Effective	Not applicable	$0
2	**Isolation/soil Capping**	Alternative is protective Degree of protection is comparable to 3 and 4.	Complies with ARARs provided institutional controls are in place to ensure periodic inspection and maintenance of capped areas. Degree of compliance is comparable to 3 and 4.	Effective, comparable to 3 and 4. However contaminants will remain in place and caps will require maintenance. Site reuse restricted to non-residential use.	Mobility reduced through the installation of a compacted soil cap. It will not reduce the toxicity or volume of impacted soil. There is no treatment performed. Reduction of toxicity and volume is comparable to 3. Reduction of mobility is comparable to 3 and 4	Effective, comparable to 3 and 4 with respect to remedy implementation risks. The duration of work is relatively short and steps can be taken to minimize impacts during implementation. The importation of soil cover material will require increased truck traffic.	Implementable, comparable to 3 and 4. Capping on steep slopes may require structural fill to achieve the required grades. Capping in drainage ravines would be less disruptive than the excavation alternatives 3 and 4.	$3,800,000
3	**Excavation and on-site consolidation of soils**	Alternative is protective. Degree of protection is comparable to 2 and 4.	Complies with ARARs provided that the consolidation cell is properly maintained. Degree of compliance is comparable to 2 and 4.	Effective, comparable to 2 and 4. Contaminants will remain in place and consolidation cell will require periodic inspection and maintenance. Site reuse restricted to non- residential use.	Mobility reduced through containment of impacted soils within an engineered consolidation cell. It will not reduce the toxicity or volume of impacted soil. There is no treatment performed. Reduction of toxicity and volume is comparable to 2. Reduction of mobility is comparable to 2 and 4.	Effective, comparable to 2 and 4 with respect to remedy implementation risks. The excavation of impacted soils will require removal of some existing vegetation in the remediation areas. The importation of backfill and capping material will require truck transportation of material.	Implementable, comparable to 2 and 4. Requires only readily available machinery and identification of borrow pit(s) to obtain clean soils for backfill. Areas to be excavated are accessible although some are very steep.	$5,000,,000
4	**Excavation and off-site disposal of soil**	Alternative is protective. Degree of protection is comparable to 2 and 3.	Complies with ARARs. Degree of compliance is comparable to 2 and 3.	Effective, comparable to 2 and 3. Site reuse restricted to non-residential use.	Mobility reduced by containing impacted soil in an off-site landfill. There is no treatment performed. Reduction of toxicity and volume is comparable to 2 and 3. Reduction of mobility is comparable to 2 and 3.	Effective, comparable to 2 and 3 with respect to remedy implementation risks. The excavation of impacted soils will require removal of some existing vegetation in the remediation areas. The off-site disposal of excavated soil and importation of fill will require a large number of trucks transporting materials.	Implementable, comparable to 2 and 3. Requires only readily available machinery and identification of borrow pit(s) to obtain clean soils for backfill. Areas to be excavated are accessible although some are very steep.	$6,300,000

1. Overall Protection of Human Health and the Environment

Soil Alternative 1, No Action, does not prevent exposure to impacted soil and is not protective of human health. Soil Alternatives 2, 3 and 4 provide comparable protection of human health and the environment. These alternatives protect human health by preventing exposure to the impacted soil through the use of a soil cover (Alternative 2); excavation and on-site consolidation (Alternative 3); or through excavation and off-site disposal (Alternative 4). Institutional controls such as a restrictive covenant prevent potential future risks by restricting excavation activities, groundwater use, and restricting land use to non-residential use. Soil Remedial Alternatives 2, 3 and 4 are equally ranked with respect to this evaluation criterion.

The NCP requires that the remedial action be reviewed no less often than every five years if the remedial action results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure. After this remedial action is completed, pollutants or contaminants will still be present on-site above levels that allow for unlimited use and unrestricted exposure. Therefore, pursuant to section 121(c) of CERCLA, 42 U.S.C. § 9621(c), a review will be conducted within five years after initiation of the remedial action and every five years thereafter to ensure that the selected remedy is still protective of human health and the environment.

Five-year reviews will include the determination of whether land use changes have occurred or will likely occur (within the next five years) and an associated evaluation of the protectiveness of the remedy for current and future receptor populations.

2. Compliance with ARARs

The ARARs for the Peters Cartridge Facility are located in Appendix B. Alternative 1, No Action, will not meet the chemical-specific ARARs and has no location-specific or action-specific ARARS. Alternatives 2, 3 and 4 have chemical-specific, location-specific and action-specific ARARs which can be met without difficulty. Alternatives 2, 3 and 4 are equally ranked with respect to this evaluation criterion.

3. Long-Term Effectiveness and Permanence

Alternative 1 is not effective as a long-term or permanent solution. It will not prevent the exposure of human and ecological receptors to contaminated soil. Alternatives 2 and 3 will require institutional controls to protect against future disturbance of soil capped areas or the consolidation cell. Neither Alternatives 2 nor 3 can be considered permanent. Alternative 4 is effective as a permanent solution because the contaminants are removed from the site. Alternatives 2, 3 and 4 will result in the removal and possible future loss of trees, understory shrubs, forbs, wildflowers and other vegetative features.

Alternative 1 will negatively impact the site reuse potential. The areas that are not remediated would require institutional controls. Alternatives 2 and 3 will allow site reuse with limited restrictions, including prohibition of non-intrusive activities in the soil cover/capped areas, groundwater use restrictions, and continued restriction on residential development of the site. Alternative 4 will allow site reuse limited to non-residential use.

4. Reduction of Toxicity, Mobility, or Volume through Treatment

None of the alternatives treat the contaminated materials. Alternative 1 does not reduce toxicity, mobility, or volume of the COCs. Alternatives 2 and 3 reduce the mobility of contaminants but they do not reduce the toxicity or volume, as contaminants will remain in place at the site. Alternative 4 reduces the mobility of COCs by containing them in an off-site landfill, but it also does not reduce the toxicity or volume of contaminants.

5. Short-Term Effectiveness

Alternative 1 would not be effective in the short term. Alternatives 2 and 3 are effective in the short-term because the duration of the work is relatively short and steps can be taken to minimize impacts of the remedial action. Alternative 4 would have the short-term impacts of an off-site disposal remedy, including increased health and safety risks off-site associated with increased truck traffic. The roads servicing the site are not well-suited to large construction vehicles. Alternatives 2, 3 and 4 will all have short-term impacts on native vegetation and habitat and potential to exacerbate erosion if high intensity precipitation events occur during the time between site disturbance and full site stabilization and revegetation.

Alternative 1 does not result in any loss of habitat, vegetation or impacts to the Little Miami River (LMR). OEPA (in 2007) has stated that the site does not impact the LMR. Alternatives 2, 3 and 4 all involve the loss of habitat, impacts on scenic vistas, removal of mature trees and understory vegetation, and at least temporary construction impacts to the existing bikeway/rail trail.

6. Implementability

Alternative 1 is the most easily implementable alternative. Alternatives 2, 3 and 4 are implementable, but pose construction challenges requiring use of specialized equipment during construction activities on steep slopes. Alternative 4 requires the additional steps of identifying an appropriate disposal site, coordinating removal of the material, and, in light of the increased truck traffic on public roads, obtaining community acceptance of the remediation plan.

Alternatives 2, 3 and 4 would require the property owners to maintain the current uses of the property which restrict residential development. The Lowland Area includes the Little Miami Scenic Trail owned by the Ohio DNR. This area is a dedicated scenic trail; thus the restriction as

open recreational land will be maintained. The Hamilton Township Property is restricted open space/recreational land, a designation which will also be maintained. The Former Process Area will be maintained as industrial/commercial property use. As part of the remedial action, deeds for all properties will be reviewed and restrictions on residential development will be added.

7. Cost

Cost estimates were developed using approximate area take-offs and unit prices for major activities such as clearing and grubbing, excavation, capping and disposal. A summary of the alternative cost estimates and detailed cost estimate worksheets are included in Appendix C.

- **Alternative 1 - No Action** has no associated costs but does not reduce risk.

- **Alternative 2 – Isolation/Soil Capping** is expected to have a net present value cost of approximately $3.8M.

- **Alternative 3 - Excavation with On-site Consolidation** is expected to have a net present value cost of approximately $5.0M

- **Alternative 4 - Excavation with Off-site Disposal** is expected to have a net present value cost of approximately $6.3M

8. State Acceptance

The State Agency, Ohio EPA, has been involved with the site prior to it being proposed for listing on the National Priorities List, and has continued to be involved in all steps of the RI/FS for the site. The State of Ohio has indicated its intention to concur with the selected remedy. The Letter of Concurrence will be added to the Administrative Record once it is received.

9. Community Acceptance

During the public comment period on the Proposed Plan, the community expressed its concern as to whether the remedy was necessary at this time to protect human health and the environment. As discussed in the Responsiveness Summary, EPA explained that there were health risks at the site that needed to be addressed and the selected remedy would be protective of human health and the environment. This ROD includes a responsiveness summary that summarizes the public comments and EPA's response to those comments. The responsiveness summary is included in this record of Decision as Part III.

Sustainability

EPA has begun examining opportunities to integrate sustainable practices into the decision-making processes and implementation strategies that carry forward to reuse strategies. Incorporation of sustainability principles can help increase the environmental, economic, and social benefits of cleanup. The practice of green remediation uses these strategies to consider all environmental effects of remedy implementation for contaminated sites and incorporates options to maximize the net environmental benefit of cleanup actions. In order to meet this goal, sustainability consideration was also factored into the evaluation of each alternative in the FS. The table below summarizes the sustainability comparison.

Table 5 - Sustainability Analysis of Remedial Alternatives

Alternative Number	Alternative name	Sustainability
1	No Action	This alternative will not cause any ecosystem disturbances and has no carbon footprint. However, it will negatively impact ecological receptors due to their exposure to concentrations of COC that exceed PRGs.
2	Isolation/Soil Capping	This alternative will benefit ecological receptors by eliminating the exposure to the COCs. Capping may induce negative impacts such as reduction in soil fertility, reduction in infiltration, increase storm water runoff, and some ecosystem disturbance. The importation of fill and capping material will require transportation so materials by truck from local borrow areas.
3	Excavation and On-site Consolidation	This alternative will benefit ecological receptors by eliminating the exposure to the COCs. However, on-site consolidation requires land disturbance to build the cell. Excavation and on-site consolidation would not require extensive trucking except for the on-site excavation equipment. The importation of fill and capping material will require transportation of materials by truck from local borrow areas.
4	Excavation and Off-site Disposal	This alternative will benefit ecological receptors by eliminating the exposure to the COCs. However, there are negative impacts of off-site disposal such as extensive material handling and hauling and associated fuel consumption.

Alternative 1 will negatively impact environmental receptors due to risks associated with exposure to COC. Alternative 2 will cause short-term ecosystem disturbances by covering the contaminated areas with a compacted soil cap. Alternative 3 (Excavation with On-site Consolidation) and Alternative 4 will cause ecosystem disturbances in the excavation areas and, in the case of Alternative 3, the consolidation area.

The carbon footprint of Alternatives 2, 3 and 4 are estimated at:

- **Alternative 2 – Isolation/Soil Capping/Containment** 475 mt CO_2
- **Alternative 3 - Excavation with On-site Consolidation** 560 mt CO_2
- **Alternative 4 - Excavation with Off-site Disposal** 676 mt CO_2

The Alternatives Carbon Footprint Calculations are provided as Appendix D.

K. Principal Threat Wastes

The NCP establishes an expectation that EPA will use treatment to address the principal threat posed by a site wherever practicable. In general, principal threat wastes are those source materials considered to be highly toxic or highly mobile which generally cannot be contained in a reliable manner or would present a significant risk to human health or the environment should exposure occur. There are no source materials constituting principal threats addressed within the scope of this action because the contaminants are not liquid, highly toxic or highly mobile. This remedy satisfies the statutory preference for engineering controls of low long-term threat pollutants and contaminants through containment. Institutional controls that restrict land use and prevent or limit exposure to remaining on-site pollutants or contaminants will also be used to supplement the engineering controls.

L. Selected Remedy

This section describes the selected remedy and provides EPA's reasoning behind its selection. Alternatives can change or be modified if new information is made available to EPA through further investigation or research. An appropriate range of alternatives was developed, based upon initial screening of technologies, and potential for contaminants to impact the environment, and site-specific RAOs and goals.

1. Summary of the Rationale Selected Remedy

EPA selects Alternative 3 - Excavation and On-site Consolidation of impacted soils and ICs for soil and groundwater. This alternative represents the best balance of overall protectiveness, compliance with ARARs, long-term effectiveness and permanence, cost, and other criteria.

2. Description of the Selected Remedy

Under Remedial Alternative 3 surface soil in the Former Process area will be excavated to a depth of at least two feet bgs in areas that exceed the EPA commercial standard for lead of 800 mg/kg; and surface soil in the Lowland area and on the Hamilton Township Property will be excavated to a depth of at least two feet bgs in areas that exceed the EPA residential standard for lead of 400 mg/kg. The actual areas to be excavated and depths will be determined and

evaluated during the Remedial Design (RD). The excavation area will be backfilled with clean fill material to the existing grade.

In general, the excavations in the upland areas would exclude areas immediately surrounding trees with a diameter greater than 12-inches. The fill materials used to backfill the excavations will be imported from off-site borrow sources. A vegetated support layer may be required over the backfill depending on the suitability of the backfill to support vegetation. The top layer would require an erosion control blanket and coir fiber rolls as temporary stabilization. The finish grade would be seeded and planted to revegetate the area with species similar to the natural vegetation. The assumed excavation areas of impacted soils encompass approximately 10 acres as shown in Figure 5.

Within the assumed excavation footprint, the total volume of excavated soil is 32,000 yd^3. The approximate breakdown of the excavated material by site area is:

- Former Process Area – 12,600 yd^3
- Lowland Area – 6,400 yd^3
- Hamilton Township Property – 13,000 yd^3

The excavation of the three shoreline sediment areas at the culvert outfalls will require excavating approximately the top 6-inches of sediment and other material from the outfall channels (i.e., gullies) and the area immediately adjacent to either side of the channels. Clean fill material would be used to backfill the excavation area and rip-rap or native river rock would be installed in the channel. The clean fill would be imported to the site. The rip-rap or river rock lining would be designed such that the size of the stabilization would be adequate to convey the predicted flows and velocities of the culvert outfalls without eroding. The backfilled area would require stabilization with temporary erosion control material and would be seeded with native vegetation.

The excavation of shoreline sediments and deltas will be to prevent exposure of aquatic receptors to constituents of ecological concern in the Little Miami River by limiting migration of site-related contaminants in depositional material in the channelized outfalls and deltas bordering the Little Miami River.

Concrete and brick rubble observed near the central outfall would be removed along with the debris in the eastern drainage channel. Additionally, depositional material in the concrete culverts will also be removed.

Under this soil remedy all excavated material will be placed in an on-site consolidation cell, tentatively located on the flat area in the southwest portion of the Hamilton Township property. The actual consolidation cell location would be identified during the RD and will be selected based on the required physical aspects such as footprint, environmental factors (current use of

the area, environmental value, and environmental effects), and the potential for beneficial use of this area.

The area of the consolidation cell would be prepared by clearing the portion of the site for the cell and stripping the fibrous material and non-structural upper soil horizon. The total estimated area for the consolidation cell is approximately 3-acres. The consolidation area will be excavated to a depth of approximately 5.5 ft bgs. The total estimated material to be excavated to create the consolidation cell is 29,300 yd^3. This material would be stockpiled on-site for possible future use. Impacted soil would be transported to the consolidation cell and placed and compacted prior to being capped. The consolidation cell would be constructed with an impermeable composite liner and cap systems. After cell excavation and preparation of the clay subgrade, a flexible membrane liner (FML) with a geotextile cushion will be installed as the main component of the cell liner system. The consolidation area will be filled to approximately one foot or less above existing grade prior to capping. The cap would be graded to divert storm water runoff from the consolidation cell and reduce the potential for erosion of the cap material.

The composite cap system is recommended to consist of a 6-inch thick vegetative support layer, a 2-foot thick layer of compacted low-permeability clay, a geocomposite drainage layer, a flexible geomembrane (FML) and a low-permeability clay layer beneath the geomembrane. The clay layers would be compacted to achieve low permeability (e.g., $\leq 1 \times 10^{-5}$cm/sec). The material for the clay layer would be imported to the site. A geocomposite drainage layer would be included above the geomembrane to provide drainage of the cover materials and reduce the potential for infiltration. The vegetative support layer will serve as a protective cover over the low-permeability material and would support vegetative stabilization. The consolidation cell would be revegetated with native plant species. The design of the consolidation cell could be configured with grades that mimic natural contour curvature and moderate side slopes suitable for the impacted material excavated from the site. The final cap design would be developed to be compliant with state regulations during the design phase of the project. During the Remedial Design phase an access restriction, if necessary, would be determined based on future use of the area.

The installation of monitoring wells located downgradient of the consolidation area and implementation of a long-term monitoring program to demonstrate there is no migration of metals from the consolidation area would be required.

Institutional controls in the form of deed restrictions would be required to restrict land use to nonresidential purposes, limit future site activities to prevent intrusive activities that could compromise the cell; and to restrict on-site groundwater use, to prevent ingestion exposures by a future resident with groundwater used as a domestic water supply.

A review will be conducted within five years after initiation of the remedial action and every five years thereafter in accordance with the NCP to ensure that the selected remedy is still protective

of human health and the environment. Five-year reviews will include the determination of whether land use changes have occurred or will likely occur (within the next five years) and an associated evaluation of the protectiveness of the remedy for current and future receptor populations.

3. Cost Estimates for Selected Remedy

Major cost elements of the selected remedy are presented in Appendix C. The information in the cost estimate summary table is based on the best available information regarding the scope of the remedial alternative. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. Major changes may be documented in the form of a memorandum in the Administrative Record file, an Explanation of Significant Difference (ESD), or a ROD amendment. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to -30 percent of the actual project cost.

4. Expected Outcomes of the Selected Remedy

The selected remedy will be protective of human health and the environment and will comply with all ARARs. The on-property area of the site will no longer present an unacceptable risk to future site workers or recreators via surface soil incidental ingestion and will be suitable for non-residential use.

The selected remedy will also provide environmental and ecological benefits in that the site soil will no longer present an unacceptable risk to terrestrial wildlife via dietary exposure to prey in soils and will become suitable habitat for local populations of terrestrial wildlife.

The following are expected to occur by implementing the selected remedy:

- Institutional controls (restrictive covenant, land use zoning restrictions, building permit restrictions) will provide long-tem effectiveness and permanence in maintaining the integrity of the vegetative soil cover and preventing direct contact with or ingestion of impacted soil; and prevent ingestion exposures by a future resident with groundwater used as a domestic water supply.

- The excavation of impacted soils in the Former Process Area, Lowland Area, and Hamilton Township Property portions of the site and clean backfill permanently removes the potential for exposure to impacted surface soils in these areas, allowing non-residential use in these areas.

- Surface area of the lead impacted surface soil is reduced by consolidating the soil on-site in an area which is already restricted for non-residential use. The overall effect is

to reduce the surface area of the site that would be restricted for future non-residential development.

Tables L1, L2, L3, and L4 in Appendix A summarize the cleanup levels for the Peters Cartridge Facility that will achieve these expected outcomes.

M. Statutory Determinations

Under CERCLA Section 121 and the NCP, remedies selected for Superfund sites are required to be protective of human health and the environment, comply with applicable or relevant and appropriate requirements (unless a waiver is justified) and be cost effective. The following sections discuss how the selected remedy for the Peters Cartridge Facility meets these statutory requirements.

1. Protection of Human Health and the Environment

The current and potential future risks at the Peters Cartridge Facility are due to the presence of copper, lead, and mercury in surface soils. Implementation of the selected remedy will be protective of human health and the environment, as described in the NCP, through the excavation and on-site consolidation of impacted soils and sediment that exceed the clean up goals presented in Section L of this ROD.

Institutional controls in the form of a Restrictive Covenant or other mechanism (e.g., local ordinance, permit process), shall restrict excavation and minimize potential risks from any remaining contamination and will prevent use of groundwater as drinking water or ingestion exposures by future resident.

2. Compliance with ARARs

Section 121(d) of CERCLA, 42 U.S.C. § 9621(d), requires that Superfund remedial actions meet ARARs. Appendix B provides all ARARs identified for this site which will be met under this ROD. In addition to ARARs, non-enforceable guidelines, criteria, and standards may be useful in designing the selected remedy. As described previously in Section H.2 of this ROD, these guidelines, criteria, and standards are known as TBCs. The selected remedy will comply with the ARARs for the site.

3. Cost Effectiveness

In EPA's judgment, the selected remedy is cost-effective because the remedy's costs are proportional to its overall effectiveness (see 40 CFR § 300.430(f)(1)(ii)(D)). This determination was made by evaluating the overall effectiveness of those alternatives that satisfied the threshold criteria (i.e. that are protective of human health and the environment and comply with all federal

and any more stringent ARARs, or as appropriate, waive ARARs). Overall effectiveness was evaluated by assessing three of the five balancing criteria, i.e., long-term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short-term effectiveness, in combination. The overall effectiveness of each alternative then was compared to the alternative's costs to determine cost-effectiveness. The relationship of the overall effectiveness of this remedial alternative was determined to be proportional to its costs and hence represents a reasonable value for the money to be spent.

4. Utilization of Permanent Solutions and Alternative Treatment (or Resource Recovery) Technologies to the Maximum Extent Practicable (MEP)

The selected remedy represents the maximum extent to which permanent solutions and treatment are practicable at the Peters Cartridge Facility. Of those alternatives that are protective of human health and the environment and comply with ARARs, EPA has determined that the selected remedy provides the best balance of trade-offs in terms of the five balancing criteria, while also considering the statutory preference for treatment as a principal element and bias against off-site treatment and disposal and considering State and community acceptance.

The selected remedy satisfies the statutory preference for engineering controls of low long-term threat pollutants and contaminants through containment. There are no source materials constituting principal threats addressed within the scope of this action because the contaminants are not liquid, highly toxic or highly mobile. Institutional controls that restrict land use and prevent or limit exposure to remaining on-site pollutants or contaminants will also be used to supplement the engineering controls.

The selected remedy satisfies the criteria for long-term effectiveness by preventing the direct exposure to contaminated soils. On-site consolidation of impacted soil will reduce the mobility of and potential for direct contact with contaminants remaining on-site. The selected remedy does not present short-term risks different from the other alternatives. There are no special implementability issues that set the selected remedy apart from any of the other alternatives evaluated.

5. Preference for Treatment as a Principal Element

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) establishes an expectation that EPA will use treatment technology to address the principal threat wastes at a site wherever practicable (NCP § 300.430(a)(1)(iii)(A)). Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur. Remedies that involve treatment of principal threat wastes likely will satisfy the statutory preference for treatment as a principal element. There are no source materials

constituting principal threats addressed within the scope of this action because the contaminants are not liquid, highly toxic or highly mobile.

This remedy satisfies the statutory preference for engineering controls of low long-term threat pollutants and contaminants through containment. Institutional controls that restrict land use and prevent or limit exposure to remaining on-site pollutants or contaminants will also be used to supplement the engineering controls.

6. Five-Year Review Requirements

The NCP requires that the remedial action be reviewed no less often than every five years if the remedial action results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure. After this remedial action is completed, pollutants or contaminants will still be present on-site above levels that allow for unlimited use and unrestricted exposure. Therefore, pursuant to section 121(c) of CERCLA, 42 U.S.C. § 9621(c), a review will be conducted within five years after initiation of the remedial action and every five years thereafter to ensure that the selected remedy is still protective of human health and the environment.

Five-year reviews will include the determination of whether land use changes have occurred or will likely occur (within the next five years) and an associated evaluation of the protectiveness of the remedy for current and future receptor populations.

N. Documentation of Significant Changes

The Proposed Plan for the Peters Cartridge Facility was released for public comment on June 30, 2009 and the public comment period ran from July 6, 2009 through August 6, 2009. The Proposed Plan identified Alternative 3 (Soil Excavation and on-site consolidation with ICs for soil and groundwater), as the preferred alternative for the site. EPA reviewed all written and verbal comments submitted during the comment period and determined that no significant changes to the remedy, as originally identified in the Proposed Plan, were necessary or appropriate.

PART III: RESPONSIVENESS SUMMARY

Peters Cartridge Facility
Kings Mills, Warren County, Ohio

EPA met the public participation requirements of Sections 113(k)(2)(B)(i-v) and 117(b) of CERCLA (42 U.S.C. §§ 9613(k)(2)(B)(i-v) and 9617(b)) during the remedy selection process for the Peters Cartridge Facility. Sections 113(k)(2)(B)(iv) and 117(b) require EPA to respond "...to each of the significant comments, criticisms, and new data submitted in written or oral presentations" on a proposed plan for a remedial action. This Responsiveness Summary addresses those concerns expressed by the public, potentially responsible parties (PRPs), and governmental bodies in written and oral comments we've received regarding the proposed remedy for the site.

EPA has established information repositories for the Peters Cartridge Facility at the following locations:

- EPA - Region 5, Records Center, 77 W. Jackson Blvd., Chicago, IL 60604

- Salem Township Library, 535 W. Pike Street, Morrow, Ohio 45152

-Warren County Administration Building, 406 Justice Drive, Lebanon, Ohio 45036

The Administrative Record containing all information we used to select the cleanup remedy for the Peters Cartridge Facility is also available to the public at these locations.

Background

Developed by Gershom Moore Peters, the son-in law of Joseph Warren King who was the founder of the King Powder Company, the Peters Cartridge Company began production during 1887 (Schiffer, 2002). The decision to build an ordnance manufacturing facility at this location was influenced by the site's proximity to the Kings Mills Powder Company. Equally as important as the short distance to a material supplier was the presence of a fully developed and operational rail line at this location, the LMRR, established at this location in 1845 (Black, 1940).

From 1887 to 1934, the Peters Cartridge facility produced ordnance and shot shell ammunition. In 1934, the Remington Arms Company, Inc (Remington) purchased the Peters Cartridge Company and continued the production of shot shell and cartridge ammunition at the facility. During the Second World War, Remington produced .30 and .45-caliber carbine ammunition for the U.S. Government, until 1944, after which operations at the facility were discontinued.

Since 1944, the Peters Cartridge Facility has been divided into multiple land parcels that have been owned and occupied by various non-ammunition making entities.

Today, Area A includes property parcels owned by Kings Mills Technical Center, Inc., Little Miami, Inc., Ohio DNR and Warren County Commissioners. Portions of Area A are currently occupied and/or in use by commercial or industrial businesses (main building area), as a public bike trail (historic railroad right-of-way), or as a parking lot (east of Grandin Road).

Area B, which is currently vacant, was transferred to Hamilton Township in 2007. The Township plans to retain this area as open space.

Summary of Significant Comments

A. Written Comments

Comment 1. Mr. & Mrs. Gerald and Janice Peters, Kings Mills, OH;

Alternative No. 1 – Do nothing, please. Didn't sound bad enough to spend millions on this-now (wait till entire site is torn down someday or rehabbed). Not urgent enough need to spend any money at this time.

Thanks for teaching us the status and asking for our input!

Response: The site investigations have shown that there are health risks associated with direct contact of the surface soils and sediment which contain contaminants exceeding acceptable health levels. Excavation and consolidation of the contaminated soils will reduce these risks.

Comment 2. Ms. Cheryl Peters, Kings Mills, OH;

Alternative No. 1 - Do nothing (or at worst Alternative No. 2). Thank you very much for the great info!

Response: The site investigations have shown that there are health risks associated with direct contact of the surface soils and sediment which contain contaminants exceeding acceptable health levels. Excavation and consolidation of the contaminated soils will reduce

these risks. While Alternative No. 2 would also reduce the risks, maintaining the cap would be much more difficult because it neither consolidates the contaminated soil into one area on-site, nor removes the impacted soil from the site; and Alternative No. 3 would reduce the area of exposure to contaminated soils and sediments.

Comment 3. Mr. John D. Minix, OH;

I am in agreement with Alternative No. 3.

Response: Thank you for your comment in support of the EPA recommended Alternative.

Comment 4. Mr. Jonathan Goolsby, Cincinnati, OH;

a. "I'm not comfortable with merely moving the soil within the property and placing it in an "impermeable" lining. What happens when the lining begins to break down in 50 to 100 years?"

Response: At this time, DuPont (the PRP) has indicated its willingness to perform the remedial action and as part of the remedy, DuPont would be responsible for the long-term maintenance of the consolidation area, (the Cell) including any future repairs that may be required to maintain the impermeable lining. In addition, downgradient monitoring wells will be installed as part of the remedy to determine whether or not any leaching is occurring.

b. "Are there any probiotics that could be added to the contaminated soils to assist in heavy metal removal?"

Response: As part of the Feasibility Study, technology screenings were conducted to determine the best method of managing and reducing risk associated with contaminated soils. The final four alternatives were determined to be the most appropriate and best current technologies available for remediation of the contaminants of concern in soils (primarily metals).

c. "Could we cart the soil to a hazmat dump?"

Response: The soils were tested during the Remedial Investigation of the site, to determine if they were characterized as hazardous waste. They were classified as solid waste because they did not have hazardous levels of contamination contained in them. Therefore the waste soils would not go to a hazardous waste landfill but to a solid waste landfill, if any are transported off-site. A detailed evaluation of Excavation and Off-Site Disposal was performed as part of the Feasibility Study (Alternative 4). Excavation and On-site Consolidation of impacted soils both reduce mobility and exposure to contaminants of concern. On-site consolidation has a lower associated cost, and less disruptive to the

community in the short term. In addition, Alternative 3 has the potential to produce less carbon emissions that Alternative 4. Therefore, on-site consolidation was selected as the best balance of overall protectiveness, compliance with ARARs, long-term effectiveness and permanence, cost, and other criteria.

d. "As a former, and soon to be again, resident of Loveland, Ohio, I believe the project should not leave any lingering questions about long-term safety. It's a gorgeous property along two major nature tourism routes -- the Loveland Bike Trail and the Little Miami River. Both are lifeblood for our little biking and canoeing town. We need to make sure this is done right and done right on the first try."

Response: EPA agrees at the history and beauty of the area surrounding the site. Completing the selected remediation approach will significantly reduce risks to human health and the environment, and every effort will be made during remedial design and implementation to minimize adverse impacts to the river and the trail.

Comment 5. Mr. Steve Mitchell, Maineville, OH;

"I am a resident of Heritage Miami Bluffs which is adjacent to the Peters Cartridge factory. My concern is this: Since the soil contaminants being moved contain various heavy metals, and the soil must be excavated then moved to another location, this will obviously create dust containing these contaminates. Since HMB lies to the south east of this site there is a good chance this dust could end up in our community. What measures will the EPA take to mitigate the possibility of dust containing lead, mercury, antimony, and arsenic from falling into our community?"

Response: The EPA will oversee the project to insure that measures are taken to control dust from the excavation and during transport. Those measures will be worked out during the design phase but can include wetting of soils and roadways. In addition, the consolidation area and the majority of the excavation work will be completed in the western and northern portions of the site, with minimal work in the southeastern portion of the site.

Comment 6. Mr. Jim Rafferty, Cincinnati, OH;

"As one of the many bike riders and walkers and runners who use the Little Miami Trail on a regular basis, how about making the site a parking and stopping point on the trail. The trail is a wonderful asset to Southern Ohio and is one of the most used parks in the state. And it also is one of the best bike trails in the nation as well. But what it really needs is more access for parking and more bathroom sites."

Response: The EPA will oversee only the remediation activities completed at the site. Redevelopment of the site will be managed by the Ohio Department of Natural Resources

(DNR), which owns the property with the trail, and/or Hamilton Township, as the site land adjacent to the bike trail is owned by several different landowners. For property not owned by DNR, Hamilton Township would have to work with the owners to redevelop the land for uses other than current uses.

Comment 7. Ms. Nancy Jackson, Hamilton Township, OH;

"I am in support of the general outline of Alternative 3 for the Peters Powder Plant Cleanup. It is my hope, however, that as the work proceeds, that great care is taken to protect as much of the desirable vegetation and delicate soil structure of this riparian area. Potential water pollution, destruction of aquatic species and other considerations were mentioned in the report; however I would also like to suggest that trauma to the hillside be minimized. Perhaps teams of horses could be used, rather than heavy equipment, to clear trees and construct trails. This has been done successfully in parks in Southern Illinois and other locations. If the project is approached with a minimalist perspective, rather than a total clearing approach, perhaps the debris and toxic materials can be cleared without clear cutting areas that are so beautiful and fragile.

I have heard discussions that this land may be available for use by horse owners in the area. The topography would be ideal for training and conditioning horses, particularly for cross country and marathon events, but if carefully designed, the proposed trails could also be used by beginner and intermediate riders and carriage drivers as well. I would suggest that trails be constructed between the Little Miami Scenic Trail and the proposed parking lot in such a way that cutbacks and other elements be included. Perhaps some of the excavation sites could be used for these kinds of features. There are organizations and individuals who specialize in designing trails for equine use, minimizing erosion and utilizing as many of the natural characteristics of the land as possible.

The three acre area on the southwest corner of this site has been identified as the potential area for depositing the contaminated soil. Is it possible that this site could be used for a large parking area for multiple horse trailers, as well as an outdoor (uncovered) arena for year round use by local horse owners?

Earlier this year, the Warren County Equine Advisory Board (with representatives from the Warren County Chapter of the Ohio Horseman's Council, the Ohio Valley Carriage Club and the local 4H Advisors) presented a proposal to the Warren County Park Board, and the Warren County Commissioners, outlining the amenities needed by horse owners in this county. As a result of the EAB's 2008 survey, it was found that almost 2000 Warren County residents own over 6000 equines, yet there were no county properties with amenities for equestrian use. One of the items on the Wish List of those who participated in the discussions was an arena for year round use. Another item was a network of horse trails throughout Warren County that would enable riders to go from one end of the county to the

other, limiting travel only by time available. We are hopeful that these and other items on the wish lists will materialize during our lifetimes. We feel that these goals are particularly important for the next generation of horse owners.

I applaud the effort to rejuvenate this Munitions Park land, and to return it to residents of Hamilton Township, Warren County and other regional residents. At this point, it is a trash dump, of every sort, but it does have the potential to be a truly beautiful resource. I hope that the effort to clean it will be thoughtful, gentle and effective. I trust that you will make the best decision.

Response: The details of the remedy will be worked out during the design phase. All viable options for removal of contaminated soils will be considered. It is the intent of the remedy to proceed with caution when removing vegetation or trees. Redevelopment of the site would be managed by the Ohio Department of Natural Resources (DNR), which owns the property with the trail, and/or Hamilton Township, as the site land adjacent to the bike trail is owned by several different landowners. For property not owned by DNR, Hamilton Township would have to work with the owners to redevelop the land for uses other than current uses.

8. Mr. Robert Karl, Ulmer|Berne|LLP, legal council to Board of Township Trustees of Hamilton Township;

a. "Hamilton Township intends to use its property at the site for recreational uses and must be assumed that the cleanup option chosen by EPA will be protective of future users."

Response: As part of the Remedial Investigation, a human health risk assessment evaluated numerous likely exposure scenarios. The most protective scenario was for potential receptors, including on-site commercial/industrial workers, utility workers, construction workers, trespassers, and recreators. The extent of the remediation was determined based on this human health risk assessment. Following completion of EPA's select remedy, the site will no longer present an unacceptable risk to future site workers or recreators and will be suitable for non-residential use.

b. "The Feasibility Study Report at page 5-8 indicates that TCLP data was obtained during the RI. Where in the RI Report is the TCLP data summarized? Was TCLP analysis performed on the soil exhibiting the highest concentrations of any one contaminant?"

Response: In their Report, the SPLP data is discussed in Section 2. SPLP analysis data is presented on Tables 30 and 40a. Numerous SPLP samples were collected, including in the vicinity of the higher total lead concentrations measured in soil samples.

c. "Any hazardous wastes encountered or generated during the remedy implementation should be removed and disposed of off-site."

Response: Based on SPLP/TLCP data obtained during the RI, site soils were not determined RCRA hazardous waste. The EPA's selected remedy consists of consolidation of site soils contaminated by metals at levels above EPA acceptable risk. If, however, hazardous wastes are encountered or generated during remedy implementation, as noted in the Feasibility Study (Section 5), a Hazardous Waste Part A Permit Application Form for treatment, storage and disposal facilities [EPA Form 8700-23] would be submitted to obtain a disposal permit from OEPA. EPA would coordinate with the PRP and OEPA to ensure that these hazardous materials would be appropriately disposed of off-site.

d. "Any damage to Township roads caused by truck traffic associated with remedy implementation must be fixed as a cost of cleanup."

Response: Short-term effectiveness is an evaluation criteria for remedial alternatives in the Feasibility Study report and the Record of Decision. It was noted that EPA's selected remedy will reduce the off-site short-term health and safety risks associated with increased truck traffic as compared to the off-site disposal alternative (Alternative 4). The most effective way to transport soil from the excavated areas to the consolidation area will be finalized during the Remedial Design phase. However, an evaluation of the current condition of Township roads and any impact on them associated with remedy implementation is not part of the selected remedy.

e. "Has EPA determined that no cleanup is necessary in the drainage swale and unnamed creek located on the east side of Grandin Road?"

Response: The Baseline Ecological Risk Assessment evaluated potential effects on benthic invertebrates in the unnamed creek exposed to sediments. The evaluation concluded that the benthic invertebrate community of the unnamed creek is not at risk due to contaminants potentially related to the site. Therefore, no remedial action is necessary in this area.

f. "Hamilton Township opposes Alternative 1 because it will not reduce the risks assocated with the soil and sediment contaminants at the site."

Response: Alternative 1 (No Action) is included in the Feasibility Study Report and the Record of Decision in accordance with the National Contingency Plan and serves as a baseline by which other alternatives can be compared. Alternative 1, No Action, does not prevent exposure to impacted soil and is not protective of human health or the environment and therefore was not selected by EPA.

g. "Hamilton Township opposes Alternative 2 because, among other things, it does not fully meet the criteria for long-term effectiveness and permanence, and it will require

compliance with use restrictions applicable to multiple capped areas located throughout the Township Property at the site."

Response: Community Acceptance is one of the nine evaluation criteria for remediation alternatives considered in the Record of Decision, and therefore, EPA is receptive to the opinion of Hamilton Township and other local stakeholders. Due to the steep slope and numerous discrete areas, Alternative 2 (Isolation/Soil Capping) capping and long-term maintenance was determined to be less implementable and less effective than Alternative 3, the selected remedy.

h. "With respect to Alternative 3, the Township is seriously considering its feasibility and, in principle, believes it could be the best alternative. Currently, DuPont and Hamilton Township have commenced discussions regarding the use of Township Property at the site for a consolidation cell under EPA's suggested cleanup alternative (Alternative 3).

Response: Thank you for your comment in support of the EPA recommended Alternative. Community Acceptance is one of the nine evaluation criteria for remediation alternatives considered in the Record of Decision, and therefore, EPA is receptive to the opinion of Hamilton Township and other local stakeholders.

i. "If Hamilton Township and DuPont are unable to reach an agreement for placement of the consolidation cell on Township Property at the site; and the technical issues [of this letter] are not addressed to the Township's satisfaction, then the Township reserves the right to advocate that the EPA choose disposal of remediation waste at an off-site facility under Alternative 4."

Response: Based on comparison of the nine evaluation criteria and comments received during the public comment period, the selected remedy in EPA's Record of Decision is Alternative 3. Placement of the consolidation cell, as well as other technical details of the remedy, will be finalized during the Negotiation and Remedial Design process. However, the Agency recognizes the Township's right to advocate for remedial Alternative 4.

j. "Under EPA's suggested cleanup alternative, will the consolidation cell include a leachate collection and management system as required for industrial solid waste landfill facilities?"

Response: The consolidation cell will include an impermeable liner system as well as an impermeable cover system. The final cap design would be developed to be compliant with state regulations during the design phase of the project. Additionally, the installation of monitoring wells located downgradient of the consolidation area and implementation of a long-term monitoring program to demonstrate there is no migration of metals from the consolidation area would be required.

k. "Under EPA's suggested cleanup alternative, how long will periodic inspection and maintenance of the consolidation cell be required and who will be responsible for performing those activities?"

Response: At this time, DuPont (the PRP) has indicated its willingness to perform the remedial actions at the site and as part of the remedy, DuPont would be responsible for the long-term maintenance of the consolidation area (i.e. the Cell), including any future repairs that may be required to maintain the impermeable lining.

l. "Under EPA's suggested cleanup alternatives, how long will the fence around the consolidation cell be required and who will be responsible for its maintenance and repair?"

Response: At this time, DuPont (the PRP) has indicated its willingness to perform the remedial actions at the site and as part of the remedy; DuPont would be responsible for the long-term maintenance of any fence around the consolidation area. If a fence is necessary, the actual fence requirements will be determined based on any redevelopment plans for the area on top of and around the consolidation area.

m. "Under EPA's suggested cleanup alternatives, what will be the duration of the ground water monitoring program and will be responsible for performing the monitoring and analysis?"

Response: As part of the remedy, DuPont (the PRP) would be responsible for the long-term ground water monitoring. EPA and OEPA will provide input and oversight of data collection and evaluation to ensure that the selected remedy remains protective to human health and the environment. The duration of the groundwater monitoring program will be determined during this evaluation.

n. "Hamilton Township reserves the right to make additional comments based on EPA's response to the questions above and/or further evaluation of the remedial alternatives."

Response: Responses to the comments and questions received during the public comments period are prepared within this Responsiveness Summary for the Record of Decision. Additional issues of stakeholders may be considered during the Remedial Design process.

9. Mr. Eric Partee, Little Miami Incorporated;

"Thank you for holding the recent public meeting regarding the subject project. The presentations were informative and we appreciate your agency's involvement in this effort. Little Miami Inc. (LMI) owns the property adjacent to the Peters Cartridge building site. The LMI property is contained within "Area A" and lies between the ODNR Bike Trail and the

Little Miami National Wild & Scenic River. Three "remediation areas" are proposed to occur on the LMI property (as shown on Figure 2 of the Proposed Plan). Little Miami Inc. owns this riverfront land in order to, among other goals, preserve it in its natural forested state. In line with this goal, LMI offers the following comments:

a. "A preconstruction/remediation meeting should be held at least 30 days prior to the commencement of any work on the LMI property. This meeting would best be held on site and would accomplish the following objectives:

- Place markers to delineate the exact areas of work,
- Tag specific trees which are not to be disturbed and confirm the actions to be taken by the contractors to reforest and reseed all disturbed areas.
-Reforestation should include the exclusive use of native vegetation. Trees which are deemed necessary to be removed should be limited to those trees with a 5 inch DBH (diameter at breast height) or less. These trees should be replaced with trees no smaller than those having a 2 inch DBH. All trees which will not be disturbed should be marked with bright tape so that contractors can clearly note these trees in the field and avoid them. Honeysuckle which is removed should be chipped.
- Confirm that the areas which are to be disturbed should be reseeded with a seed mixture of native grasses and wildflowers, and that clean soil is to be deposited and compacted as needed to assure that the ground surface is returned to preconstruction grade. No remediation work should destabilize the riverbank and lead to accelerated bank erosion.
-Clean soil used in the project should be brought to the site from an off-site location located outside of Area's A and B and not closer than 1000 feet from the Little Miami National Wild & Scenic River.
- Confirm that no concrete, rip-rap of other materials of any type are to be placed or installed upon LMI property without the consent of LMI.
- Confirm that any existing fencing within the remediation areas shall be removed off site by the contractor, and that any pits or wells contained within the remediation areas shall be backfilled by the contractor.
- Confirm in writing that LMI will be held harmless from any and all activities conducted by the contractor(s) when entering upon and conducting activities on LMI property.

Response: As part of the Remedial Design process, details related to excavation and remediation activities in wooded and shoreline areas will be finalized, including tree clearing, backfill materials, and reseeding and other restoration requirements. In its review and participation of the Remedial Design, EPA will recommend such a pre-remediation meeting as well as determining criteria for trees not to be disturbed, clearly marking trees not to be disturbed, use of a native seed mix, minimizing erosion, chipping of honey suckle trees, and sources of clean fill. Reseeding with native vegetation is already a part of the selected remedy. As described in the Feasibility Study Report and the Record of Decision, excavation

will exclude areas immediately surrounding trees greater than 12-inches in diameter. However, to minimize erosion in the lowland areas, a smaller tree diameter will likely be maintained, with this tree diameter to be determined during Remedial Design.

As described in the Feasibility Study Report and the Record of Decision, a limited amount of rip-rap or native river rock material will be placed where the site outfalls discharge. The rip-rap or river rock lining would be designed such that the size of the stabilization would be adequate to convey the predicted flows and velocities of the culvert outfalls without eroding.

Some monitoring wells located in the lowland areas may be left in place to allow for future evaluation of groundwater quality. Removal of fencing in the lowland area is not specifically part of the selected remedy. If portions of fencing are located in targeted remediation areas these may be removed.

DuPont (the PRP) will need to obtain access agreements for each of the properties on which remediation will occur. Specific conditions, including being held harmless from site activities, could be specified in these access agreements.

b. "LMI does not object to the placement and containment of the excavated soil from the Peters Cartridge and LMI properties in the proposed 3 acre site upland from and outside of the Little Miami Sole Source Aquifer. LMI understands that Hamilton Township supports the additional capping of the cell with a hard surface parking lot to accommodate public hiking of the Township's hillside forest preserve land. LMI further understands that a truck haul route will be constructed between the lower portion of the Peter's site and up the hillside to the containment cell. LMI agrees to this route in concept and would like to have the opportunity to comment on any proposed alignment. "

Response: Thank you for your comment in support of the EPA recommended Alternative. EPA is not involved in determining specific redevelopment of the consolidation area (such as a hard surface parking lot) only in that EPA must ensure the remedy integrity; however, EPA recognizes that the area can have beneficial reuse for the community. EPA will consider community concerns in its review and comment, including the most effective way to transport soil from the excavated areas to the consolidation area will be finalized during the Remedial Design phase.

B. Oral Comments

Comment 1. Mr. Gatton;

Would the county have access to those monitoring wells in the future?

Response: The proposed soil-consolidated cell will be located on Hamilton Township property. However, during the course of the remedial activities, access to the monitoring wells installed for the consolidation cell on that property would be limited to DuPont and/or its contractor who would perform well maintenance and monitoring for remedial action purposes. Access would also be available to EPA during this time.

Comment 2. Mr. Chris Toloden;

I understand the potential hazard that can be out there, but it is a potential hazard. Tests have shown that there is no adverse effect to the wildlife, and there is a lot of history out there. And when you remove all of that, you're going to remove a lot of that history.

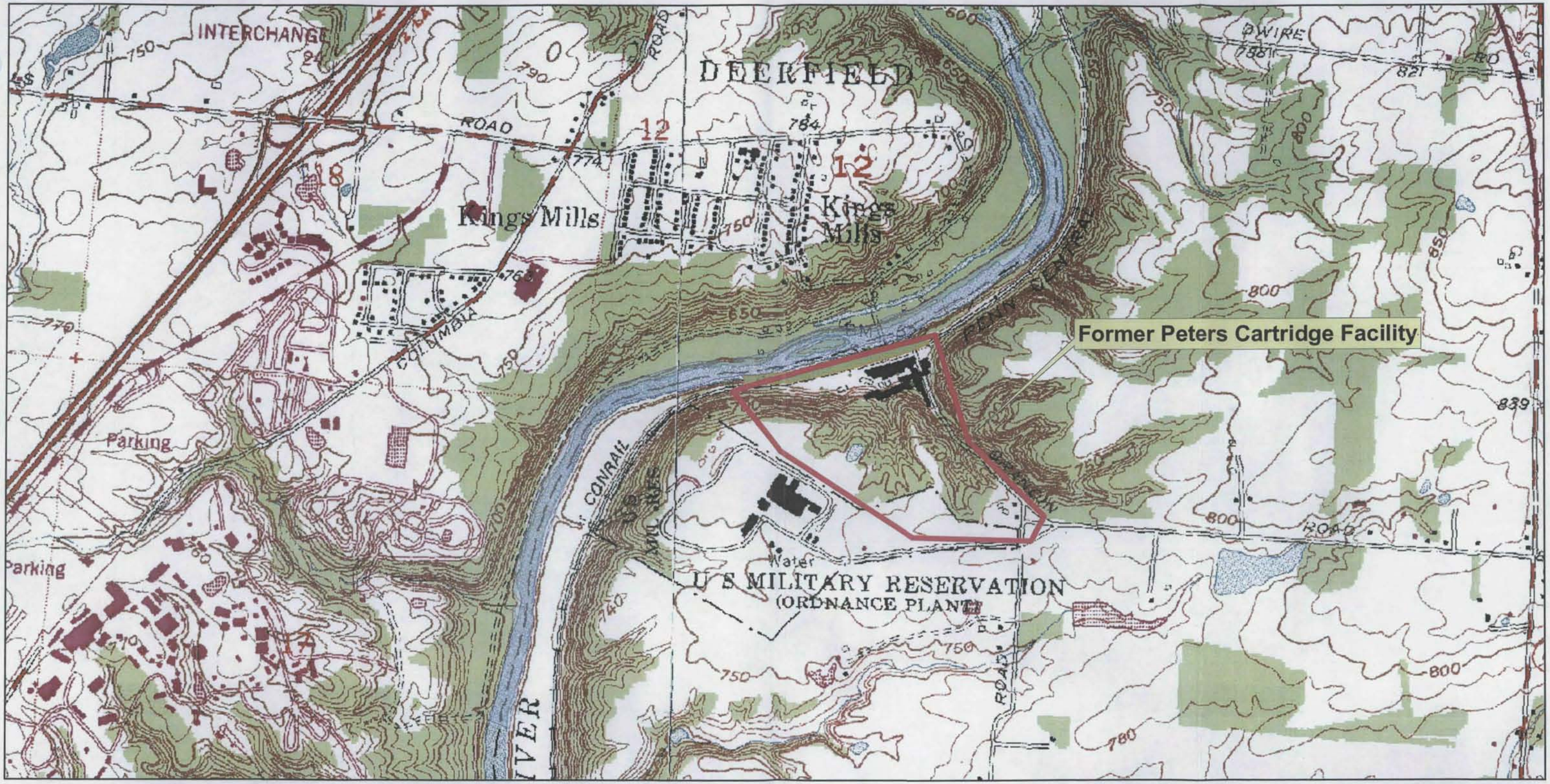
Response: EPA understands the public concern with respect to the integrity of the historical aspect of the site. However, the site investigations have shown that there are health risks associated with direct contact of the surface soils and sediment which contain contaminants exceeding acceptable health levels and it is EPA's mission to protect the public and environment from substantial and imminent danger. By reducing exposure risks, remediation will leave the site safer for the use and enjoyment of the public.

Comment 3. Mr. Gary Boeres. Hamilton Township Representative;

The elected officials had a meeting tonight and couldn't be here. They have a strong interest in what's happening on this property because we do own it and have an interest in what happens in the long-term, consolidation area for the site because we don't want to maintain it should there be a problem 30, 40, 50 years from. We certainly don't want that responsibility to be the township's.

Response: At this time, DuPont (the PRP) has indicated its willingness to perform the remedial actions at the site. Once DuPont signs an agreement with EPA to perform the remedial action, DuPont would be responsible, as part of that remedial action, for maintenance of the consolidation area on the Hamilton Township Property.

FIGURES



N
W E
S

Data sources consistent wtih
the National Standard
for Spatial Data Accuracy (1998)

0 500 1,000 2,000 Feet

0 0.125 0.25 0.5 0.75 1 Miles

Site Location Map

Former Peters Cartridge Facility
Hamilton Township, Ohio

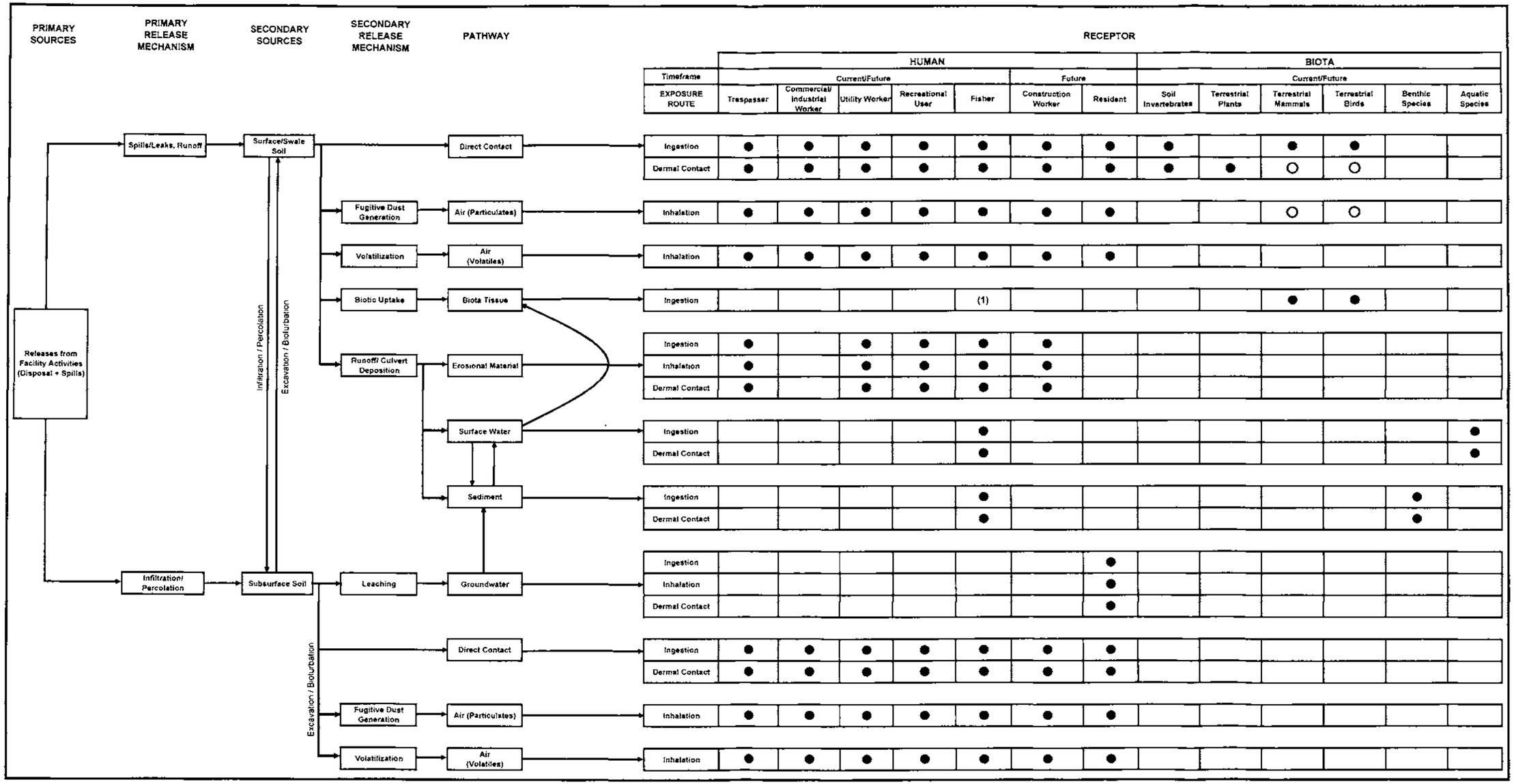
Geosyntec consultants

Ann Arbor, Michigan | 27-Oct-08

Figure 1

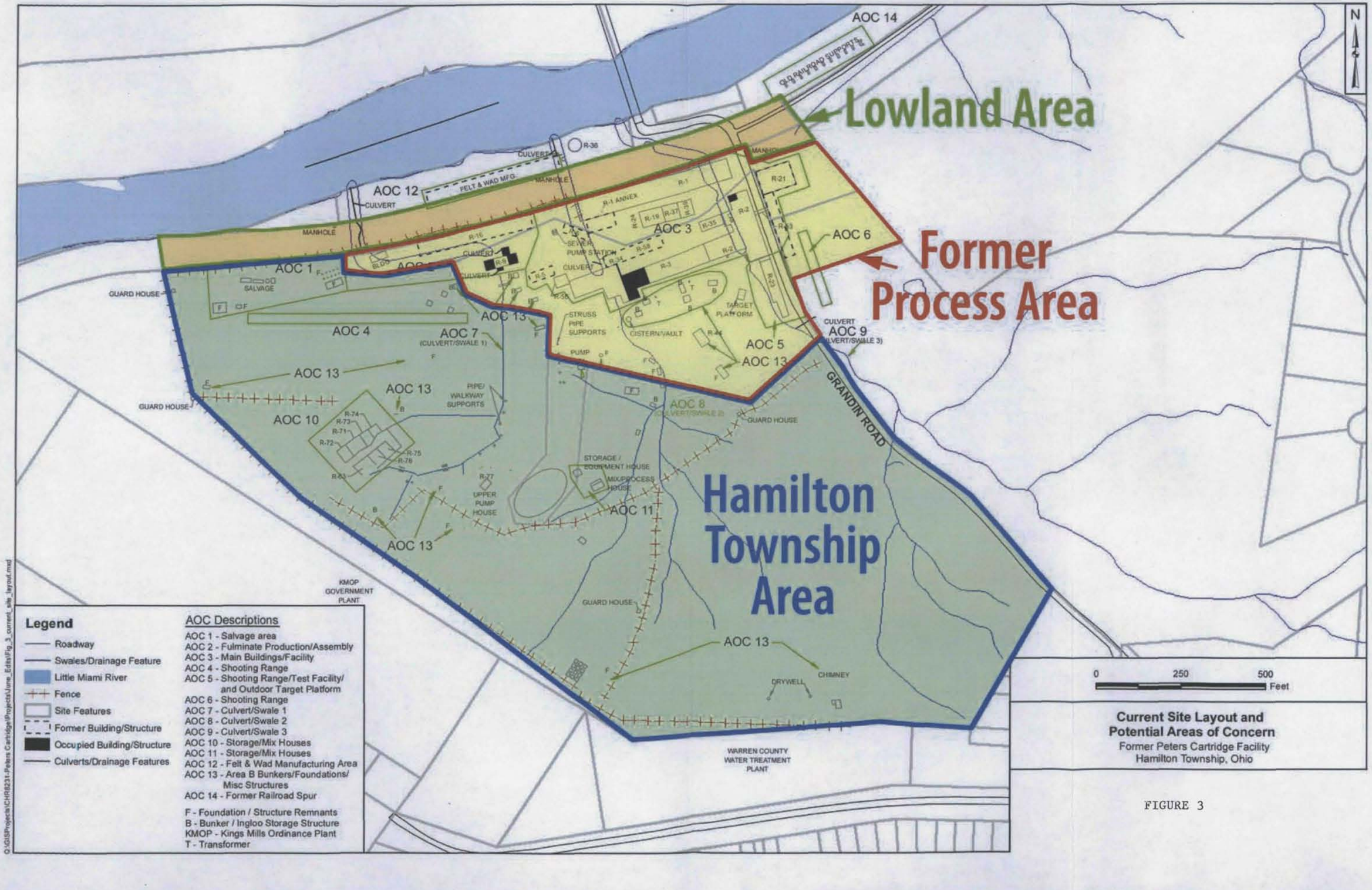
K:\GIS\Project\CH8231-Pet...\Fig_1_Site_Location_Map.mxd; Chicago-10

Figure 2. Conceptual Site Model



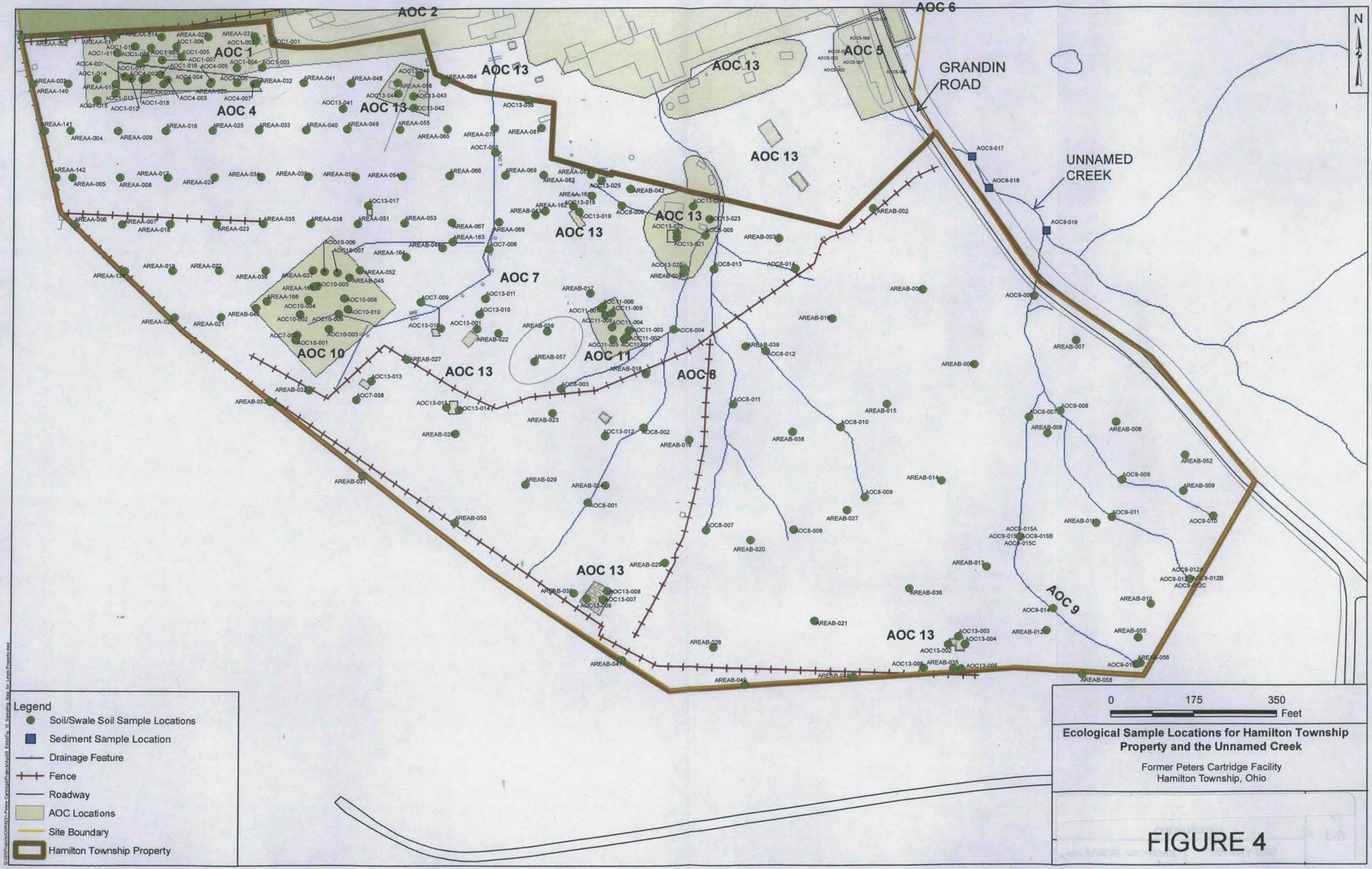
○ Potential exposure, but minor pathway

(1) Fish are not known to be impacted by site contaminants



Current Site Layout and Potential Areas of Concern
Former Peters Cartridge Facility
Hamilton Township, Ohio

FIGURE 3


AOC 1
AOC 2
AOC 4
AOC 5
AOC 6
AOC 7
AOC 8
AOC 9
AOC 10
AOC 11
AOC 13
GRANDIN ROAD
UNNAMED CREEK
N
Legend
Soil/Swale Soil Sample Locations
Sediment Sample Location
Drainage Feature
Fence
Roadway
AOC Locations
Site Boundary
Hamilton Township Property
0
175
350
Feet
Ecological Sample Locations for Hamilton Township Property and the Unnamed Creek
Former Peters Cartridge Facility
Hamilton Township, Ohio
FIGURE 4

Approximate Shoreline Excavation Areas

Unnamed Creek

N

Legend

- Approximate Shoreline Excavation Areas
- Sample with Exceedance of Preliminary Remediation Goal (PRG)
- Unlikely or Limited Potential For Unacceptable Risk (No Action)
- 6' High Chain Link Fence
- On-Site Consolidation Area
- Potential Remediation Area
- 100-Year Floodplain Boundary
- Ground Contour-4 foot interval
- Lowland Area
- Former Process Area
- Hamilton Township Property
- Site Boundary
- Roadway
- Swales/Drainage Feature
- Little Miami River
- Existing Fence
- LMR Scenic Trail-Paved
- LMR Scenic Trail-Right of Way

200 100 0 200 Feet

Alternative 3: Excavation with On-Site Consolidation

Former Peters Cartridge Facility
Hamilton Township, Ohio

Figure 5.

Notes:
1. The areas for shoreline excavation are based on the initial PRGs (i.e., literature-based sediment quality guidelines). As described in Section 3.1.6 of the FS, pre-design and remedial action sampling results may be utilized, as necessary, as part of more detailed ecological evaluations to develop site-specific ecological PRGs to refine the extent of cleanup.
2. The Preliminary Remediation Goal (PRG) used for lead is the USEPA default commercial/industrial value of 800 mg/kg in the Former Process Area and the USEPA default residential value of 400 mg/kg in the Lowland Area and Hamilton Township Property.
3. Remaining PRG exceedance locations have a calculated incremental lifetime cancer risk greater than $1x10^{-5}$ for individual carcinogenic COCs, a non-cancer hazard quotient (HQ) greater than 1 for individual non-carcinogens, an arsenic concentration greater than the site-specific background of 20.57 mg/kg, or an ecological LOAEL HQ greater than 1 for individual COECs.

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APPENDIX A

Tables G1- 32 and Tables L1-L4

Table G-1

Summary of Chemical of Concern and Medium-Specific Exposure Point Concentration

Scenario Timeframe: Current/Future
Medium: Soil
Exposure Medium: Surface/Swale Soil (0-2')

Exposure Point	Chemical of Concern	Concentration Detected		Units	Frequency of Detection	Exposure Point Concentration	Exposure Point Concentration Units	Statistical Measure (1)
		Minimum	Maximum					
Former Process Area - Current								
	Arsenic	7 1	81	mg/kg	18 / 18	44	mg/kg	95% UCL
	Lead	27	156000	mg/kg	94 / 94	5287	mg/kg	Mean
	Benzo(a)pyrene TEQ	0 0245	49 81	mg/kg	17 / 17	20	mg/kg	95% UCL
	Naphthalene	0 18	120	mg/kg	8 / 17	54	mg/kg	95% UCL
Former Process Area - Future								
	Arsenic	7 1	192	mg/kg	26 / 26	48	mg/kg	95% UCL
	Lead	17 7	156000	mg/kg	112 / 112	4667	mg/kg	Mean
	Benzo(a)pyrene TEQ	0 0245	49 81	mg/kg	25 / 25	21	mg/kg	95% UCL
	Naphthalene	0 18	120	mg/kg	11 / 25	36	mg/kg	95% UCL
Lowland Area - Current								
	Lead	4 16	15500	mg/kg	58 / 58	1041	mg/kg	Mean
Lowland Area - Future								
	Lead	4 16	15500	mg/kg	64 / 64	980	mg/kg	Mean
Hamilton Township Property - Current/Future (Surface/Swale Soil)								
	Antimony	1 15	2290	mg/kg	14 / 23	451	mg/kg	95% UCL
	Arsenic	9 96	2280	mg/kg	23 / 23	1224	mg/kg	95% UCL
	Lead	12 7	217000	mg/kg	228 / 228	4333	mg/kg	Mean
	Mercury	0.0364	846	mg/kg	223 / 223	35	mg/kg	95% UCL
	Benzo(a)pyrene TEQ	0 00743	1 338	mg/kg	23 / 23	0 29	mg/kg	95% UCL

Key

(1) Statistics: Maximum Detected Value (Max), 95% UCL (95% UCL), Arithmetic Mean (Mean)

TEQ - Toxicity Equivalency Quotient

The table represents the current and future chemicals of concern (COCs) and exposure point concentrations (EPCs) for each of the COCs detected in surface and swale soil (i.e. the concentration that will be used to estimate the exposure and risk for each COC in surface/swale soil). The table includes the range of concentrations detected for each COC, as well as the frequency of detection (i.e. the number of times the chemical was detected in the samples collected at the Site), the EPC, and how the EPC was derived. This table indicates that carcinogenic PAHs (represented by benzo(a)pyrene TEQ), naphthalene, antimony, arsenic, lead, and mercury are the only COCs in surface/swale soil at the Site. The 95% UCL on the arithmetic mean was used as the EPC for the carcinogenic PAHs, antimony, arsenic, and mercury. The arithmetic mean concentration was used as the EPC for lead.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table G-2

Summary of Chemical of Concern and Medium-Specific Exposure Point Concentration

Scenario Timeframe: Future

Medium: Soil

Exposure Medium: Subsurface Soil (>2')

Exposure Point	Chemical of Concern	Concentration Detected		Units	Frequency of Detection	Exposure Point Concentration	Exposure Point Concentration Units	Statistical Measure
		Minimum	Maximum					(1)
Former Process Area								
	Antimony	5 8	422	mg/kg	9 / 10	311	mg/kg	95% UCL
	Arsenic	10 1	46 6	mg/kg	10 / 10	29	mg/kg	95% UCL
	Lead	2 98	3320	mg/kg	15 / 15	807	mg/kg	Mean
	Mercury	0 0319	248	mg/kg	15 / 15	123	mg/kg	95% UCL
	Benzo(a)pyrene TEQ	*0.0141*	*2.279*	*mg/kg*	*10 / 10*	*1.7*	*mg/kg*	95% UCL

Key

(1) Statistics: Maximum Detected Value (Max); 95% UCL (95% UCL); Arithmetic Mean (Mean)

The table represents the future chemicals of concern (COCs) and exposure point concentrations (EPCs) for each of the COCs detected in subsurface soil (i.e., the concentration that will be used to estimate the exposure and risk for each COC in subsurface soil). The table includes the range of concentrations detected for each COC, as well as the frequency of detection (i.e., the number of times the chemical was detected in the samples collected at the Site), the EPC, and how the EPC was derived. This table indicates that carcinogenic PAHs (represented by benzo(a)pyrene TEQ), antimony, arsenic, lead, and mercury are the only COCs in subsurface soil at the Site. The 95% UCL on the arithmetic mean was used as the EPC for the carcinogenic PAHs, antimony, arsenic, and mercury. The arithmetic mean concentration was used as the EPC for lead.

Source: *A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)*

Table G-3

Summary of Chemical of Concern and Medium-Specific Exposure Point Concentration

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Potable Groundwater

Exposure Point	Chemical of Concern	Concentration Detected		Units	Frequency of Detection	Exposure Point Concentration	Exposure Point Concentration Units	Statistical Measure (1)
		Minimum	Maximum					
Site-wide Groundwater								
	Arsenic	0.71	8.1	ug/L	7 / 11	8.1	ug/L	Max

Key

(1) Statistics Maximum Detected Value (Max); 95% UCL (95% UCL); Anthmetic Mean (Mean)

Max is maximum concentration for all site monitoring wells sampled in May 2007.

N/A - Not available

The table represents the future chemical of concern (COC) and exposure point concentration (EPC) for the COC detected in Site-wide groundwater (i.e., the concentration that will be used to estimate the exposure and risk for the COC in Site-wide groundwater). The table includes the range of detected concentrations for the COC, as well as the EPC, and how the EPC was derived. The maximum detected concentration was used as the EPC for arsenic in groundwater.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table G-4

Cancer Toxicity Data Summary

Pathway: Ingestion, Dermal

Chemical of Concern	Oral Cancer Slope Factor	Dermal Cancer Slope Factor	Slope Factor Units	Weight of Evidence/Cancer Guideline Description	Source	Date [1] (MM/DD/YYYY)
Benzo(a)pyrene TEQ	7.3E+00	7.3E+00	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	02/25/09
Arsenic	1.5E+00	1.5E+00	$(mg/kg\text{-}day)^{-1}$	A	IRIS	02/25/09
Lead	N/A	N/A	N/A	B2	IRIS	02/25/09

Pathway: Inhalation

Chemical of Concern	Unit Risk	Units	Inhalation Cancer Slope Factor	Units	Weight of Evidence/Cancer Guideline Description	Source	Date [1] (MM/DD/YYYY)
Benzo(a)pyrene TEQ	1.1E-03	$(ug/m^3)^{-1}$	N/A	N/A	B2	ORNL CalEPA	02/25/09
Naphthalene	3.4E-05	$(ug/m^3)^{-1}$	N/A	N/A	C	ORNL CalEPA	02/25/09
Arsenic	4.3E-03	$(ug/m^3)^{-1}$	N/A	N/A	A	IRIS	02/25/09

Key

N/A Not applicable

IRIS Integrated Risk Information System, U.S. EPA

ORNL Oak Ridge National Laboratory (Regional Screening Level Tables)

CalEPA California Environmental Protection Agency

EPA Group

A - Human carcinogen

B1 - Probable human carcinogen - Indicates that limited human data are available

B2 - Probable human carcinogen - Indicates sufficient evidence in animals and inadequate or no evidence in humans

C - Possible human carcinogen

D - Not classifiable as a human carcinogen

E - Evidence of noncarcinogenicity

(1) Date indicates when IRIS was last reviewed for the most current toxicity value

(2) The following toxicity equivalency factors (TEFs) were utilized to convert site carcinogenic PAH concentrations to benzo(a)pyrene toxicity equivalents (TEQ)

Benzo(a)anthracene	0.1
Benzo(a)pyrene	1
Benzo(b)fluoranthene	0.1
Benzo(k)fluoranthene	0.01
Chrysene	0.001
Dibenz(a,h)anthracene	1
Indeno(1,2,3-cd)pyrene	0.1

This table provides the carcinogenic risk information which is relevant to the contaminants of concern in soil and groundwater. At this time, slope factors are not available for the dermal route of exposure. Thus, the dermal slope factors used in this assessment have been extrapolated from oral values. An adjustment factor is sometimes applied, and is dependent upon how well the chemical is absorbed via the oral route. Adjustments are particularly important for chemicals with less than 50% absorption via the ingestion route. However, adjustment is not necessary for the chemicals evaluated at this site. Therefore, the same values presented above were used as the dermal carcinogenic slope factors for these contaminants. Three of the COCs are also considered carcinogenic via the inhalation route.

Source: **A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)**

Table G-5

Non-Cancer Toxicity Data Summary

Pathway: Ingestion, Dermal

Chemical of Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Dermal RfD	Dermal RfD Units	Primary Target Organ	Combined Uncertainty/ Modifying Factors	Sources of RfD: Target Organ	Dates of Rfd: Target Organ [1] (MM/DD/YYYY)
Antimony	Chronic	4.0E-04	mg/kg-day	6.0E-05	mg/kg-day	Blood	1000	IRIS	02/25/09
Arsenic	Chronic	3.0E-04	mg/kg-day	3.0E-04	mg/kg-day	Dermal; Cardiovascular	3	IRIS	02/25/09
Lead	Chronic	N/A	N/A	N/A	N/A	Developmental	N/A	N/A	N/A
Mercury	Chronic	3.0E-04	mg/kg-day	2.1E-05	mg/kg-day	Kidney; Neurological	1000	IRIS	02/25/09

Pathway: Inhalation

Chemical of Concern	Chronic/ Subchronic	Inhalation RfC	Inhalation RfC Units	Inhalation RfD	Inhalation RfD Units	Primary Target Organ	Combined Uncertainty/ Modifying Factors	Sources of RfC: RfD; Target Organ	Dates (MM/DD/YYYY)
Arsenic	Chronic	3E-02	ug/m^3	N/A	N/A	Dermal; Cardiovascular	N/A	ORNL; CalEPA	02/25/09
Mercury	Chronic	0.3	ug/m^3	N/A	N/A	Kidney; Neurological	30	IRIS	02/25/09

Key

N/A - No information available

IRIS - Integrated Risk Information System, U.S. EPA

ORNL: Oak Ridge National Laboratory (Regional Screening Level Tables)

CalEPA: California Environmental Protection Agency

(1) Date indicates when IRIS was last reviewed for the most current toxicity value.

This table provides non-carcinogenic risk information which is relevant to the contaminants of concern in soil and groundwater. Three of the COCs have oral toxicity data indicating their potential for adverse non-carcinogenic health effects in humans. Chronic toxicity data available for the three COCs for oral exposures have been used to develop chronic oral reference doses (RfDs), provided in this table. The available chronic toxicity data indicate that antimony affects the blood, arsenic affects the skin and cardiovascular system, and mecury affects the kidney and neurological systems. A reference dose is not available for lead. Dermal RfDs are not available for any of the COCs. As was the case for the carcinogenic data, dermal RfDs can be extrapolated from oral RfDs by applying an adjustment factor as appropriate. Oral RfDs were adjusted for COCs with less than 50% absorption via the ingestion route (antimony and mercury) to derive dermal RfDs for these COCs. Inhalation reference concentrations (RfCs) are available for two COCs evaluated for the inhalation pathway.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table G-6

Risk Characterization Summary - Carcinogens

Scenario Timeframe: Current
Receptor Population: Commercial/Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Soil	Surface Soil	Former Process Area	Arsenic	2E-05	3E-08	5E-06	--	3E-05
			Benzo(a)pyrene TEQ	5E-05	3E-09	4E-05	--	9E-05
			Naphthalene	--	4E-06	--	--	4E-06
							Surface Soil Risk Total =	1E-04
							Total Risk =	1E-04

Key

-- Route of exposure is not applicable to this medium.

This table provides risk estimates for the significant routes of exposure for the current adult commercial/industrial worker in the Former Process Area. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of an adult commercial/industrial worker's exposure to soil, as well as the toxicity of the COCs (arsenic, benzo(a)pyrene TEQ, and naphthalene). The total risk from direct exposure to contaminated soil at this Site to a current adult commercial/industrial worker in the Former Process Area is estimated to be 1×10^{-4}. The COCs contributing most to this risk level are arsenic and carcinogenic PAHs in surface soil. This risk level indicates that if no clean-up action is taken, an individual would have an increased probability of 1 in 10,000 of developing cancer as a result of Site-related exposure to the COCs.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table G-7

Risk Characterization Summary - Carcinogens

Scenario Timeframe: Future

Receptor Population: Commercial/Industrial Worker

Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Soil	Surface Soil	Former Process Area	Arsenic	3E-05	3E-08	5E-06	--	3E-05
			Benzo(a)pyrene TEQ	5E-05	4E-09	5E-05	--	1E-04
			Naphthalene	--	3E-06	--	--	3E-06
							Surface Soil Risk Total =	1E-04
							Total Risk =	1E-04

Key

-- Route of exposure is not applicable to this medium.

This table provides risk estimates for the significant routes of exposure for the future adult commercial/industrial worker in the Former Process Area. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of an adult commercial/industrial worker's exposure to soil, as well as the toxicity of the COCs (arsenic, benzo(a)pyrene TEQ, and naphthalene). The total risk from direct exposure to contaminated soil at this Site to a future adult commercial/industrial worker in the Former Process Area is estimated to be 1×10^{-4}. The COCs contributing most to this risk level are arsenic and carcinogenic PAHs in surface soil. This risk level indicates that if no clean-up action is taken, an individual would have an increased probability of 1 in 10,000 of developing cancer as a result of Site-related exposure to the COCs.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table G-8

Risk Characterization Summary - Carcinogens

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Young Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Soil	Surface Soil	Former Process Area	Arsenic	1E-04	2E-07	1E-05	--	1E-04
			Benzo(a)pyrene TEQ	1E-03	5E-08	4E-04	--	1E-03
			Naphthalene	--	1E-05	--	--	1E-05
							Surface Soil Risk Total =	2E-03
Soil	Subsurface Soil	Former Process Area	Arsenic	7E-05	1E-07	6E-06	--	7E-05
			Benzo(a)pyrene TEQ	8E-05	4E-09	3E-05	--	1E-04
							Subsurface Soil Risk Total =	2E-04
							Total Risk =	2E-03

Key

– Route of exposure is not applicable to this medium.

This table provides risk estimates for the significant routes of exposure for a future young child and adult resident exposed to soil in the Former Process Area. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of a young child and adult resident's exposure to soil, as well as the toxicity of the COCs (arsenic, benzo(a)pyrene TEQ, and naphthalene). The total risk from exposure to contaminated surface and subsurface soil in the Former Process Area to future residents is estimated to be 2×10^{-3}. The COCs contributing most to this risk level are arsenic and PAHs in soil. *This risk level indicates that if no clean-up action is taken, an individual would have an increased probability of 2 in 1000 of developing cancer as a result* of Site-related exposure to the COCs in soil.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table G-9

Risk Characterization Summary - Non-Carcinogens

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Young Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface Soil	Former Process Area	Arsenic	Dermal, Cardiovascular	2E+00	3E-03	2E-01	2E+00
							Surface Soil Hazard Index Total =	2E+00
Soil	Subsurface Soil	Former Process Area	Antimony	Blood	1E+01	--	2E-01	1E+01
			Mercury	Kidney; Neurological	5E+00	8E-04	2E-01	5E+00
							Subsurface Soil Hazard Index Total =	1E+01
							Dermal Hazard Index =	2E+00
							Blood Hazard Index =	1E+01
							Kidney Hazard Index =	5E+00
							Neurological Hazard Index =	5E+00
							Cardiovascular Hazard Index =	2E+00

Key

-- Route of exposure is not applicable to this medium.

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of the hazard quotients) for all routes of exposure for a future young child and adult resident exposed to soil in the Former Process Area. The Risk Assessment Guidance (RAGS) for Superfund states that, generally, a hazard index (HI) of greater than 1 indicates the potential for adverse noncancer effects. The estimated target organ HIs between 2 and 10 indicate that the potential for adverse effects could occur from exposure to contaminated soil containing antimony, arsenic, and mercury.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table G-10

Risk Characterization Summary - Carcinogens

Scenario Timeframe: Future
Receptor Population: Commercial/Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Soil	Surface/Swale Soil	Hamilton Township Property	Arsenic	6E-04	8E-07	1E-04	--	8E-04
			Benzo(a)pyrene TEQ	7E-07	5E-11	6E-07	--	1E-06
							Surface/Swale Soil Risk Total =	8E-04
							Total Risk =	8E-04

Key

-- Route of exposure is not applicable to this medium.

This table provides risk estimates for the significant routes of exposure for the future adult commercial/industrial worker at the Hamilton Township Property. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of an adult commercial/industrial worker's exposure to soil, as well as the toxicity of the COCs (arsenic and benzo(a)pyrene TEQ). The total risk from direct exposure to contaminated soil at this Site to a future adult commercial/industrial worker at the Hamilton Township Property is estimated to be 8×10^{-4}. The COCs contributing most to this risk level are arsenic and carcinogenic PAHs in surface/swale soil. This risk level indicates that if no clean-up action is taken, an individual would have an increased probability of 8 in 10,000 of developing cancer as a result of Site-related exposure to the COCs.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table G-11

Risk Characterization Summary - Non-Carcinogens

Scenario Timeframe: Future
Receptor Population: Commercial/Industrial Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface/Swale Soil	Hamilton Township Property	Arsenic	Dermal; Cardiovascular	4E+00	2E-02	8E-01	5E+00
							Surface/Swale Soil Hazard Index Total =	5E+00
							Dermal Hazard Index =	5E+00
							Cardiovascular Hazard Index =	5E+00

Key

-- Route of exposure is not applicable to this medium

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of the hazard quotients) for all routes of exposure for the future adult commercial/industrial worker at the Hamilton Township Property. The Risk Assessment Guidance (RAGS) for Superfund states that, generally, a hazard index (HI) of greater than 1 indicates the potential for adverse noncancer effects. The estimated target organ HI of 5 indicates that the potential for adverse effects could occur from exposure to contaminated surface/swale soil containing arsenic.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table G-12

Risk Characterization Summary - Carcinogens

Scenario Timeframe: Current/Future
Receptor Population: Utility Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Soil	Surface/Swale Soil	Hamilton Township Property	Arsenic	3E-04	1E-07	2E-05	--	3E-04
							Surface/Swale Soil Risk Total =	3E-04
							Total Risk =	3E-04

Key

-- Route of exposure is not applicable to this medium

This table provides risk estimates for the significant routes of exposure for the current/future adult utility worker at the Hamilton Township Property. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of an adult utility worker's exposure to soil, as well as the toxicity of the COC (arsenic). The total risk from direct exposure to contaminated soil at this Site to a future adult utility worker at the Hamilton Township Property is estimated to be 3×10^{-4}. The COC contributing the most to this risk level is arsenic in surface/swale soil. This risk level indicates that if no clean-up action is taken, an individual would have an increased probability of 3 in 10,000 of developing cancer as a result of Site-related exposure to the COC.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table G-13

Risk Characterization Summary - Non-Carcinogens

Scenario Timeframe: Current/Future
Receptor Population: Utility Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface/Swale Soil	Hamilton Township Property	Arsenic	Dermal; Cardiovascular	2E+00	2E-03	1E-01	2E+00
							Surface/Swale Soil Hazard Index Total =	2E+00
							Dermal Hazard Index =	2E+00
							Cardiovascular Hazard Index =	2E+00

Key

-- *Route of exposure is not applicable to this medium*

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of the hazard quotients) for all routes of exposure for the current/future adult utility worker at the Hamilton Township Property. The Risk Assessment Guidance (RAGS) for Superfund states that, generally, a hazard index (HI) of greater than 1 indicates the potential for adverse noncancer effects. The estimated target organ HI of 2 indicates that the potential for adverse effects could occur from exposure to contaminated surface/swale soil containing arsenic.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table G-14

Risk Characterization Summary - Non-Carcinogens

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface/Swale Soil	Hamilton Township Property	Antimony	Blood	2E+00	--	3E-02	2E+00
			Arsenic	Dermal; Cardiovascular	6E+00	9E-03	6E-01	7E+00
							Surface/Swale Soil Hazard Index Total =	9E+00
							Dermal Hazard Index =	7E+00
							Blood Hazard Index =	2E+00
							Cardiovascular Hazard Index =	7E+00

Key

-- Route of exposure is not applicable to this medium.

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of the hazard quotients) for all routes of exposure for the future adult construction worker at the Hamilton Township Property. The Risk Assessment Guidance (RAGS) for Superfund states that, generally, a hazard index (HI) of greater than 1 indicates the potential for adverse noncancer effects. The estimated target organ HIs between 2 and 7 indicate that the potential for adverse effects could occur from exposure to contaminated surface/swale soil containing antimony and arsenic.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table G-15

Risk Characterization Summary - Carcinogens

Scenario Timeframe: Current/Future
Receptor Population: Trespasser
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Soil	Surface/Swale Soil	Hamilton Township Property	Arsenic	1E-04	5E-08	3E-05	--	1E-04
							Surface/Swale Soil Risk Total =	1E-04
							Total Risk =	1E-04

Key

-- Route of exposure is not applicable to this medium

This table provides risk estimates for the significant routes of exposure for the current/future adolescent trespasser at the Hamilton Township Property. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of an adolescent trespasser's exposure to soil, as well as the toxicity of the COC (arsenic). The total risk from direct exposure to contaminated soil at this Site to a current/future adolescent trespasser at the Hamilton Township Property is estimated to be 1×10^{-4}. The COC contributing most to this risk level is arsenic in surface/swale soil. This risk level indicates that if no clean-up action is taken, an individual would have an increased probability of 1 in 10,000 of developing cancer as a result of Site-related exposure to the COC.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table G-16

Risk Characterization Summary - Non-Carcinogens

Scenario Timeframe: Current/Future
Receptor Population: Trespasser
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface/Swale Soil	Hamilton Township Property	Arsenic	Dermal; Cardiovascular	2E+00	3E-03	5E-01	2E+00
							Surface/Swale Soil Hazard Index Total =	2E+00
							Dermal Hazard Index =	2E+00
							Cardiovascular Hazard Index =	2E+00

Key

-- Route of exposure is not applicable to this medium.

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of the hazard quotients) for all routes of exposure for the current/future adolescent trespasser at the Hamilton Township Property. The Risk Assessment Guidance (RAGS) for Superfund states that, generally, a hazard index (HI) of greater than 1 indicates the potential for adverse noncancer effects. The estimated target organ HI of 2 indicates that the potential for adverse effects could occur from exposure to contaminated surface/swale soil containing arsenic.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table G-17

Risk Characterization Summary - Carcinogens

Scenario Timeframe: Future
Receptor Population: Recreational User
Receptor Age: Young Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Soil	Surface/Swale Soil	Hamilton Township Property	Arsenic	2E-03	5E-07	3E-04	--	2E-03
			Benzo(a)pyrene TEQ	8E-06	5E-11	4E-06	--	1E-05
							Surface/Swale Soil Risk Total =	2E-03
							Total Risk =	2E-03

Key

-- Route of exposure is not applicable to this medium

This table provides risk estimates for the significant routes of exposure for the future young child and adult recreational user at the Hamilton Township Property. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of a young child and adult recreational user's exposure to soil, as well as the toxicity of the COCs (arsenic and benzo(a)pyrene TEQ). The total risk from direct exposure to contaminated soil at this Site to future recreational users at the Hamilton Township Property is estimated to be 2×10^{-3}. The COCs contributing most to this risk level are arsenic and carcinogenic PAHs in surface/swale soil. This risk level indicates that if no clean-up action is taken, an individual would have an increased probability of 2 in 1,000 of developing cancer as a result of Site-related exposure to the COCs.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table G-18

Risk Characterization Summary - Non-Carcinogens

Scenario Timeframe: Future
Receptor Population: Recreational User
Receptor Age: Young Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface/Swale Soil	Hamilton Township Property	Antimony	Blood	2E+00	--	1E-01	2E+00
			Arsenic	Dermal; Cardiovascular	6E+00	7E-03	2E+00	8E+00
							Surface/Swale Soil Hazard Index Total =	1E+01
							Dermal Hazard Index =	8E+00
							Blood Hazard Index =	2E+00
							Cardiovascular Hazard Index =	8E+00

Key

-- Route of exposure is not applicable to this medium.

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of the hazard quotients) for all routes of exposure for the future young child and adult recreational user at the Hamilton Township Property. The Risk Assessment Guidance (RAGS) for Superfund states that, generally, a hazard index (HI) of greater than 1 indicates the potential for adverse noncancer effects. The estimated target organ HIs between 2 and 8 indicate that the potential for adverse effects could occur from exposure to contaminated surface/swale soil containing antimony and arsenic.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table G-19

Risk Characterization Summary - Carcinogens

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Young Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Soil	Surface/Swale Soil	Hamilton Township Property	Arsenic	3E-03	4E-06	3E-04	--	3E-03
			Benzo(a)pyrene TEQ	1E-05	6E-10	6E-06	--	2E-05
							Surface/Swale Soil Risk Total =	3E-03
							Total Risk =	3E-03

Key

– Route of exposure is not applicable to this medium.

This table provides risk estimates for the significant routes of exposure for the future young child and adult resident at the Hamilton Township Property. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of a young child and adult resident's exposure to soil, as well as the toxicity of the COCs (arsenic and benzo(a)pyrene TEQ). The total risk from direct exposure to contaminated soil at this Site to future residents at the Hamilton Township Property is estimated to be 3×10^{-3}. The COCs contributing most to this risk level are arsenic and carcinogenic PAHs in surface/swale soil. This risk level indicates that if no clean-up action is taken, an individual would have an increased probability of 3 in 1,000 of developing cancer as a result of Site-related exposure to the COCs.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table G-20

Risk Characterization Summary - Non-Carcinogens

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Young Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil	Surface/Swale Soil	Hamilton Township Property	Antimony	Blood	1E+01	--	3E-01	1E+01
			Arsenic	Dermal; Cardiovascular	5E+01	8E-02	4E+00	6E+01
			Mercury	Kidney; Neurological	1E+00	2E-04	6E-02	2E+00
							Surface/Swale Soil Hazard Index Total =	7E+01
							Dermal Hazard Index =	6E+01
							Kidney Hazard Index =	2E+00
							Neurological Hazard Index =	2E+00
							Blood Hazard Index =	1E+01
							Cardiovascular Hazard Index =	6E+01

Key

-- Route of exposure is not applicable to this medium.

This table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of the hazard quotients) for all routes of exposure for the future young child and adult resident at the Hamilton Township Property. The Risk Assessment Guidance (RAGS) for Superfund states that, generally, a hazard index (HI) of greater than 1 indicates the potential for adverse noncancer effects. The estimated target organ HIs between 2 and 60 indicate that the potential for adverse effects could occur from exposure to contaminated surface/swale soil containing antimony, arsenic, and mercury.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table G-21

Risk Characterization Summary - Carcinogens

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Young Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk				
				Ingestion	Inhalation	Dermal	External (Radiation)	Exposure Routes Total
Groundwater	Potable Groundwater	Site-wide Groundwater	Arsenic	2E-04	--	--	--	2E-04
							Groundwater Risk Total =	2E-04
							Total Risk =	2E-04

Key

-- Route of exposure is not applicable to this medium.

This table provides risk estimates for the significant routes of exposure for the future child and adult resident exposed to Site-wide groundwater used as household water. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of a child's and adult's exposure to groundwater, as well as the toxicity of the COC (arsenic). The total risk from direct exposure to contaminated Site-wide groundwater to a future resident, in the event that groundwater is used as a potable source, is estimated to be 2×10^{-4}. The COC contributing most to this risk level is arsenic in groundwater. This risk level indicates that if no clean-up action is taken, an individual would have an increased probability of 2 in 10,000 of developing cancer as a result of Site-related exposure to arsenic in groundwater.

Source: A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents (U.S. EPA, 1999)

Table G-22

Occurrence, Distribution, and Selection of Chemicals of Concern (COPECs)
Former Peters Cartridge Facility, Hamilton Township, Ohio

Medium: Outfall Surface Water

Chemical [1, a, b]	Frequency of Detection	Maximum Detected Concentration (ug/L)	Ecological Screening Value (ug/L)	Ecological Screening Value Source	HQ	COPEC? [2]	Reason for Exclusion
Cadmium	0 / 7	ND	0.15	Region 5	NA	No	ND
Copper	2 / 7	7.6	1.58	Region 5	5	Yes	
Lead	0 / 7	ND	1.17	Region 5	NA	No	ND
Mercury	1 / 7	0.094	0.0013	Region 5	72	Yes	
Silver	0 / 7	ND	0.12	Region 5	NA	No	ND
Benzo(a)anthracene	1 / 7	0.077	0.025	Region 5	3	Yes	
Benzo(a)pyrene	2 / 7	0.077	0.014	Region 5	6	Yes	
Benzo(k)fluoranthene	1 / 7	0.042	-	NA	NA	No	NSC

Notes:

Chemicals in the outfall surface water samples, identified in the SLERA with maximum detected concentrations exceeding screening criteria, were addressed in the FS.

[2] Analytes were selected in the SLERA as contaminants of potential ecological concern (COPECs) if the maximum HQ exceeded 1.0

a. Hardness-dependent metals criteria (Cd, Cu, Pb) are calculated using the 50 mg/L as $CaCO_3$ as recommended by USEPA Region 5 ESV.

b. Total metal concentrations are reported.

HQ - Hazard Quotient (ratio of the maximum detected concentration to the screening toxicity value)

COPEC - Chemical of potential ecological concern

NA - not available

ND - not detected

NSC - Detected constituents for which not screening criteria was available

Table G-23

Occurrence, Distribution, and Selection of Chemicals of Concern (COPECs)
Former Peters Cartridge Facility, Hamilton Township, Ohio

Medium: Culvert Surface Water

Chemical [1, a, b]	Frequency of Detection	Maximum Detected Concentration (ug/L)	Screening Toxicity Value (ug/L)	Screening Toxicity Value Source	HQ	COPEC? [2]	Reason for Exclusion
Cadmium	0 / 4	ND	0.15	Region 5	NA	No	ND
Copper	1 / 4	20.8	1.58	Region 5	13	Yes	
Lead	0 / 4	ND	1.17	Region 5	NA	No	ND
Mercury	3 / 4	1.4	0.0013	Region 5	1077	Yes	
Silver	1 / 4	2.1	0.12	Region 5	18	Yes	

Notes:

Chemicals in the culvert surface water samples, identified in the SLERA with maximum detected concentrations exceeding screening criteria, were addressed in the FS.

Analytes were selected in the SLERA as contaminants of potential ecological concern (COPECs) if the maximum HQ exceeded 1.0

a Hardness-dependant metals criteria (Cd, Cu, Pb) are calculated using the 50 mg/L as $CaCO_3$ as recommended by USEPA Region 5 ESV.

b Total metal concentrations are reported.

HQ - Hazard Quotient (ratio of the maximum detected concentration to the screening toxicity value)

COPEC - Chemical of potential ecological concern

NA - not available

ND - not detected

Table G-24

Occurrence, Distribution, and Selection of Chemicals of Concern (COPECs)
Unnamed Creek
Former Peters Cartridge Facility, Hamilton Township, Ohio

Medium: Sediment

Chemical [1]	Frequency of Detection	Maximum Detected Concentration (mg/kg)	Ecological Screening Value (mg/kg)	Ecological Screening Value Source	HQ	COPEC? [2]	Reason for Exclusion
Arsenic	3 / 3	15.1	9.79	Region 5	1.5	Yes	
Beryllium	3 / 3	0.969	NA	Region 5	NA	No	NSV
Cadmium	3 / 3	1.22	0.99	Region 5	1.2	Yes	
Lead	3 / 3	57	35.8	Region 5	1.6	Yes	
Mercury	3 / 3	1.1	0.174	Region 5	6.4	Yes	
Thallium	3 / 3	0.132	NA	Region 5	NA	No	NSV
Acenaphthene	0 / 3	ND	0.00671	Region 5	NA	No	ND
Acenaphthylene	0 / 3	ND	0.00587	Region 5	NA	No	ND

Notes.

[1] Chemicals identified in the SLERA with maximum detected concentrations exceeding screening criteria or considered bioaccumulative were evaluated in the BERA

[2] Analytes were selected in the BERA as contaminants of potential ecological concern (COPECs) if the maximum HQ exceeded 1.0

HQ - Hazard Quotient (ratio of the maximum detected concentration to the screening toxicity value)

COPEC - Chemical of potential ecological concern

NA - not available

ND - not detected

NSV - Detected constituents for which not screening criteria was available

Table G-25

Occurrence, Distribution, and Selection of Chemicals of Concern (COPECs)
Outfall Sediment
Former Peters Cartridge Facility, Hamilton Township, Ohio

Medium: Sediment

Chemical [1]	Frequency of Detection	Maximum Detected Concentration (mg/kg)	Ecological Screening Value (mg/kg)	Ecological Screening Value Source	HQ	COPEC? [2]	Reason for Exclusion
Antimony	4 / 12	569	NA	Region 5	NA	No	NSV
Arsenic	12 / 12	124	9.79	Region 5	13	Yes	
Beryllium	12 / 12	0.854	NA	Region 5	NA	No	NSV
Lead	12 / 12	2370	35.8	Region 5	66	Yes	
Mercury	12 / 12	0.594	0.174	Region 5	3.4	Yes	
Selenium	4/ 12	3.84	NA	Region 5	NA	No	NSV
Thallium	12 / 12	4.79	NA	Region 5	NA	No	NSV
Acenaphthene	1 / 12	1.9	0.00671	Region 5	283	Yes	
Acenaphthylene	5 / 12	4.8	0.00587	Region 5	818	Yes	
Anthracene	12 / 12	7.8	0.0572	Region 5	136	Yes	
Benzo(a)anthracene	12 / 12	11	0.108	Region 5	102	Yes	
Benzo(a)pyrene	12 / 12	8.6	0.15	Region 5	57	Yes	
Benzo(g,h,i)perylene	12 / 12	11	0.17	Region 5	65	Yes	
Benzo(k)fluoranthene	12 / 12	4.4	0.24	Region 5	18	Yes	
Chrysene	12 / 12	9.5	0.166	Region 5	57	Yes	
Dibenzo(a,h)anthracene	12 / 12	1	0.033	Region 5	30	Yes	
Fluoranthene	12 / 12	31	0.423	Region 5	73	Yes	
Fluorene	10 / 12	3.4	0.0774	Region 5	44	Yes	
Indeno(1,2,3-cd)pyrene	12 / 12	7.9	0.20	Region 5	40	Yes	
Naphthalene	1 / 12	4.3	0.176	Region 5	24	Yes	
Phenanthrene	12 / 12	35	0.204	Region 5	172	Yes	
Pyrene	12 / 12	31	0.195	Region 5	159	Yes	

Notes:

[1] Chemicals in the outfall sediment samples, identified in the SLERA with maximum detected concentrations exceeding screening criteria, were addressed in the FS.

[2] Analytes were selected as contaminants of potential ecological concern (COPECs) if the maximum HQ exceeded 1.0

HQ - Hazard Quotient (ratio of the maximum detected concentration to the screening toxicity value)

COPEC - Chemical of potential ecological concern

NA - not available

NSV - Detected constituents for which not screening criteria was available

Table G-26

Occurrence, Distribution, and Selection of Chemicals of Concern (COPECs)
Culvert Erosional Material
Former Peters Cartridge Facility, Hamilton Township, Ohio

Medium: Soil

Chemical [1, a, b]	Frequency of Detection	Maximum Detected Concentration (mg/kg)	Ecological Screening Value (mg/kg)	Ecological Screening Value Source	HQ	COPEC? [2]	Reason for Exclusion
Antimony	7 / 12	5.47	0.27	Eco-SSL	20	Yes	
Copper	13/ 13	507	28	Eco-SSL	18	Yes	
Lead	13/ 13	313	11	Eco-SSL	28	Yes	
Mercury	13/ 13	42.9	0.1	Region 5	429	Yes	
Selenium	6/ 12	0.811	0.52	Eco-SSL	1.6	Yes	
Thallium	12 / 12	0.267	0.0569	Region 5	4.7	Yes	
Zinc	12 / 12	219	46	Eco-SSL	4.8	Yes	
Naphthalene	0 / 12	ND	0.0994	Region 5	NA	No	ND

Notes:

[1] Chemicals in the culvert erosional material samples, identified in the SLERA with maximum detected concentrations exceeding screening criteria, were addressed in the FS.

[2] Analytes were selected as contaminants of potential ecological concern (COPECs) if the maximum HQ exceeded 1.0

HQ - Hazard Quotient (ratio of the maximum detected concentration to the screening toxicity value)

COPEC - Chemical of potential ecological concern

NA - not available

NSV - Detected constituents for which not screening criteria was available

Table G-27

Occurrence, Distribution, and Selection of Chemicals of Concern (COPECs)
Former Process Area
Former Peters Cartridge Facility, Hamilton Township, Ohio

Medium: Soil

Chemical [1]	Frequency of Detection	Maximum Detected Concentration (mg/kg)	Screening Toxicity Value (mg/kg)	Screening Toxicity Value Source	HQ	COPEC? [2]	Reason for Exclusion
Antimony	13 / 14	57	0.27	Eco-SSL	211	Yes	
Arsenic	14 / 14	68	18	Eco-SSL	4	Yes	
Cadmium	9 / 12	1.2	0.36	Eco-SSL	3	Yes	
Copper	103 / 103	910	28	Eco-SSL	33	Yes	
Lead	103 / 103	156000	11	Eco-SSL	14182	Yes	
Mercury	103 / 103	83	0.1	Region 5	831	Yes	
Selenium	14 / 14	2.2	0.52	Eco-SSL	4	Yes	
Thallium	13 / 14	0.56	0.0569	Region 5	10	Yes	
Zinc	14 / 14	1010	46	Eco-SSL	22	Yes	
Benzo(a)anthracene	13 / 13	21	5.21	Region 5	4	Yes	
Benzo(a)pyrene	13 / 13	17	1.52	Region 5	11	Yes	
Chrysene	13 / 13	18	4.73	Region 5	4	Yes	
Naphthalene	4 / 13	2.9	0.0994	Region 5	29	Yes	
Phenanthrene	13 / 13	46	46	Region 5	1	No	BSV

Notes:

Chemicals identified in the SLERA with maximum detected concentrations exceeding screening criteria or considered bioaccumulative were evaluated in the BERA.

[1] Analytes were selected in the BERA as contaminants of potential ecological concern (COPECs) if the maximum HQ exceeded 1.0

HQ - Hazard Quotient (ratio of the maximum detected concentration to the screening toxicity value)

COPEC - Chemical of potential ecological concern

BSV - Below Screening Value

EcoSSL = USEPA Ecological Soil Screening Level, lower of avian and mammalian values

Region 5 = USEPA Region 5 Ecological Screening Level

NA = not available

Table G-28

Occurrence, Distribution, and Selection of Chemicals of Concern (COPECs)
Lowland Area
Former Peters Cartridge Facility, Hamilton Township, Ohio

Medium: Soil

Chemical [1]	Frequency of Detection	Maximum Detected Concentration (mg/kg)	Screening Toxicity Value (mg/kg)	Screening Toxicity Value Source	HQ	COPEC? [2]	Reason for Exclusion
Antimony	1 / 2	3	0.27	Eco-SSL	11	Yes	
Cadmium	1 / 1	0.47	0.36	Eco-SSL	1	Yes	
Copper	60 / 60	993	28	Eco-SSL	35	Yes	
Lead	60 / 60	2770	11	Eco-SSL	252	Yes	
Mercury	60 / 60	4.5	0.1	Region 5	45	Yes	
Selenium	2 / 2	2.3	0.52	Eco-SSL	4	Yes	
Thallium	2 / 2	0.49	0.0569	Region 5	9	Yes	
Zinc	2 / 2	108	46	Eco-SSL	2	Yes	
Naphthalene	1 / 2	1.6	0.0994	Region 5	16	Yes	

Notes:

[1] Chemicals identified in the SLERA with maximum detected concentrations exceeding screening criteria or considered bioaccumulative were evaluated in the BERA.

[2] Analytes were selected in the BERA as contaminants of potential ecological concern (COPECs) if the maximum HQ exceeded 1.0.

HQ - Hazard Quotient (ratio of the maximum detected concentration to the screening toxicity value)

COPEC - Chemical of potential ecological concern

BSV - Below Screening Value

EcoSSL = USEPA Ecological Soil Screening Level, lower of avian and mammalian values

Region 5 = USEPA Region 5 Ecological Screening Level

NA = not available

Table G-29

Occurrence, Distribution, and Selection of Chemicals of Concern (COPECs)
Hamilton Township
Former Peters Cartridge Facility, Hamilton Township, Ohio

Medium: Soil

Chemical [1]	Frequency of Detection	Maximum Detected Concentration (mg/kg)	Screening Toxicity Value (mg/kg)	Screening Toxicity Value Source	HQ	COPEC? [2]	Reason for Exclusion
Antimony	15 / 30	2290	0.27	Eco-SSL	8481	Yes	
Arsenic	30 / 30	1050	18	Eco-SSL	58	Yes	
Cadmium	13 / 30	3.86	0.36	Eco-SSL	11	Yes	
Chromium	30 / 30	60.9	26	Eco-SSL	2	Yes	
Copper	257 / 257	53900	28	Eco-SSL	1925	Yes	
Lead	263 / 264	217000	11	Eco-SSL	19727	Yes	
Mercury	260 / 260	846	0.1	Region 5	8460	Yes	
Nickel	30 / 30	64.7	38	Eco-SSL	2	Yes	
Selenium	23 / 31	2.86	0.52	Eco-SSL	6	Yes	
Silver	8 / 30	5.21	4.2	Eco-SSL	1	Yes	
Thallium	31 / 31	1.56	0.0569	Region 5	27	Yes	
Zinc	30 / 30	16800	46	Eco-SSL	365	Yes	
Chrysene	28 / 31	7.9	4.73	Region 5	2	Yes	
Naphthalene	7 / 31	6	0.0994	Region 5	60	Yes	

Notes:

[1] Chemicals identified in the SLERA with maximum detected concentrations exceeding screening criteria or considered bioaccumulative were evaluated in the BERA

[2] Analytes were selected in the BERA as contaminants of potential ecological concern (COPECs) if the maximum HQ exceeded 1.0

HQ - Hazard Quotient (ratio of the maximum detected concentration to the screening toxicity value)

COPEC - Chemical of potential ecological concern

BSV - Below Screening Value

Eco-SSL = USEPA Ecological Soil Screening Level, lower of avian and mammalian values

Region 5 = USEPA Region 5 Ecological Screening Level

NA = no. available

Table G-30

Ecological Exposure Pathways of Concern
Former Peters Cartridge Facility, Hamilton Township, Ohio

Exposure Media	Exposure Area	Sensitive Environment Flag Y or N	Receptor	Endangered/ Threatened Species Flag Y or N	Exposure Routes	Assessment Endpoints	Measurement Endpoints
AQUATIC HABITAT							
Sediment	Unnamed Creek	N	Benthic Invertebrates	N	Ingestion and direct contact with chemicals in sediment	Protection of benthic invertebrate populations from exposure to contaminated sediment	- Comparison of sediment COPEC concentrations to concentrations associated wth adverse effects on macroinvertebrates
TERRESTRIAL HABITAT							
Soils	Former Process Area, Lowland Area, Hamilton Township Property	N	Terrestrial invertebrate populations	N	Direct contact and ingestion of COPECs in soil	Protection of terrestrial invertebrate populations from exposure to contaminated soil/swale soil	- Comparison of soil COPEC concentrations to concentrations associated wth adverse effects on soil invertebrates
Soils, Diet	Former Process Area, Lowland Area, Hamilton Township Property	N	Terrestrial herbivorous mammal populations	N	Dietary exposures of COPECs	Protection of terrestrial herbivore populations from direct or dietary exposure to contaminated soil/swale soil	- Comparison of estimated dietary doses of herbivorous mammals (meadow vole) with TRVs using food chain modeling
Soils, Prey	Former Process Area, Lowland Area, Hamilton Township Property	N	Terrestrial *invertivore mammal* populations	N	Dietary exposures of COPECs	Protection of terrestrial *invertivore* populations from direct or dietary exposure to contaminated soil/swale soil	- Comparison of estimated dietary doses of *invertivore mammals* (short-tail shrew) with TRV using food chain modeling
Soils, Prey	Former Process Area, Lowland Area, Hamilton Township Property	N	Terrestrial avian carnivore populations	N	Dietary exposures of COPECs	Protection of terrestrial avian carnivore populations from direct or dietary exposure to contaminated soil/swale soil	- Comparison of estimated dietary doses of avian carnivores (American kestrel) with TRVs using food chain modeling

Notes:

COPEC - Chemical of potential ecological concern
TRVs - Toxicity reference values

Table G-31

COC Concentrations Expected to Provide Adequate Protection of Ecological Receptors
Former Peters Cartridge Facility, Hamilton Township, Ohio

Habitat Type/Name	Exposure Medium	COC	Protective Level*	Units	Basis	Assessment Endpoint
Terrestrial	Soil, Prey	Copper	11,608	mg/kg	LOAEL TRV, HQ = 1	Protection of terrestrial herbivore (meadow vole) populations from direct or dietary exposure to contaminated soil/swale soil
	Soil, Prey	Copper	**291**	mg/kg	LOAEL TRV, HQ = 1	Protection of terrestrial invertivore (short-tail shrew) populations from direct or dietary exposure to contaminated soil/swale soil
	Soil, Prey	Copper	1,134,952	mg/kg	LOAEL TRV, HQ = 1	Protection of terrestrial avian carnivore (American kestrel) populations from direct or dietary exposure to contaminated soil/swale soil
	Soil, Prey	Lead	26,612	mg/kg	LOAEL TRV, HQ = 1	Protection of terrestrial herbivore (meadow vole) populations from direct or dietary exposure to contaminated soil/swale soil
	Soil, Prey	Lead	**2,647**	mg/kg	LOAEL TRV, HQ = 1	Protection of terrestrial invertivore (short-tail shrew) populations from direct or dietary exposure to contaminated soil/swale soil
	Soil, Prey	Lead	2,194,500	mg/kg	LOAEL TRV, HQ = 1	Protection of terrestrial avian carnivore (American kestrel) populations from direct or dietary exposure to contaminated soil/swale soil
	Soil, Prey	Mercury	**85**	mg/kg	LOAEL TRV, HQ = 1	Protection of terrestrial herbivore (meadow vole) populations from direct or dietary exposure to contaminated soil/swale soil
	Soil, Prey	Mercury	163	mg/kg	LOAEL TRV, HQ = 1	Protection of terrestrial invertivore (short-tail shrew) populations from direct or dietary exposure to contaminated soil/swale soil
	Soil, Prey	Mercury	3,139	mg/kg	LOAEL TRV, HQ = 1	Protection of terrestrial avian carnivore (American kestrel) populations from direct or dietary exposure to contaminated soil/swale soil

Notes:

* Bold value represents the selected ecological protective level concentration for each COC based on the lowest protective level amongst the receptors evaluated

HQ - Hazard Quotient

COC - Chemical of Concern

TRV - Toxicity Reference Value

LOAEL - Lowest observed adverse effects level

Table G-32

COC Concentrations Expected to Provide Adequate Protection of Ecological Receptors
Sediment Outfall Material - Ecological
Former Peters Cartridge Facility, Hamilton Township, Ohio

Habitat Type/Name	Exposure Medium	COC	Protective Level	Units	Basis	Assessment Endpoint
Outfall Sediment	Sediment	Arsenic	33	mg/kg	PEC	Protection of aquatic receptors from direct exposure to contaminated erosional material associated with outfalls, and protection of receptors in the Little Miami River from potential transport of COCs in outfall material to the surface water or sediment of the Little Miami River.
	Sediment	Lead	128	mg/kg	PEC	
	Sediment	Mercury	1	mg/kg	PEC	
	Sediment	Benzo(a)pyrene	1.45*	mg/kg	PEC	

Notes:

* PAHs were identified as chemicals of potential ecological concern in sediments. The protective level is based on the PEC for Benzo(a)pyrene, as representative of PAHs present in the outfall material

COC - Chemical of Concern

PEC - Probable Effects Concentrations are consensus-based sediment quality guidelines (MacDonald et al., 2000)

Table L-1: Soil Cleanup Levels for the Protection of Human Health

Former Process Area, Surface Soil (0-2') - Site Worker Scenario

Non-Carcinogenic Chemical of Concern	Target Endpoint	Cleanup Levels (mg/kg)	Basis	RME Hazard Quotient
Lead	Developmental	800	EPA Commercial/Industrial Screening Level	N/A [1]
Arsenic	Dermal; Cardiovascular	20.57	Background	0.081
Carcinogenic Chemical of Concern	**Cancer Classification**	**Cleanup Levels (mg/kg)**	**Basis**	**RME Risk**
Arsenic	A	20.57	Background	1E-05
Benzo(a)pyrene TEQ	B2	2.1	risk	1E-05
Naphthalene	C	137	risk	1E-05

Lowland Area, Surface Soil (0-2') - Recreational User Scenario

Non-Carcinogenic Chemical of Concern	Target Endpoint	Cleanup Levels (mg/kg)	Basis	RME Hazard Quotient
Lead	Developmental	400	EPA Residential Screening Level	N/A [1]

Hamilton Township Property, Surface Soil (0-2') - Recreational User Scenario

Non-Carcinogenic Chemical of Concern	Target Endpoint	Cleanup Levels (mg/kg)	Basis	RME Hazard Quotient
Lead	Developmental	400	EPA Residential Screening Level	N/A [1]
Antimony	Blood	225	Hazard Quotient	1
Arsenic	Dermal; Cardiovascular	20.57	Background	0.17
Carcinogenic Chemical of Concern	**Cancer Classification**	**Cleanup Levels (mg/kg)**	**Basis**	**RME Risk**
Arsenic	A	20.57	Background	3E-05
Benzo(a)pyrene TEQ	B2	0.26	risk	1E-05

Key

(1) For adult site workers, the PRG is based on the ORNL regional screening level (May 19, 2009) for industrial exposures of 800 mg/kg, protective of all subpopulations including pregnant workers. For future recreational users, the PRG is based on the ORNL regional residential screening level of 400 mg/kg, developed by EPA using the Integrated Exposure Uptake Biokinetic Model specifically for evaluating lead exposures in young children.

Cancer Classification

A - Human carcinogen

B2 - Probable human carcinogen - indicates sufficient evidence in animals and inadequate or no evidence in humans

C - Possible human carcinogen

Table L-2: Interim Groundwater Cleanup Levels - Residential Scenario				
Carcinogenic Chemical of Concern	**Cancer Classification**	**Cleanup Levels (ug/L)**	**Basis**	**RME Risk**
Arsenic	A	10	MCL	2E-04
Non-Carcinogenic Chemical of Concern	**Target Endpoint**	**Cleanup Levels (ug/L)**	**Basis**	**RME Hazard Quotient**
Arsenic	Skin	10	MCL	9E-01

Key
MCL - Maximum Contaminant Level

Table L-3: Soil Cleanup Levels for the Protection of Ecological Receptors

On-Property, Surface Soil

Chemical of Concern	Receptor	Cleanup Level (mg/kg)	Basis
Copper	Terrestrial invertivore	291	LOAEL TRV, HQ = 1
Lead	Terrestrial invertivore	2647	LOAEL TRV, HQ = 1
Mercury	Terrestrial herbivore	85	LOAEL TRV, HQ = 1

Key

HQ - Hazard Quotient

TRV - Toxicity Reference Value

LOAEL - Lowest observed adverse effects level

Table L-4: Sediment Outfall Material Cleanup Levels for the Protection of Ecological Receptors

Outfall Sediment [1]

Chemical of Concern	Cleanup Level (mg/kg)	Basis
Arsenic	33	PEC
Lead	128	PEC
Mercury	1	PEC
Benzo(a)pyrene	1.45*	PEC

Key

* PAHs were identified as chemicals of concern in sediments. The protective level is based on the PEC for Benzo(a)pyrene, as representative of PAHs present in the outfall material

1. Protection of aquatic receptors from direct exposure to contaminated erosional material associated with outfalls, and protection of receptors in the Little Miami River from potential transport of COCs in outfall material to the surface water or sediment of the Little Miami River.

COC - Chemical of Concern

PEC - Probable Effects Concentrations are consensus-based sediment quality guidelines (MacDonald et al., 2000)

APPENDIX B

ARARs and TBCs

Attachment 2
Preliminary List of Potentially Applicable/Relevant and Appropriate Requirements
Former Peters Cartridge Facility
Hamilton Township, Ohio

Potentially Applicable Relevant and Appropriate Requirements	Description	Type of ARAR	Potentially Applicable/ Relevant and Appropriate?	Comment
CLEAN AIR ACT (CAA)				
42 U.S.C. § 7401 et seq. as amended in 1977 and 1990	Regulates air emissions from area, stationary, and mobile sources. Authorizes EPA to establish National Ambient Air Quality Standards.	Chemical-Specific	Applicable	Certain provisions may be applicable only if remedial actions (e.g., excavation) result in emissions above threshold amounts. NAAQS are not ARARS.
National Emission Standards for Hazardous Air Pollutants (40 CFR 61)	Identifies emission standards for specific hazardous air pollutants.	Chemical-Specific	Applicable	May be applicable only if the identified hazardous air pollutants emitted as a result of remedial actions exceed threshold amounts. Air emissions are not anticipated after construction activities are completed.
CLEAN WATER ACT (CWA) OF 1977				
33 U.S.C. § 1251 et seq. as amended in 1987	Implements a system to impose effluent limitations on, or otherwise prevent, discharges of pollutants into any waters of the United States from any point source.	Chemical-Specific	Appropriate and Relevant	Substantive requirements may be appropriate and relevant if remedial actions have the potential to result in discharges to surface water (e.g., Little Miami River).
CLEAN WATER ACT (CWA) OF 1977 (cont.)				
Wetlands Protection (40 CFR 6.302(a) Appendix A)	Codifies standards established under Executive Order 11990. No activity that adversely affects a wetland shall be permitted if a practicable alternative with lesser effects is available.	Location-Specific	Applicable	Disturbance to wetlands will occur during remedial actions at the site.
Wetlands Protection (40 CFR 22, 40 CFR 230 to 233, and 33 CFR 320 to 330)	Allows for permitting of discharge of dredged or fill material to the waters of the United States if no practicable alternatives exists that are less damaging to the aquatic environment. Applicants must demonstrate that the impact to wetlands is minimized.	Location-Specific	Applicable	Disturbance to wetlands will occur during remedial actions at the site.

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Preliminary List of Potentially Applicable/Relevant and Appropriate Requirements
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Potentially Applicable Relevant and Appropriate Requirements	Description	Type of ARAR	Potentially Applicable/ Relevant and Appropriate?	Comment
EMERGENCY PLANNING AND COMMUNITY RIGHT-TO-KNOW ACT (EPCRA) OF 1986				
42 U.S.C. § 11001 et seq.	Designated to help local communities protect public health, safety and the environment from chemical hazards. Enables states and communities to prepare to respond to unplanned releases of hazardous substances. Requires facilities at which hazardous substances are present to report the presence of these materials to emergency responders. Requires companies to report the release of hazardous substances.	Action-Specific	Applicable	Substantive requirements may be applicable if hazardous chemicals are stored or used at the site in excess of threshold amounts.
RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) OF 1976				
Hazardous Waste Management	Management of generation, treatment, storage, disposal, and transport of hazardous waste.	Action-Specific	Applicable	Applicable to the extent that waste is characterized or listed hazardous waste
Definition and identification of hazardous waste 40 CFR Part 261.	Identifies those wastes subject to regulation.	Action-Specific	Applicable	RCRA requirements are applicable to hazardous wastes, if any, generated from remedial actions.
Standards for Generators 40 CFR 262.10-40	Establishes regulation covering activities of generators of hazardous wastes. Requirements include ID number, record keeping, and use of uniform national manifest.	Action-Specific	Applicable	Substantive requirements are applicable if RCRA hazardous is generated on site to be managed off site.

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Preliminary List of Potentially Applicable/Relevant and Appropriate Requirements
Former Peters Cartridge Facility
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Potentially Applicable Relevant and Appropriate Requirements	Description	Type of ARAR	Potentially Applicable/ Relevant and Appropriate?	Comment
Subpart G – Closure/Post-Closure 40 CFR Part 264	Concerns site closure requirements, including operation and maintenance, site monitoring, record keeping, and site use.	Action-Specific	Relevant and Appropriate	Substantive closure and post-closure requirements may be relevant and appropriate to hazardous wastes generated and disposed of on site.
Subpart I – Storage Container 40 CFR Part 264	Requirements for on-site storage of hazardous wastes or temporary storage phases during cleanup actions. Requirements for maintenance of storage containers, compatibility with waste, inspection, storage area, location, and closure.	Action-Specific	Applicable	Substantive requirements may be applicable to container storage of hazardous wastes, if any, prior to off-site shipment under generator standards.
Subpart S – Corrective Action for Solid Waste Management Units 40 CFR Part 264	Requirements for CAMUs and temporary treatment units at RCRA-permitted TSD facilities undergoing corrective action.	Action-Specific	Applicable	Substantive requirements may be applicable in the event hazardous remediation waste is re-deposited on-site.
Subpart X – Miscellaneous Units 40 CFR Part 264.600-603	Standards for performance of miscellaneous treatment units. Miscellaneous treatment units may include shredders or desorption.	Action-Specific	Applicable	Subpart X may apply to use of on-site physical treatment technologies such as shredders for managing hazardous waste, if any.
Land Disposal Restrictions 40 CFR, Part 268.	The land disposal restrictions and treatment requirements for materials subject to restrictions on land disposal.	Action-Specific	Applicable	Excavation and removal is a potential action; therefore, LDR may be triggered for characteristic contaminated soil.

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Preliminary List of Potentially Applicable/Relevant and Appropriate Requirements
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Potentially Applicable Relevant and Appropriate Requirements	Description	Type of ARAR	Potentially Applicable/ Relevant and Appropriate?	Comment
42 U.S.C. § 6901 et seq. as amended by the Hazardous and Solid Waste Amendments of 1984 (HSWA) and 1986, the Federal Facilities Compliance Act of 1992, and the Land Disposal Program Flexibility Act of 1996.	Enacted to provide control of hazardous waste by imposing management requirements on generators and transporters of hazardous waste and upon owners and operators of treatment, storage and disposal (TSD) facilities. Also set forth a framework for management of non-hazardous waste. Focuses only on active or future facilities. HSWA requires phasing out land disposal of hazardous waste.	Action-Specific	Applicable	Certain provisions may be applicable for treatment, storage or disposal of hazardous wastes on site. Other provisions may be relevant and appropriate for hazardous waste management on site.
Standards for Identification and Listing of Hazardous Waste (40 CFR 261)	Provides criteria for identification of hazardous and solid wastes.	Action-Specific	Applicable	Will be applicable for identifying hazardous wastes.
Standards Applicable to Generators of Hazardous Waste (40 CFR 262)	Regulates the manifesting, pre-transport requirements, and record keeping and reporting for hazardous waste generators.	Action-Specific	Applicable	Substantive requirements may be applicable if hazardous waste is generated at the site.
Standards Applicable to Transporters of Hazardous Waste (40 CFR 263)	Establishes standards that apply to persons transporting hazardous waste within the United States if the transportation requires a manifest under RCRA.	Action-Specific	Applicable	If hazardous wastes are transported offsite the requirements are applicable.
Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities (40 CFR 264)	Regulations apply to owners and operators of facilities that treat, store, or dispose of hazardous waste through the use of surface impoundments, waste piles, incinerators, land treatment units, and landfills.	Action-Specific	Applicable	Substantive requirements may be applicable and others may be relevant and appropriate if on-site activities include treatment, storage or disposal of hazardous waste.

Attachment 2
Preliminary List of Potentially Applicable/Relevant and Appropriate Requirements
Former Peters Cartridge Facility
Hamilton Township, Ohio

Potentially Applicable Relevant and Appropriate Requirements	Description	Type of ARAR	Potentially Applicable/ Relevant and Appropriate?	Comment
Manifesting, Record Keeping, and Reporting Requirements (40 CFR 264.70 to 264.77)	These standards apply to owners and operators of all facilities which treat, store, or dispose of hazardous wastes.	Action-Specific	Applicable	Substance requirements may be applicable if site activities include treatment, storage or disposal of hazardous waste.
Releases from Solid Waste Management Units (40 CFR 264.90 to 264.101)	Regulations apply to owners or operators of hazardous waste treatment, storage, or disposal facilities.	Action-Specific	Relevant and Appropriate	May be relevant and appropriate for release from solid waste management unit at the site, if any.
Closure and Post Closure Requirements (40 CFR 264.110 to 264.120)	Facility owner or operator must close a hazardous waste facility in a way that minimizes the need for further maintenance and maximizes the protection of human health and the environment.	Action-Specific	Relevant and Appropriate	May be relevant and appropriate if hazardous wastes generated and disposed of on-site.
Land Disposal Restrictions (40 CFR 268)	Identifies hazardous wastes that are restricted from land disposal and defines those limited circumstances under which an otherwise prohibited waste may continue to be land disposed.	Action-Specific	Applicable	May be applicable if characteristic remediation waste is land disposed.

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Preliminary List of Potentially Applicable/Relevant and Appropriate Requirements
Former Peters Cartridge Facility
Hamilton Township, Ohio

SAFE DRINKING WATER ACT (SDWA) OF 1974				
42 U.S.C. § 300f et seq. as amended in 1986	Established to protect the quality of drinking water in the United States. Focuses on all waters actually or potentially designed for drinking use, whether from above ground or underground sources. The Act authorized EPA to establish safe standards of purity and required all owners or operators of public water supply systems to comply with primary (health-related) standards.	Chemical-Specific	Relevant and Appropriate	Would be applicable for future potable water use scenario.
National Primary Drinking Water Regulations and Implementation (40 CFR 141 and 142)	Establishes maximum contaminant levels (MCLs) which are health risk based standards for public water systems.	Chemical-Specific	Relevant and Appropriate	Would be applicable for future potable water use scenario.
National Secondary Drinking Water Standards (40 CFR 143)	Establishes welfare-based secondary standards for public water systems.	Chemical-Specific	Relevant and Appropriate	Would be applicable for future potable water use scenario.
ENDANGERED SPECIES ACT OF 1973				
7 U.S.C. §136; 16 U.S.C. § 460 et seq.	Provides a program for conservation of threatened and endangered plants and animals and the habitats in which they are found.	Location-Specific	Potentially Relevant and Appropriate	USFWS has indicated that endangered species have been observed in the vicinity of the site. Care will be taken to not permanently remove specific habitat.
FLOOD CONTROL ACT OF 1944				
16 U.S.C. § 460	Provides the public with knowledge of flood hazards and promotes prudent use and management of flood plains.	Location-Specific	Yes	Portions of the Site are located within the Little Miami River floodplain.

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NATIONAL HISTORIC PRESERVATION ACT OF 1966				
16 U.S.C. § 470 et seq.	Establishes a national registry of historic sites. Provides for preservation of historic or prehistoric resources.	Location-Specific	Relevant and Appropriate	A building on the site is listed in the National Registry of Historical Places. However, no building demolition is anticipated in the alternatives under consideration.

Attachment 2
Preliminary List of Potentially Applicable/Relevant and Appropriate Requirements
Former Peters Cartridge Facility
Hamilton Township, Ohio

Category	Ohio Revised Code	Description	Type of ARAR	Potentially Applicable/ Relevant and Appropriate?	Application
OEPA, DIVISION OF EMERGENCY AND REMEDIAL RESPONSE ARAR LISTING					
General	5301.00 - Para. .8 to .92	Uniform Environmental Covenants Act - Standards for Environmental Covenants	Action-Specific	Applicable	Applies to institutional controls or use restrictions implemented as part of the on-site remedy.
Natural Resources	1531.25	Endangered Animal Species - Prohibits removal or destruction of endangered animal species	Location-Specific	Relevant and Appropriate	USFWS has indicated that endangered species have been observed in the vicinity of the site. Care will be taken to not permanently remove specific habitat.
Air Pollution Control	3704.05 A-I	Prohibits emissions of an air contaminant in violation of SEC. 3704 or any rules, permits, order, or variance issued pursuant to that section of the ORC	Chemical-Specific	Applicable	Certain provisions may be applicable only if remedial actions result in emissions above threshold amounts.
Hazardous Waste	3734.02 (I)	No hazardous waste facility shall emit any particulate matter, dust, fumes, gas, mist, smoke, vapor, or odorous substance that interferes with the enjoyment of life or property or is injurious to public health	Action-Specific	Applicable	Remedial actions will include movement of earth which may potentially result in air emissions.
Solid and Infectious Waste	3734.03	Prohibits open dumping or open burning of solid waste or treated or untreated infectious waste	Action-Specific	Applicable	Certain provisions may be applicable for treatment, storage or disposal of hazardous wastes on site. Other provisions may be relevant and appropriate for hazardous waste management on site.
Surface Water	3767.14	Prohibits throwing refuse, oil, or filth into lakes, streams or drains	Action-Specific	Applicable	Considered applicable given that the Site is located on the Little Miami River.
Surface Water	6111.04	Pollution of waters of the state is prohibited	Action-Specific	Applicable	May be applicable if remedial actions have the potential to result in discharges to surface water (e.g., Little Miami River).

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Category	Ohio Revised Code	Description	Type of ARAR	Potentially Applicable/ Relevant and Appropriate?	Application
Surface Water	6111.04.2	Establishes regulations requiring compliance with national effluent standards	Chemical-Specific	Relevant and Appropriate	May be relevant and appropriate if remedial actions have the potential to result in discharges to surface water (e.g., Little Miami River).
Surface Water	6111.07 A,C	Prohibits failure to comply with requirements of Sections 6111.01 – 6111.08 or any rules, permits or orders issued under those sections	Action-Specific	Applicable	May be applicable if remedial actions have the potential to result in discharges to groundwater or surface water (e.g., Little Miami River).
Natural Resources	1501:31-23-01, A-B	List of Ohio Endangered Animal Species	Location-Specific	Relevant and Appropriate	No threatened or endangered species, or their habitats, are present at or near the Site, however, USFWS has said endangered species have been seen in the area.
Natural Resources	1517	Protection of Wild and Scenic Rivers	Location-Specific	Applicable	Applicable for shoreline delta removal work.
Surface Water/ Wetlands	401	The 401 Water Quality Certification and Isolated Wetland Permit Section reviews projects that would impact waters of the State.	Action-Specific	Applicable	Although a permit will not be necessary, substantial compliance with the permit application will be required.
Surface Water	3745-1-03	Analytical methods and collection procedures for surface water discharge	Action-Specific	Applicable	May be applicable if remedial actions have the potential to result in discharges to groundwater or surface water (e.g., Little Miami River).
Surface Water	3745-1-04 A,B,C,D,E	All surface waters of the state shall be free from: A) objectionable suspended solids, B) floating debris, oil and scum, C) materials that create a nuisance, D) toxic, harmful or lethal substances, and E) nutrients that create nuisance growth	Action-Specific	Applicable	

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Category	Ohio Revised Code	Description	Type of ARAR	Potentially Applicable/ Relevant and Appropriate?	Application
Surface Water	3745-1-05 A-C	Antidegradation policy for surface water - Prevents degradation of surface water quality below designated use or existing water quality	Action-Specific	Applicable	May be applicable if remedial actions have the potential to result in discharges to groundwater or surface water (e.g., Little Miami River).
Surface Water	3745-1-21	Established water use designations for stream segments within the Great Miami River Basin	Location-Specific	Applicable	May be applicable if remedial actions have the potential to result in discharges to groundwater or surface water (e.g., Little Miami River).
Surface Water	3745-1-34	Applies to discharges to streams within the Ohio River Basin	Location-Specific	Applicable	May be applicable if remedial actions have the potential to result in discharges to groundwater or surface water (e.g., Little Miami River).
Air Pollution Control	3734-02 (1)	Prohibits emissions of particulate matter or dust.	Action Specific	Applicable	May pertain to a site where there is earth moving.
Air Pollution Control	3745-15-07 A	Defines and prohibits air pollution nuisances	Action Specific	Applicable	Remedial actions will include movement of earth which may potentially result in air emissions.
Air Pollution Control	3745-15-08 A	Prohibits dilution or other means to conceal emissions without actual reductions	Action-Specific	Applicable	Remedial actions will include movement of earth which may potentially result in air emissions.
Air Pollution Control	3745-17-02 A,B,C	Establishes standards for total suspended particulates	Chemical-Specific	Applicable	Remedial actions will include movement of earth which may potentially result in air emissions.
Air Pollution Control	3745-17-05	Prohibits degradation of air quality in any area where it is better than required by 3745-17-02	Action-Specific	Applicable	Remedial actions will include movement of earth which may potentially result in air emissions.
Air Pollution Control	3745-17-08 A1, A2, B, D	Requires that all emissions of fugitive dust be controlled.	Action-Specific	Applicable	Remedial actions will include movement of earth which may potentially result in air emissions.

Attachment 2
Preliminary List of Potentially Applicable/Relevant and Appropriate Requirements
Former Peters Cartridge Facility
Hamilton Township, Ohio

Category	Ohio Revised Code	Description	Type of ARAR	Potentially Applicable/ Relevant and Appropriate?	Application
Solid Waste	3745-29-08	Requirements for construction of industrial solid waste facilities	Action-Specific	Applicable	OEPA will require substantive compliance with the requirements for construction of an industrial waste landfill.
Hazardous Waste	3745-270-03 A-D	Prohibits dilution as a means of achieving land disposal restriction levels	Action-Specific	Applicable	May be applicable in the event hazardous waste remediation waste is re-deposited on-site.
Hazardous Waste	3745-270-07 A-E	Testing, tracking, and recordkeeping requirements for generators, treaters, and disposal facilities	Action-Specific	Applicable	Applicable to hazardous wastes, if any, generated from remedial actions.
Hazardous Waste	3745-270-09 A-D	Rules applicable to land disposal of characteristic wastes	Action-Specific	Applicable	Applicable to hazardous wastes, if any, generated from remedial actions.
Hazardous Waste	3745-270-40 A-J	Listing of chemical specific land treatment standards or required treatment technologies	Chemical-Specific	Applicable	Applicable to hazardous wastes, if any, generated from remedial actions and disposed of on-site.
Hazardous Waste	3745-270-42 A-D	Lists specific treatment technologies for specific wastes	Chemical-Specific	Applicable	
Hazardous Waste	3745-270-45 A-D	Specific treatment technologies and performance standards for various debris	Action-Specific	Applicable	Applicable to on-site debris.
Hazardous Waste	3745-270-48 A	Lists chemical specific standards for land disposal	Chemical-Specific	Applicable	On-site consolidation is a potential action; therefore, may be applicable to on-site disposal.
Hazardous Waste	3745-270-49 A-E	Standards for soil treatment	Chemical-Specific	Relevant and Appropriate	May be relevant if pretreatment of the soil before on-site consolidation or off-site disposal is necessary.
Hazardous Waste	3745-270-50 A-F	Rules for storage of wastes that violate land disposal restrictions (LDRs)	Action-Specific	Applicable	Excavation and removal is a potential action; therefore, LDR may be triggered for characteristic contaminated soil.

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Preliminary List of Potentially Applicable/Relevant and Appropriate Requirements
Former Peters Cartridge Facility
Hamilton Township, Ohio

Category	Ohio Revised Code	Description	Type of ARAR	Potentially Applicable/ Relevant and Appropriate?	Application
Hazardous Waste	3745-50-44 B	Establishes the substantive hazardous waste land disposal permit requirements necessary for Ohio EPA to determine adequate protection of ground water	Action-Specific	Applicable	Applicable to hazardous wastes disposed of on-site or existing areas of hazardous waste that will be capped in place.
Hazardous Waste	3745-52-11 A-D	Any person generating a waste must determine if that waste is a hazardous waste	Chemical-Specific	Applicable	Applicable where waste of any type is located
Hazardous Waste	3745-52-12 A-C	A generator must not store, treat, dispose or transport hazardous waste without a generator number	Action-Specific	Applicable	Excavation and off-site disposal is a potential action; applicable where hazardous waste will be transported off-site for treatment, storage or disposal.
Hazardous Waste	3745-52-20	Requires that a generator who transports hazardous waste off-site prepare a uniform hazardous waste manifest	Action-Specific	Applicable	Excavation and off-site disposal is a potential action; applicable where hazardous waste will be transported off-site for treatment, storage or disposal.
Hazardous Waste	3745-52-22	Specifies the number of manifest copies to be prepared	Action-Specific	Applicable	
Hazardous Waste	3745-52-23	Specifies procedures for the use of hazardous waste manifests	Action-Specific	Applicable	
Hazardous Waste	3745-52-30	Requires a generator package hazardous waste in accordance with US DOT regulations for transport off-site	Action-Specific	Applicable	
Hazardous Waste	3745-52-31	Requires packages of hazardous waste be labeled in accordance with US DOT regulations for transport off-site	Action-Specific	Applicable	

Attachment 2
Preliminary List of Potentially Applicable/Relevant and Appropriate Requirements
Former Peters Cartridge Facility
Hamilton Township, Ohio

Category	Ohio Revised Code	Description	Type of ARAR	Potentially Applicable/ Relevant and Appropriate?	Application
Hazardous Waste	3745-52-32	Specified language for marking packages of hazardous waste prior to off-site transportation	Action-Specific	Applicable	
Hazardous Waste	3745-52-33	Specifies that generators shall placard hazardous waste prior to off-site transport	Action-Specific	Applicable	
Hazardous Waste	3745-52-34	Identifies maximum time periods that a generator can accumulate hazardous waste without being considered an operator or storage facility	Action-Specific	Applicable	Applicable to hazardous wastes, if any, generated from remedial actions
Hazardous Waste	3745-52-40 A-D	Specified records shall be kept for three years	Action-Specific	Applicable	Applicable to hazardous wastes, if any, generated from remedial actions
Hazardous Waste	3745-52-41 A, B	Required generators to submit annual reports to OEPA	Action-Specific	Applicable	Applicable if hazardous waste generated on-site is to be managed off-site.
Hazardous Waste	3745-54-13 A	Prior to any treatment, storage, or disposal of a hazardous waste, a representative sample must be chemically and physically analyzed	Action-Specific	Applicable	Applicable to hazardous wastes, if any, generated from remedial actions
Drinking Water	3745-81-11 A,B,C	Maximum Contaminant Levels for Inorganics	Chemical-Specific	Relevant and Appropriate	Would be applicable for future potable water use scenario.
Drinking Water	3745-81-12 A,B,C	Maximum Contaminant Levels for Organics	Chemical Specific	Relevant and Appropriate	
Groundwater	3745-9-03 A-C	Standards for design and closure of wells	Action-Specific	Applicable	Applicable to on-site ground water wells that either will be installed or have been

Attachment 2
Preliminary List of Potentially Applicable/Relevant and Appropriate Requirements
Former Peters Cartridge Facility
Hamilton Township, Ohio

Category	Ohio Revised Code	Description	Type of ARAR	Potentially Applicable/ Relevant and Appropriate?	Application
Groundwater	3745-9-04 A,B	Mandates that wells be located so as to prevent contamination from entering a well and to be accessible for cleaning and maintenance	Action-Specific	Applicable	installed since Feb 15, 1975.
Groundwater	3745-9-05 A1, B-H	Specified minimum construction requirements for new ground water wells	Action-Specific	Applicable	
Groundwater	3745-9-06 A	Established specific requirements for well in different types of aquifers	Action-Specific	Applicable	Applicable to on-site ground water wells that either will be installed or have been installed since Feb 15, 1975.
Groundwater	3745-9-07 A-C	Established specific grouting procedures for wells	Action-Specific	Applicable	
Groundwater	3745-9-10 A,B,C	Provides procedures for closing and sealing wells	Action-Specific	Applicable	

ALTERNATIVES CARBON FOOTPRINT CALCULATIONS

ALTERNATIVE 2

Alternative 2 Conversion Factors	
Disposal Distance	30 miles
Disposal Amount	20 cy/load
Borrow Distance	10 miles
Borrow Amount	20 cy/load
Nonroad Diesel Fuel Usage	2.8 gal/hr
No. of Nonroad Construction Veh.	4 veh.
Workday Length	10 hrs
Project Length	17 weeks
Heavy Duty Diesel Fuel Economy	9 mpg
Diesel-to-carbon factor	22.9 lbs/gal
Land-Clearing Footprint	0.0007 mt/sf
Excavation Depth	0.5 ft
Cap Thickness	2.5 ft

Location	Area of excavated Material (sf)	Volume of Excavated Material (cy)	Volume of Cap (cy)	Land Clearing Carbon Footprint (mt)	Disposal Hauling Footprint (mt)	Borrow Hauling Footprint (mt)
Excavation Area E1	13640	253	1263	10	1	1
Excavation Area E2	88168	1633	8164	62	6	9
Excavation Area E3	35310	654	3269	25	2	4
Excavation Area E4	5460	101	506	4	0	1
Excavation Area E5	6330	117	586	4	0	1
Excavation Area E6	8120	150	752	6	1	1
Excavation Area E7	4750	88	440	3	0	1
Excavation Area E8	14494	268	1342	10	1	2
Excavation Areas E9-1 & E9-2	8313	154	770	6	1	1
Excavation Area E10-1, E10-2 & E10-3	5563	103	515	4	0	1
Excavation Area E11	16658	308	1542	12	1	2
Excavation Area E12-1 thru E12-5	28700	531	2657	20	2	3
Excavation Area E13	9732	180	901	7	1	1
Excavation Area E14	17837	330	1652	12	1	2
Excavation Area E15	18212	337	1686	13	1	2
Excavation Area E16	11878	220	1100	8	1	1
Excavation Area E17	61770	1144	5719	43	4	7
Excavation Area E18	14331	265	1327	10	1	2
Excavation Area C1	62187	1152	5758	44	4	7
Total	**431453**	**7988**	**39949**	**302**	**28**	**46**

TOTAL CARBON FOOTPRINT	(mt)
Land Clearing	302
Hauling/Trucking	74
Excavating Equipment	99
	475

Alternative 2: All affected areas will be excavated to a depth of 0.5 ft. Excavated material will be disposed of off site. A 2 ft thick cap with a 0.5 ft thick vegetation layer will be placed over affected areas. Cap material will be imported from off-site.

ALTERNATIVE 3

Alternative 3 Conversion Factors	
Consolidation Distance	0.2 miles
Consolidation Amount	20 cy/load
Borrow Distance	10 miles
Borrow Amount	20 cy/load
Nonroad Diesel Fuel Usage	2.8 gal/hr
No. of Nonroad Construction Veh.	4 veh.
Workday Length	10 hrs
Project Length	17 weeks
Heavy Duty Diesel Fuel Economy	9 mpg
Diesel-to-carbon factor	22.9 lbs/gal
Land-Clearing Footprint	0.0007 mt/sf
Excavation Depth	2 ft
Fill Thickness	2 ft
Cap Thickness	2.5 ft

Location	Area of excavated Material (sf)	Volume of Excavated Material (cy)	Volume of Fill/Cap (cy)	Land Clearing Carbon Footprint (mt)	Consolidation Hauling Footprint (mt)	Borrow Hauling Footprint (mt)
Excavation Area E1	13640	1010	1010	10	0.02	1
Excavation Area E2	88168	6531	6531	62	0.15	8
Excavation Area E3	35310	2616	2616	25	0.06	3
Excavation Area E4	5460	404	404	4	0.01	0
Excavation Area E5	6330	469	469	4	0.01	1
Capped Area E6	8120	601	752	6	0.01	1
Capped Area E7	4750	352	440	3	0.01	1
Excavation Area E8	14494	1074	1074	10	0.02	1
Excavation Areas E9-1 & E9-2	8313	616	616	6	0.01	1
Excavation Area E10-1, E10-2 & E10-3	5563	412	412	4	0.01	0
Capped Area E11	16658	1234	1542	12	0.03	2
Excavation Area E12-1 thru E12-5	28700	2126	2126	20	0.05	2
Excavation Area E13	9732	721	721	7	0.02	1
Excavation Area E14	17837	1321	1321	12	0.03	2
Excavation Area E15	18212	1349	1349	13	0.03	2
Excavation Area E16	11878	880	880	8	0.02	1
Excavation Area E17	61770	4576	4576	43	0.11	5
Excavation Area E18	14331	1062	1062	10	0.02	1
Excavation Area C1	62187	4606	4606	44	0.11	5
Capped Area BC2	148500	27000	13750	104	0.62	16
Total	**579953**	**58960**	**46256**	**406**	**1**	**53**

TOTAL CARBON FOOTPRINT	(mt)
Land Clearing	406
Hauling/Trucking	55
Excavating Equipment	99
	560

Alternative 3: Affected areas will be excavated to a depth of 2 ft. The excavated material will be placed in a consolidation area (BC2) to the south of the site. The consolidation area will be capped.

ALTERNATIVE 4

Alternative 4 Conversion Factors	
Disposal Distance	30 miles
Disposal Amount	20 cy/load
Borrow Distance	10 miles
Borrow Amount	20 cy/load
Nonroad Diesel Fuel Usage	2.8 gal/hr
No. of Nonroad Construction Veh.	4 veh.
Workday Length	10 hrs
Project Length	17 weeks
Heavy Duty Diesel Fuel Economy	9 mpg
Diesel-to-carbon factor	22.9 lbs/gal
Land-Clearing Footprint	0.0007 mt/sf
Excavation Depth	2 ft
Fill Thickness	2 ft

Location	Area of excavated Material (sf)	Volume of Excavated Material (cy)	Volume of Fill/Cap (cy)	Land Clearing Carbon Footprint (mt)	Disposal Hauling Footprint (mt)	Borrow Hauling Footprint (mt)
Excavation Area E1	13640	1010	1010	10	3	1.17
Excavation Area E2	88168	6531	6531	62	23	7.54
Excavation Area E3	35310	2616	2616	25	9	3.02
Excavation Area E4	5460	404	404	4	1	0.47
Excavation Area E5	6330	469	469	4	2	0.54
Excavation Area E6	8120	601	601	6	2	0.69
Excavation Area E7	4750	352	352	3	1	0.41
Excavation Area E8	14494	1074	1074	10	4	1.24
Excavation Areas E9-1 & E9-2	8313	616	616	6	2	0.71
Excavation Area E10-1, E10-2 & E10-3	5563	412	412	4	1	0.48
Excavation Area E11	16658	1234	1234	12	4	1.42
Excavation Area E12-1 thru E12-5	28700	2126	2126	20	7	2.45
Excavation Area E13	9732	721	721	7	2	0.83
Excavation Area E14	17837	1321	1321	12	5	1.52
Excavation Area E15	18212	1349	1349	13	5	1.56
Excavation Area E16	11878	880	880	8	3	1.02
Excavation Area E17	61770	4576	4576	43	16	5.28
Excavation Area E18	14331	1062	1062	10	4	1.23
Excavation Area C1	62187	4606	4606	44	16	5.32
Excavated Area BC2	122200	9052	9052	86	31	10.45
Total	**553653**	**41012**	**41011**	**388**	**142**	**47**

TOTAL CARBON FOOTPRINT	(mt)
Land Clearing	388
Hauling/Trucking	189
Excavating Equipment	99
	676

Alternative 4: Affected soils will be excavated to a depth of 2 ft and disposed of off-site. Clean fill will be obtained from area BC2 and used to backfill the excavated areas.

Sources:

1 Nonroad Diesel Fuel Usage estimated from US EPA Clean Air Nonroad Diesel - Regulatory Impact Analysis Chapter 6: Equipment and Maintenance Costs (Table 6.2-29, assuming a 75-175 hp engine with 250 hrs per oil change and 699 gallons per oil change interval)
http://www.epa.gov/nonroad-diesel/2004fr.htm

2 Heavy Duty Diesel Truck Fuel Economy obtained from 2009 miles-per-gallon estimates in USEPA MOBILE6.2 Vehicle Emmission Modeling Software
http://www.epa.gov/OMS/m6.htm#m60

3 Diesel to Carbon factor taken from terrapass calculation methodology
http://www.terrapass.com/carbon-footprint-calculator/methodology-popup.html

4 Land Clearing Carbon Footprint obtained from buildcarbonneutral.org carbon footprint calculator. (Calculator parameters: Eastern Temperate Forest, Existing Vegetation Type = Forest, Installed Vegetation Type = Tall Grass)
http://buildcarbonneutral.org/

APPENDIX E

Administrative Record Index

U.S. ENVIRONMENTAL PROTECTION AGENCY
REMEDIAL ACTION

ADMINISTRATIVE RECORD
FOR
PETERS CARTRIDGE SITE
KINGS MILL, WARREN COUNTY, OHIO

ORIGINAL
AUGUST 12, 2009
(SDMS ID: 311884)

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
1	10/18/04	Yalvigi, S., DuPont Engineering	Molitor, P., U.S. EPA	Preliminary Remedial Action Objectives (PRAO) and Identification of Candidate Technologies (ICT) Technical Memorandum for the Former Peters Cartridge Site w/ Cover Letter **(SDMS ID: 311867)**	26
2	06/10/05	Molitor, P., U.S. EPA	Yalvigi, S., DuPont Engineering	Letter re: U.S. EPA Approval of the Revised RI/FS Work Plan for the Peters Cartridge Factory Site w/ Attachment **(SDMS ID: 311875)**	64
3	06/20/05	Yalvigi, S., DuPont Engineering	Molitor, P., U.S. EPA	Revised Text Pages for the Final Remedial Investigation and Feasibility Study Work Plan for the Former Peters Cartridge Site w/ Cover Letter **(SDMS ID: 311877)**	73
4	02/02/06	Molitor, P., U.S. EPA	Yalvigi, S., DuPont Engineering	Letter re: Site Characterization Technical Memorandum for the Peters Cartridge Factory Site **(SDMS ID: 311868)**	1
5	03/27/06	Yalvigi, S., DuPont Engineering	Molitor, P., U.S. EPA	Letter re: Request for Time Extension on Remedial Investigation Report and Preliminary Remedial Action Objectives Memo for the Former Peters Cartridge Company Site **(SDMS ID: 311869)**	1
6	04/05/06	Molitor, P., U.S. EPA	Yalvigi, S., DuPont Engineering	Letter re: Request for Time Extension on Remedial Investigation Report for the Former Peters Cartridge Company Site **(SDMS ID: 311870)**	3

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
7	11/28/06	Geosyntec Consultants	DuPont Corporate Remediation Group	Supplemental Remedial Investigation Work Plan for the Former Peters Cartridge Site **(SDMS ID: 311876)**	49
8	01/12/07	Molitor, P., U.S. EPA	Yalvigi, S., DuPont Engineering	Letter re: Supplemental Remedial Investigation Work Plan and Quality Assurance Project Plan Addendum 1 for the Peters Cartridge Factory Site **(SDMS ID: 311871)**	4
9	09/02/08	Larson, D., Geosyntec Consultants	Molitor, P., U.S. EPA	Letter re: Request for Extension to Respond to Comments on the Baseline Ecological Risk Assessment and the Revised Screening Level Ecological Risk Assessment for the Former Peters Cartridge Company Site **(SDMS ID: 311872)**	2
10	10/28/08	Molitor, P., U.S. EPA	Yalvigi, S., DuPont Engineering	Letter re: Review of Response to EPA Comments on the Revised Remedial Investigation Report Appendix K (Revised Screening Level Ecological Risk Assessment) and Appendix L (Baseline Ecological Risk Assessment) for the Former Peters Cartridge Factory Site **(SDMS ID: 311873)**	1
11	02/25/09	Geosyntec Consultants	DuPont Corporate Remediation Group	Remedial Investigation Report for the Former Peters Cartridge Facility **(SDMS ID: 311878)**	1965
12	06/23/09	Geosyntec Consultants	DuPont Corporate Remediation Group	Final Feasibility Study Report for the Former Peters Cartridge Facility **(SDMS ID: 311879)**	153
13	06/30/09	U.S. EPA	Public	Fact Sheet: EPA Proposes Cleanup Plan for Ammunition Site **(SDMS ID: 311874)**	5

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
14	07/09/09	Pulse-Journal Little Miami	Public	U.S. EPA Public Notice: EPA is Accepting Public Comments on the Proposed Cleanup Plan of the Peters Cartridge Factory Superfund Site **(SDMS ID: 311865)**	1
15	07/09/09	The Western Star	Public	U.S. EPA Public Notice: EPA is Accepting Public Comments on the Proposed Cleanup Plan of the Peters Cartridge Factory Superfund Site **(SDMS ID: 311866)**	1
16	07/15/09	Around-the-Clock Reporting Services	U.S. EPA	Transcript: July 15, 2009 Public Hearing on U.S. EPA's Proposed Cleanup of the Peters Cartridge Site **(SDMS ID: 311883**	34
17	08/12/09	Concerned Citizens	Krause, P., U.S. EPA	E-Mail Transmissions/ Public Comment Sheets re: Seven Comments on the Proposed Cleanup Plan for the Peters Cartridge Site **(PORTIONS OF THIS DOCUMENT HAVE BEEN REDACTED) (SDMS ID: 311880)**	14

UPDATE #1
SEPTEMBER 16, 2009

1	08/05/09	Partee, E., Little Miami Incorporated	Krause, P., U.S. EPA	Letter re: Little Miami Comments on Clean Up of Peters Cartridge Site	2
2	08/06/09	Karl, R., Ulmer Berne LLP	Krause, P., U.S. EPA	Letter re: Board of Trustees of Hamilton Township Comments on EPA's Proposed Cleanup Plan for the Peters Cartridge Factory Site	3