EPA SUPERFUND PROGRAM
RECORD OF DECISION
CENTRAL CHEMICAL SUPERFUND SITE
HAGERSTOWN, MARYLAND

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TABLE OF CONTENTS

Page

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS AND ABBREVIATIONS

$(mg/kg/day)^{-1}$	per milligram per kilogram per day
ARAR	applicable or relevant and appropriate requirements
ASTM	American Society for Testing and Materials
ATSDR	Agency for Toxic Substances and Disease Registry
B&W	Baker & Wibberly
bgs	below ground surface
CAS_RN	Chemical Abstracts Service Registry Number
CCSPG	Central Chemical Site Participation Group
Central Chemical	Central Chemical Corporation
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CERCLIS	Comprehensive Environmental Response, Compensation and Liability Information System
CFR	Code of Federal Regulations
cfs	cubic foot per second
CLP	Contract Lab Program
cm/sec	centimeters per second
CNS	central nervous system
COC	contaminant of concern
COMAR	Code of Maryland Regulations
COPCs	contaminants of potential concern
CSM	conceptual site model
CW	construction worker
cy	cubic yards
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene
DDT	Dichlorodiphenyltrichloroethane
ECO	ecological receptor
EPA	United States Environmental Protection Agency
EPC	exposure point concentration
ERA	ecological risk assessment
ESI	Expanded Site Inspection
FS	Feasibility Study
GW	ground water
HEAST	Health Effects Assessment Summary Table

HHRA	Human Health Risk Assessment
HI	hazard index
HQ	hazard quotient
IRIS	Integrated Risk Information System
ISW	indoor site worker
lb/in^2	pounds per square inch
LOAEL	lowest observed adverse effects level
MDE	Maryland Department of the Environment
MDWR	Maryland Department of Water Resources
µg/kg	micrograms per kilogram
$\mu g/m^3$	micrograms per cubic meter
mg/kg	milligrams per kilogram
mg/kg/day	milligrams per kilogram per day
m/s	meters per second
msl	mean sea level
NCEA	EPA National Center for Environmental Assessment
NCP	National Contingency Plan
NE	northeast
NOAEL	no observed adverse effects level
NPDES	National Pollutant Discharge Elimination System
NW	northwest
O&M	Operation and Maintenance
OU	Operable Unit
%	percent
POTW	publicly owned treatment works
ppm	parts per million
PPRTV	EPA provisional peer-reviewed toxicity value
PRAP	Proposed Remedial Action Plan
PRG	preliminary remediation goal
PRP	Potentially Responsible Party
RAO	remedial action objectives
RCRA	Resource Conservation and Recovery Act
RDI	Remedial Design Investigation
RI	Remedial Investigation
RME	reasonable maximum exposure
ROD	Record of Decision

SE	southeast
Site	Central Chemical Superfund Site
SPLP	Synthetic Precipitation Leaching Procedure
S/S	solidification/stabilization
SSI	Screening Site Investigation
SVOC	semi-volatile organic compound
SW	southwest
TRV	toxicity reference value
UCL	upper confidence limit
URS	URS Corporation
USGS	United States Geological Survey
VOC	volatile organic compound
WCHD	Washington County Health Department
Weston	Roy F. Weston, Inc.
WRA	Maryland Water Resource Administration

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CENTRAL CHEMICAL SUPERFUND SITE
HAGERSTOWN, MARYLAND

1.0 DECLARATION

1.1 SITE NAME AND LOCATION

Central Chemical Superfund Site
Hagerstown, Washington County, Maryland
Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) ID#: MDD003061447

This Record of Decision (ROD) pertains to Operable Unit 1 (OU-1) of the Central Chemical Superfund Site (Site). OU-1 addresses contaminated soils, and principal threat wastes at the Site, including a Former Waste Lagoon. The Site is located along Mitchell Avenue in the City of Hagerstown, Washington County, Maryland.

1.2 STATEMENT OF BASIS AND PURPOSE

This decision document presents the Selected Remedy for OU-1 of the Central Chemical Superfund Site (Site), in Hagerstown, Maryland, which was chosen in accordance with Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended, and, to the extent practicable, the National Contingency Plan (NCP). This decision is based on the Administrative Record File for this Site.

The State of Maryland concurs with the Selected Remedy identified for OU-1 (Figure 14).

1.3 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 hazardous substances into the environment.

1.4 DESCRIPTION OF THE SELECTED REMEDY

This ROD addresses contaminated soils and principal threat wastes at the Site which pose a threat to human health and the environment (ecological receptors and ground water). As discussed in Section 2.11 of this ROD, the contents of the Former Waste Lagoon, which include powders and sludge, are considered to be principal threat waste. The overall cleanup strategy for the Site is:

1. Treat the principal threat waste present in the Former Waste Lagoon using In-Situ Solidification/Stabilization (S/S) technology. S/S of the Former Waste Lagoon

will prevent the leaching of hazardous substances from the wastes, and will mitigate the threat these wastes pose to ground water. Contents of the Former Waste Lagoon which cannot be successfully solidified/stabilized (based on the results of a treatability study to be performed during the pre-Remedial Design Investigation) will be excavated and transported off-Site, with treatment as necessary, and disposed of off-Site at an off-Site waste disposal facility in accordance with CERCLA §121(d)(3).

2. After the Former Waste Lagoon has been addressed, the contaminated soils from the remainder of the Site (outside of the footprint of the Former Waste Lagoon) will be excavated and consolidated in the area of the treated Former Waste Lagoon. A low permeability cover system will be placed over the consolidated contaminated soils. The treated Former Waste Lagoon, the consolidated contaminated soils, and the low permeability cover system will constitute a permanent Consolidation Area on the Site for contaminated media (soils, treated principal threat waste). This area is referred to in the ROD as the "Consolidation Area." A ground water monitoring, extraction, and treatment system will be installed around the Consolidation Area to prevent contaminant migration beyond the boundaries of the Consolidation Area.

The overall objective of the cleanup actions required by this ROD is to prevent contact between human and ecological receptors and contaminated soils; treat the principal threat waste present in the Former Waste Lagoon; and prevent contaminant migration via ground water beyond the boundaries of the Consolidation Area.

Based on the results of the currently available information, including the human health risk assessment (HHRA) and ecological risk assessment (ERA), response actions to address the presence of Site-related hazardous substances in surface water and sediment are not warranted.

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a site wherever practicable (40 Code of Federal Regulations [CFR] §300.430(a)(1)(iii)(A)). The "principal threat" concept is applied to the characterization of "source materials" at a Superfund Site. A source material is material that includes or contains hazardous substances, pollutants or contaminants that act as a reservoir for migration of contamination to ground water, surface water or air, or acts as a source for direct exposure. Contaminated ground water generally is not considered to be a source material. Principal threat wastes are those 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. EPA considers the contents of the Former Waste Lagoon to be principal threat waste (discussed in Section 2.11).

EPA's Selected Remedy consists of the following:

1. Conduct a pre-Remedial Design Investigation.

2. Perform Solidification/Stabilization treatment of the contents of the Former Waste Lagoon.

3. Contents of the Former Waste Lagoon which cannot be successfully treated by Solidification/Stabilization (i.e. do not achieve the Solidification/Stabilization performance standards described in the Selected Remedy) will be excavated and transported off-Site, with treatment as necessary, and disposed of off-Site at an off-Site waste disposal facility in accordance with CERCLA §121(d)(3).

4. Excavate contaminated soils above Site-specific Soil Remediation Standards from Domain 1, Domain 2 (outside footprint of Former Waste Lagoon) and Domain 3. Confirmation sampling will be performed at the completion of excavation activities to demonstrate compliance with the Soil Remediation Standards (specified in the Selected Remedy).

5. Consolidate the excavated soils from #4 above on the footprint of the solidified/stabilized Former Waste Lagoon area. If it is determined during the remedial design, or during the remedial action, that the volume of contaminated soil at the Site cannot be consolidated within the boundaries of the cover system (Consolidation Area) set forth in #6, below, then the excess contaminated soil will be disposed of off-Site at an appropriate off-Site waste disposal facility in accordance with CERCLA §121(d)(3).

6. Construct, maintain, and periodically inspect an engineered low permeability cover system over the consolidated contaminated soils and Former Waste Lagoon area ("Consolidation Area").

7. Capture contaminated ground water/leachate in the vicinity of the Consolidation Area by installation, operation, maintenance, and periodic monitoring of a ground water monitoring, extraction and treatment system.

8. The discharge point for the treated ground water will be the Hagerstown public sewer system in accordance with applicable Federal pre-treatment standards.

9. Use of the Central Chemical property shall be limited to commercial/industrial use, and ensure maintenance and prevent disturbance of the low permeability cover system and ground water monitoring, extraction, and treatment system, through establishment and implementation of institutional controls.

10. Principal threat wastes identified outside of the Former Waste Lagoon area on the Site shall be excavated and transported off-Site, with treatment as necessary, and disposed of off-Site at an off-Site waste disposal facility in accordance with CERCLA §121(d)(3). Principal threat wastes include containers of hazardous substances, non-aqueous phase liquids, powders, and sludge.

11. No further action is included in the Selected Remedy for OU-1 with regard to sediments and surface water.

The estimated cost of the Selected Remedy is $14,350,772.

1.5 STATUTORY DETERMINATION

1.5.1 Selected Remedy

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 the remedial action (unless justified by a waiver), is cost-effective, and utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable.

This remedy also satisfies the statutory preference for treatment as a principal element of the remedy (i.e., reduces the toxicity, mobility, or volume of hazardous substances, pollutants, or contaminants as a principal element through treatment).

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after initiation of the remedial action to ensure that the remedy is, or will be, protective of human health and the environment.

1.6 ROD DATA CERTIFICATION CHECKLIST

The following information is included in the Decision Summary section of this ROD. Additional information can be found in the Administrative Record File for the Site.

- Contaminants of concern (COCs) and their respective concentrations (Section 2.7.1.1 and Table 9)
- Baseline risk represented by the COCs (Tables 1, 2 and 3)
- Cleanup levels established for COCs and the basis for these levels (Table 13)
- How source materials constituting principal threats are addressed (Section 2.11)
- Current and reasonable anticipated future land use assumptions and current and potential future beneficial uses of ground water used in the baseline risk assessment and ROD (Section 2.6)
- Potential land and ground water use that will be available at the site as a result of the Selected Remedy (Section 2.12.2.2)
- Estimated capital, annual operation and maintenance (O&M), and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected (Table 14)
- Key factor(s) that led to selecting the remedy (Section 2.10.4)

Dennis P Carney (signature) — 9/30/09

Kathyrn A. Hodgkiss, Acting Director
Hazardous Site Cleanup Division
EPA Region III

Date

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2.0 DECISION SUMMARY

2.1 SITE NAME, LOCATION, AND BRIEF DESCRIPTION

The Central Chemical Superfund Site (Site) is located in Hagerstown, Washington County, Maryland. The Site is located along the north side of Mitchell Avenue, to the west of the intersection of Mitchell Avenue and North Burhans Boulevard. The Site consists of the Central Chemical property and any areas where Site-related hazardous substances have come to be located.

The Site is depicted on the Hagerstown, Maryland-Pennsylvania United States Geological Survey (USGS) quadrangle. The Site coordinates are 39°, 39', 23" north latitude and 77°, 43', 27" west longitude. The CERCLIS identification number for the Site is MDD003061447.

The Site location is shown on Figure 1.

The EPA is the lead agency for Site activities and the Maryland Department of the Environment (MDE) is the support agency.

Central Chemical Corporation ("Central Chemical") is the current owner of the Central Chemical property. Central Chemical's predecessors obtained the Central Chemical property from the Citizens Development Company of Hagerstown, Washington County on April 4, 1911.

The Central Chemical property was initially developed in the 1930s for fertilizer blending and manufacturing operations which continued until 1984. Pesticide blending operations occurred at the property between approximately the 1940s and 1960s. The pesticide blending operation included use of various compounds such as Dichlorodiphenyltrichloroethane (DDT), Sevin, Dichlorodiphenyldichloroethane (DDD), Daconil (fungicide), Guthion (an organophosphate pesticide), Aldrin, Dieldrin, Chlordane, Toxaphene, lead arsenate, and Omite (insecticide), which were blended with inert materials at the property. The raw pesticides were manufactured at other locations. The grinding and blending was accomplished using air and hammer mills and wetting agents, followed by dry packaging of the material. From the 1940s to the 1960s, Central Chemical also produced liquid pesticides containing various components such as Aldrin, Endrin, DDT, Dieldrin, miscible oils, Chlordane, Methoxychlor, and Toxaphene, which were prepared with organic solvents. Liquid pesticide activities are believed to have been performed in the Liquid Pesticide Building in the northwestern portion of the Site. The air mill pesticide operations building was destroyed by fire in 1965. Central Chemical filed an application with the Maryland Department of Health for registration of the Site as a fertilizer manufacturing plant in December 1968. Fertilizer manufacturing continued at the Site until 1984. The Central Chemical property is currently vacant, and is occupied by concrete slabs associated with former buildings.

Review of previous environmental investigations for the Site (Section 2.2) indicates that at least two areas of the Site are believed to be former waste disposal areas. In the northeast corner of the Site lies a backfilled Former Waste Lagoon. In approximately the central portion of the Site lies a potential sinkhole. The Remedial Investigation (RI) performed at the Site has identified highly contaminated soils and waste materials (powders, sludge) in the Former Waste Lagoon, and an isolated lens of white/grey "impacted material" (which turned to liquid during handling) in the subsurface in the vicinity of the potential sinkhole.

The two on-Site waste disposal areas are depicted on Figure 2 (the potential sinkhole is located in the area of Figure 2 labeled "drainage swale").

Certain Potentially Responsible Parties (PRPs) conducted the RI/FS. During the RI/FS, the PRPs divided the Site into three areas for evaluation, as follows:

- "Domain 1" is the western portion of the Site which was formerly occupied by Site buildings. Domain 1 is currently occupied by the concrete slabs of former Site buildings, and roadways.
- "Domain 2" is the northeastern portion of the Site, and is occupied by a Former Waste Lagoon (which is described further in this ROD).
- "Domain 3" is the southeastern portion of the Site, which is currently undeveloped and is partially wooded. The potential sinkhole is located along the western boundary of this area.

For consistency with the RI/FS documents, the same designations for different areas of the Site are included in this ROD. A map depicting the boundaries of the three "Domain Areas" is included as Figure 3.

2.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

Numerous environmental investigations of the Site have been conducted. A summary of the environmental investigations of the Site follows.

In the early 1960's, the State of Maryland and Washington County Health Department (WCHD) were notified of complaints by local residents that pesticide odors were migrating from the plant. Air samples collected by the State on October 18, 1962 revealed 7.5 milligrams per cubic meter (mg/m^3) of Guthion. This concentration was deemed not to pose a hazard at the time by the State Health Department.

Following transfer of pesticide operations to a new location in Elkton, Maryland in 1968, Central Chemical filed an application for registration of the Hagerstown Site as a Fertilizer Manufacturing Plant with the Maryland Department of Health on December 6, 1968.

State and county health departments were notified of complaints by local residents concerning emission of dust and smoke for the Number 2 stack at the Central Chemical property in 1970. These emissions were due to oil-burning dryers, which were used in the fertilizer manufacturing operations. (The Number 1 stack emitted waste material from the ammoniator used in the fertilizer manufacturing, and records described it as usually non-visible).

On June 8, 1970, the WCHD sent a certified letter to Central Chemical, indicating that the Site had been inspected on May 28, 1970. The WCHD identified on-Site dumping of refuse, and a pool of dark, odorous liquid. The WCHD required Central Chemical to consolidate the on-Site dumped refuse, cover the refuse with two feet of soil, and grade the area to promote surface water runoff away from the "dumping site."

On August 5, 1970 the Maryland Department of Water Resources (MDWR) performed a field inspection at the Site. The Water Resources Engineer identified a small "dump" outside of the plant area which contained water and sacks of "Omite" (reportedly a powdered insecticide used for mite control).

In response to air quality concerns, Central Chemical signed a Plan for Compliance with the State on April 30, 1971. The Plan stated that Central Chemical would be in compliance with State Air Regulations by December 31, 1971. This compliance included the installation of vibrating bag filters and an economic study of the fertilizer granulator in order to determine whether to cease operation or install emission control equipment. State records indicate that the Plan for Compliance was complete by February 14, 1972. These records indicate that Central Chemical opted to cease operation of the fertilizer granulator.

The State of Maryland began monitoring the Site for DDT contamination in 1976, following identification of DDT in sediments of the Antietam Creek during a study of the Potomac River watershed conducted by the U.S. Geological Survey. Sediment sampling conducted in 1976 revealed elevated concentrations of lead and DDT in an unnamed tributary located downstream of surface water drainage from the Site.

Samples were collected from Antietam Creek in June 1976. These samples indicated that DDT and lead were migrating to Antietam Creek from the Hagerstown Area. As part of the effort to locate the source of the DDT, soil samples were collected from the Site and vicinity in August and October 1976. The samples revealed DDT concentrations from 0.2 to 1,646.4 parts per million (ppm), lead from 14.8 to 395 ppm, and arsenic from 2.2 to 300 ppm. Environmental concerns were addressed by the State through Consent Order C-0-77-432, with subsequent amendments, issued during the period of 1977-1978. As a result of these actions, Central Chemical contracted to have the quarry (Former Waste Lagoon) and potential sinkhole areas covered with clay and soil. This action included vegetative stabilization (seeding and mulching of the Site) in order to reduce migration of soils from the Site.

Soil samples were collected by the Maryland Water Resource Administration (WRA) in August, and October 1976 from surface water drainage areas on-Site or near the Site. The WRA's soil samples revealed elevated concentrations of DDT, arsenic, and lead.

Following the identification of elevated concentrations of pesticides and heavy metals at the Site in 1976, a Complaint and Order (C-0-77-432) was issued to Central Chemical Corporation by the WRA in 1977. This action directed Central Chemical to submit a hydrogeologic investigation of the Site. Through Supplemental Orders C-0-77-432A,B,C, the State continued to direct investigation and stabilization of the Site by Central Chemical to prevent further migration of contaminated soils. The State issued a Notice of Compliance on December 14, 1979.

Pursuant to WRA's Supplemental Order C-0-77-432A, Central Chemical contracted with Baker & Wibberly (B&W) to conduct a hydrologic assessment of the Site in 1977. This hydrologic assessment included collection of soil samples, ground water, and ponded surface water from the Site and vicinity. These samples were analyzed for DDT, arsenic and lead.

Based on the B&W study, and a consent agreement with the State of Maryland, Central Chemical closed the Former Waste Lagoon, and a potential sinkhole located on-Site by covering those areas with clay and soil, and vegetative stabilization.

In March 1987, during the excavation of a trench for a sewer line by a third party, excavation workers unearthed what appeared to be buried chemical materials in the area of the Former Waste Lagoon (located in Domain 2). Soil samples collected at that time revealed pesticides, naphthalene and volatile organic compounds (VOCs).

After the identification of the on-Site dump in 1987 (during sewer line excavation), MDE began negotiating a Consent Order with Central Chemical. Though Central Chemical did not sign the proposed Consent Order with the State, they did hire Weston (a contractor) to undertake some investigatory work at the Site.

Following the March 1987 incident, the MDE directed Central Chemical to conduct an environmental investigation of the Site. Central Chemical engaged Roy F. Weston, Inc. (Weston) to perform a Phase I Environmental Investigation, which was completed in 1989. Weston's investigation included aerial photograph analysis, fracture trace analysis, soil sampling, ground water sampling, aquifer tests, and geophysical investigations. The Phase I Environmental Investigation included soil borings into the Former Waste Lagoon. Soil samples collected from the Former Waste Lagoon revealed DDT contamination.

The MDE prepared a Screening Site Investigation (SSI) for the Site in 1989. The MDE provided oversight of the soil borings that were advanced into the Former Waste Lagoon by Weston. MDE described the contents of the Former Waste Lagoon, as follows: *"The borings were drilled as deep as thirty-six (36) feet and encountered black material, yellow powder, and gray waste material, green seams, black and gray silt and clay, brown sand and silt and white powder. Strong petroleum odors were noted during the drilling."* The MDE SSI indicated that VOCs, pesticides, and heavy metals were detected in the soil and ground water at the Site. The highest concentrations of contaminants were present in the Former Waste Lagoon; however, lower contaminant concentrations were also detected off of the Central Chemical property. MDE concluded that the Site represented a threat to public health, and should be further evaluated.

Central Chemical was issued a Site Complaint (SC-O-92-185) on May 22, 1992 by MDE. Central Chemical was cited for improper storage of materials, including two 5-gallon containers, which reportedly contained "prohibited pesticides." The materials were subsequently removed and a Notice of Compliance was issued.

Federal, State, and local officials requested that Central Chemical install a fence around the quarry (Former Waste Lagoon) in 1992. Central Chemical agreed to construct the fence, which was completed by October 1992.

EPA performed an evaluation of the Site in 1992, to determine if a removal action was warranted at the Site. Samples were collected from the monitoring wells, shallow soils, and interior building surfaces (the buildings were not demolished until 2005). Based on the samples collected, EPA determined that removal action was not warranted at that time.

The MDE issued a draft Expanded Site Inspection (draft ESI) in 1993. The draft ESI included a review of historical Site data, and soil, ground water, surface water, and sediment sampling. The draft ESI indicated that pesticide soil contamination at the Site posed a risk to trespassers slightly above EPA's acceptable cancer risk range.

An EPA contractor conducted soil and sediment sampling on April 14, 1994. Pesticides were detected in six of the seven soil/sediment samples collected. At the request of EPA, the Agency for Toxic Substances and Disease Registry (ATSDR) reviewed the Site data and made the following recommendations:

- Since a large discrepancy exists between MDE and EPA data for samples collected outside the fence line, additional surface soil sampling (0 to 3 inches) should be conducted at this location to determine if pesticides are present at levels of health concern.

- Restrict dirt biking and other activities on the western part of the Site until surface soil contamination has been adequately characterized.

- Given the proximity of the encroaching housing development on the northeast border of the Site, consider collection of off-Site surface and subsurface soil samples at this location to determine if migration of Site related contaminants has occurred at levels of health concern.

- Determine if subsistence fishing is occurring at Antietam Creek. If so, consider fish sampling for analysis of DDT concentrations in the edible portion of the fish.

To address the issues identified by ATSDR, the MDE prepared an Expanded Site Inspection (ESI) in 1996. The ESI included additional soil and fish-tissue sampling. The ESI determined that pesticides in surface soils on and near the Site do not pose a significant increase in cancer risk to adult or child pedestrians walking or playing in the area. A slightly increased risk of adverse health effects was identified, however, for young children who play frequently along the footpaths along the fence near the railroad tracks (west side of Site). The fish tissue data revealed the presence of DDT (Site-related pesticide), and DDD/ Dichlorodiphenyldichloroethylene (DDE) (DDT breakdown products), however, the concentrations present were not of immediate health concern.

An EPA contractor collected 45 soil samples to the northwest of the Central Chemical property in August 1996. In 1996, that property was an open field, which was subsequently developed by residential housing. EPA collected samples parallel to the existing Central Chemical fence line in sampling lines 3 feet, 13 feet, and 40 feet from the Central Chemical fence. DDT contamination was identified in the 3 feet, and 13 feet sampling lines. In February 1997, EPA and Central Chemical entered into an Administrative Order on Consent (AOC) for Removal Response Action, Docket No. 111-97-08-DC, to construct a fence beyond the existing fence that would result in DDT contaminated soil being present within the Central Chemical fence line. Central Chemical complied with the order and extended the fence to contain the contaminated soils on approximately February 28, 1997.

An EPA contractor performed confirmation sampling of soils located outside the extended Central Chemical fence in February 1997. A total of 15 confirmation soil samples were collected. DDT, DDD, and DDE were detected in the confirmation soil samples, albeit at concentrations below removal action levels. MDE reviewed the soil sample results and concluded that the current concentrations of pesticides in the surface soil near the Central Chemical property did not pose a significant increase in cancer risk to construction workers, adults or children from incidental ingestion of soil. A slight potential increase for non-carcinogenic health effects for children from incidental ingestion of soil was noted. MDE concluded that because the soil samples which exhibited elevated contaminant concentrations were now within the Central Chemical fence, access to this area should be limited, reducing the potential for adverse health effects to children.

An MDE contractor performed additional soil sampling outside of the Central Chemical fence line to the northwest of the Site in June 1997. A total of eight soil samples were collected outside of the Central Chemical fence to the northwest of the Site. DDT, DDD, and DDE were detected in the soil samples at low concentrations. MDE determined that the contaminant concentrations did not represent a carcinogenic risk above EPA's acceptable cancer risk range.

The Site was proposed to the CERCLA National Priorities List on June 17, 1996, and was listed as Final on the National Priorities List on September 25, 1997.

A group of Potentially Responsible Parties (PRPs) for the Site, known as the Central Chemical Site Participation Group (CCSPG), performed an RI/FS at the Site. The RI/FS was completed in 2009.

In 2002, two areas were identified on the Site where elevated concentrations of pesticides were present. The first area included a pile of light brown powdery pesticide material. A second area consisted of a tarry residue that was present on the ground surface. These two areas were excavated and the materials were shipped offsite for disposal by incineration. The amount of material involved in this voluntary action was approximately 3.2 tons.

In 2003, an interim remedial measure was performed to reduce the mobility of site constituents that could be subject to transport in rainfall runoff. The interim measure consisted of installation of silt fencing along the Mitchell Avenue frontage of the site and the installation of a clean gravel drive area at the Site entrance.

In 2005, the CCSPG removed all remaining structures from the Site at a cost of approximately $3,000,000. Although the demolition of the Site buildings would have typically been performed as part of the Site remedial action and not the RI/FS, the Group elected to perform this interim remedial action. The demolition program resulted in the offsite disposal of approximately 1,100 tons of material at a Resource Conservation and Recovery Act (RCRA) Subtitle C landfill, approximately 3,900 tons of material at a RCRA Subtitle D landfill, 176 tons of asbestos containing materials at a RCRA Subtitle D landfill, and the recycling of over 550 tons of steel. In addition, 12.5 tons of scrap tires were recycled.

2.3 COMMUNITY PARTICIPATION

The RI/FS and Proposed Remedial Action Plan for the Site were made available to the public in April 2009. They can be found in the Administrative Record file and the information repository maintained at the EPA Docket Room in Region III and at the Washington County Free Library. The notice of the availability of these two documents was published in the Herald-Mail. A public comment period was held from April 15, 2009 to May 14, 2009. Two requests for extensions of the public comment period were received by EPA. As a result, the public comment period was extended to July 15, 2009. In addition, a public meeting was held on April 28, 2009 to present the Proposed Remedial Action Plan to a broader community audience than those that had already been involved at the Site. At this meeting, representatives from EPA and the MDE answered questions about the remedial alternatives evaluated, and EPA's Preferred Alternative. EPA's response to comments received during the public comment period is included in the Responsiveness Summary, which is part of this ROD.

A community liaison panel was also formed as part of the community participation activities at the Site. The community liaison panel is comprised of local citizens, members of local government, local elected officials, the PRPs at the Site, EPA staff, and MDE staff. During the RI/FS, periodic meetings with the community liaison panel were held to discuss Site conditions, RI/FS findings, advantages/disadvantages associated with the available remedial options, and community concerns.

2.4 SCOPE AND ROLE OF OPERABLE UNIT OR RESPONSE ACTION

As with many Superfund sites the problems at the Central Chemical Site are complex. As a result, EPA has organized the work into two operable units (OUs):

- Operable Unit 1: Contaminated soils and principal threat waste. Also, the results of the RI for sediments and surface water are included in this ROD (OU-1).
- Operable Unit 2: Contaminated ground water

This ROD addresses contaminated soils and principal threat wastes at the Site which pose a threat to human health and the environment (ecological receptors, and ground water). As discussed in Section 2.11 of this ROD, the contents of the Former Waste Lagoon, which include powders and sludge, are considered to be principal threat waste. The overall cleanup strategy for the Site is:

1. Treat the principal threat waste present in the Former Waste Lagoon using In-Situ S/S technology. S/S of the Former Waste Lagoon will prevent the leaching of hazardous substances from the wastes, and will mitigate the threat these wastes

pose to ground water. Contents of the Former Waste Lagoon which cannot be successfully solidified/stabilized (based on the results of a treatability study to be performed during the pre-Remedial Design Investigation) will be excavated and transported off-Site, with treatment as necessary, and disposed of off-Site at an off-Site waste disposal facility in accordance with CERCLA §121(d)(3).

2. After the Former Waste Lagoon has been addressed, the contaminated soils from the remainder of the Site (outside of the footprint of the Former Waste Lagoon) will be excavated and consolidated in the area of the treated Former Waste Lagoon. A low permeability cover system will be placed over the consolidated contaminated soils. The treated Former Waste Lagoon, the consolidated contaminated soils, and the low permeability cover system will constitute a permanent Consolidation Area on the Site for contaminated media (soils, treated principal threat waste). A ground water monitoring, extraction and treatment system will be installed around the Consolidation Area to prevent contaminant migration beyond the boundaries of the Consolidation Area.

The overall objective of the cleanup actions required by this ROD is to prevent contact between human and ecological receptors and contaminated soils; treat the principal threat waste present in the Former Waste Lagoon; and prevent contaminant migration via ground water beyond the boundaries of the Consolidation Area.

As discussed below in Section 2.7 and Section 2.12, additional soil samples will be collected on the properties adjacent to the Central Chemical property during the pre-Remedial Design Investigation to determine if there is an unacceptable risk posed by the soils. EPA conclusions on the need for response actions beyond the boundaries of the Central Chemical property will be documented in an appropriate EPA decision document.

The delineation of ground water contamination at the Site is not complete. Once the delineation of contaminated ground water is complete, EPA will issue a proposed remedial action plan and a subsequent ROD for OU-2 (contaminated ground water). Ground water contamination at the Site is discussed further below in Section 2.5 (Site Characteristics).

Based on the results of the HHRA and ERA, response actions to address the presence of Site-related hazardous substances in surface water and sediment are not warranted.

2.5 SITE CHARACTERISTICS

2.5.1 Physical Characteristics and Land Use

The Site includes the Central Chemical property, a single 19.02-acre parcel situated in an area of mixed industrial, commercial, and residential uses, and any areas where Site-related hazardous substances have come to be located. The Site also includes a ground water contamination plume which extends to the northeast and southwest of the Central Chemical property. As discussed elsewhere in this ROD, ground water contamination at the Site is being addressed as a separate OU (OU-2). Therefore, a separate proposed remedial action plan will be prepared by EPA which discusses the extent of ground water contamination, and ground water remedial alternatives.

Finally, the Site includes downstream sediments and surface water which may have been contaminated by activities on the Central Chemical property. The results of the RI for sediments and surface water are included in this ROD (OU-1).

The Site is bordered on the south and east by Mitchell Avenue, beyond which lies "Maryland Metals," an industrial property; on the west by active railroad tracks, beyond which are commercial and residential properties; on the northwest by the Brighton Manor residential sub-division; and on the northeast by residential townhouses. An electrical substation, owned by the City of Hagerstown, is also located to the northeast of the Site, beyond which lies a partially empty shopping center. Central Chemical Corporation sold the substation property to the Hagerstown Municipal Light Company in 1985.

Buildings associated with the former fertilizer blending and manufacturing operations were located in the southwestern portion of the Site. Several smaller structures associated with the pesticide blending operations were located on the northwestern portion of the Site. Due to their deteriorating condition, the Site buildings were demolished in 2005; however, the building foundations and floor slabs were left intact and are currently present on-Site. A fence encloses the Central Chemical property and two gates are located along Mitchell Avenue to control access to the property.

2.5.2 Site Geology and Hydrogeology

The Central Chemical Site of Hagerstown, Maryland is located in the Great Valley (Hagerstown Valley in Maryland) of the Appalachian Ridge and Valley Province. The Ridge and Valley Province is composed of strongly folded and faulted sedimentary rocks. The Hagerstown Valley, which is located in the eastern portion of the Ridge and Valley Province, is a wide valley of karst terrain that was formed on predominantly carbonate bedrock of Cambrian and Ordovician age. As described by the Maryland Geologic Survey, "*The Hagerstown Valley is characterized by enormous folds of the rock layers ...[with] the South Mountain Anticlinorium located to the east and the Massanutten Synclinorium in the west. ... Numerous smaller folds are superimposed on this basic pair of folds, which have been eroded away, and the area has been broken and rearranged by normal and thrust faults. The result is a north-northeast-south-southwest fabric, strata that dip in various directions and to varying degrees, and fault-controlled interruptions and juxtapositions of strata.*" (Duigon, 2001).

Three carbonate formations are located in the vicinity of the Central Chemical Site (Figures 4 & 7). The Rockdale Run Formation is composed of stromatolitic silty limestones and dolomites over a basal chert. The Stonehenge Limestone underlies the Rockdale Run Formation and is composed of an upper, thin-bedded, course-grained oolitic limestone with flat pebble conglomerate over massively bedded algal limestones. The Conococheague Formation underlies the Stonehenge Limestone and is comprised of three members. The Upper Member includes sets of alternating, thin, planar beds of limestone and dolomite, narrow beds of blue and pink marble, and thin bedded, flat pebble limestone and conglomerate. The Middle Member is comprised of limestone and interbedded dolomite (the Upper and Middle Members outcrop at the Site). The Lower Member consists of narrow sets of siltstone and massive dolomite intercalated with algal and stromatolitic limestones, ribbony carbonate and flat pebble conglomerate beds.

The Conococheague Formation is a karst aquifer that is over 1,500 feet in thickness. Karst aquifers are characterized by the enlargement of secondary features and voids by the solvent action of circulating water creating tertiary porosity. Bedrock aquifers have little intergranular, or primary porosity. Secondary porosity is provided by rock fractures, faults and bedding plane separations. Ground water moves through most karst aquifers principally through tertiary porosity provided by the interconnection of network of conduits and voids. Conduits greater than 5 to 10 millimeters (mm) in diameter can result in rapid flow where velocities generally exceed 0.001 meters per second (m/s) (ASTM, 1995). Ground water flow in the rock mass is also both primary and secondary; however, such flow is typically slow (less than 0.001 m/s) and is usually only a small percentage of the volume of water discharging through the aquifer, though it provides most of the storage (ASTM, 1995).

Karst aquifers can store large volumes of water in the unsaturated (vadose) zone known as the epikarst, which is the uppermost portion of carbonate bedrock (commonly 20 to 45 feet in thickness). The epikarst in the Conococheague Formation at the Central Chemical Site consists of highly fractured and dissolved bedrock, which is expressed on the surface as a type of karst known as pinnacle-and-grike karst where contact between bedrock and the soil overburden is very irregular (Figure 5). Highly permeable vertical pathways are formed along intersections of isolated vertical fractures. According to the ASTM, *"The epikarst behaves as a locally saturated, sometimes perennial, storage zone that functions similarly to a leaky capillary barrier or a perched aquifer. Flow into this zone is more rapid than flow out of it, as only limited vertical pathways transmit water downwards."* (ASTM, 1995). See Figure 6.

Fractures containing ground water at monitoring wells drilled the Central Chemical Site were first encountered at approximately 48 feet below ground surface (bgs). However, the average elevation of ground water at the time of installation was 28.2 feet bgs indicating semi-confined conditions typical of karst aquifers. The average depth to ground water as measured at the same wells in May 2008 (a period of high ground water) was 24.64 feet bgs. The difference between the level where ground water was first encountered and the higher static elevation of ground water in monitoring wells indicates that on a small scale (the vicinity of a well), there are unfractured blocks of rocks having negligible permeability (Duigon, 2001).

The Central Chemical Site is located near the axis of a north northeast (NNE) trending, southwest (SW) plunging, asymmetric anticline with very steeply dipping beds (55° to 90° +) on the NW limb and shallower dipping beds (25° to 45°) on the SE limb. A thrust fault is located approximately 1,000 feet to the west NW of the site (See Figure 7 Cross-Section). The Site geology and hydrogeology are complicated by a secondary anticline, which mimics the primary anticline, and bisects the Site near the former lagoon (Figure 8). The secondary "Site" anticline and primary anticline provide structural hydraulic controls on contaminant migration. Contaminant migration is limited to the west by steeply dipping bedding planes of the secondary anticline and facilitated to the east (with depth) by the shallow dipping bedding planes of the primary and secondary anticlines.

Hydrogeology at the Central Chemical Site is further complicated by a ground water divide that coincides with the secondary "Site" anticline. Hydraulic contours of ground water elevation indicate flow radiating from the central anticline; however, the actual flow path of ground water is parallel to the NE/SW strike only deviating to the SE and NE along fractures in a stair step type of flow pattern. Structural control of contaminant migration is influenced both horizontally and vertically by asymmetric bedding planes of the "Site" anticline. However, it appears that varying degrees of interconnection exist locally on a small scale between shallow and deeper hydraulic zones. These hydraulic zones may be somewhat continuous parallel to strike, but are discontinuous perpendicular to strike because horizontal and vertical conductivity are reversed due to the anticline.

Ground water contaminant plumes from the former lagoon extend approximately one half mile to the southwest and one half mile to the northeast (Figure 9). It is possible that irrigation wells located approximately one mile to the northeast (Fountainhead Country Club) draw ground water from the Site to the northeast.

Soils at the Central Chemical Site are mainly composed of clayey silts resulting from the chemical weathering of in-situ limestone and dolomite bedrock. Some thin sand lenses occur, but are horizontally discontinuous due to weathering of steeply dipping bedrock strata. The thickness of the soil overburden ranges from 44 feet at monitoring well (MW)-J to 0 feet where bedrock outcrops occur. The average thickness of soil is 19.05 feet based on the depth of 26 current and historic on-site wells.

It is important to note that the most contaminated area of the Site is the former pesticide and fertilizer waste lagoon, which was located in the northern portion of the Site. When operational, the former lagoon was over an acre in size with an estimated depth between 20 and 30 feet bgs. The former lagoon was backfilled in the late 1960s with construction debris, contaminated soils and principal threat wastes. The depth to ground water in the vicinity of the Former Waste Lagoon is expected to vary seasonally in response to rainfall and snow melt conditions. There is a potential that the ground water level may seasonally rise into the contaminated soils and wastes present in the Former Waste Lagoon. The estimated elevation range for the bottom of the former lagoon is 590 to 605 feet above mean sea level (msl). The measured ground water elevation (msl) in monitoring wells surrounding the former lagoon in May 2008 ranged from 605.49 feet at MW-M to 595.89 feet at MW-K indicating that ground water was likely within the basin of the Former Waste Lagoon thus providing a continuing contaminant source mass for ground water transport.

2.5.3 Site Drainage and Surface Water

Generally, the Site slopes from north to south. Surface drainage from the northern (higher) portion of the Site flows south through a drainage swale that runs through the eastern portion of the Site. Surface runoff from the drainage swale then enters a pipe that runs under the Site entrance road to the grassy area in front of the former fertilizer building. This conveyance system was noted in the 1982 topographic map that was prepared by the City of Hagerstown. This drainage feature was also discussed in Maryland Water Pollution Control Commission correspondence and field reports obtained from the Maryland Archives. The drainage swale was constructed in the early 1950s. The pipe outlet for the drainage swale is now apparently covered and is no longer visible at the surface. Any water that enters the pipe likely dissipates underground. Surface drainage that does not enter this system flows overland and enters a storm drain to the south of the Site on Mitchell Avenue.

Surface water runoff from a small portion (approximately 0.3 acres) of the Site enters a storm drain on Mitchell Avenue. Runoff flows southward from the drain through the underground storm water system for approximately one mile, where it discharges from a box culvert into Marsh Run 2 in City Park, near Walnut Street Marsh Run 2 flows through City Park along an improved channel. The natural channel has been modified with rip-rap and other engineering techniques. The channel itself is about 8 to 12 feet wide. Flow varies from a rivulet to more than one cubic foot per second (cfs), depending on weather conditions. Marsh Run 2 is not a fishery or recreational stream. Several inflows discharge to Marsh Run 2 on its course through City Park. As Marsh Run 2 flows through Hagerstown, it is contained through segments of concrete-lined conduits. Several storm drains and tributaries contribute to flow along this segment. Marsh Run 2 follows Memorial Boulevard southeast past Potomac Street, and continues eastward along Memorial Boulevard to Eastern Boulevard, where it is joined by a tributary contained in a separate concrete-lined conduit. Marsh Run 2 then turns south and flows around a former power plant (Maryland Electric Light and Power). Marsh Run 2 then discharges into Antietam Creek, approximately 1.8 miles downstream from the box culvert in City Park.

Based on the information from the MDE, Marsh Run 2 qualifies as a Class 3 stream, capable of supporting a reproducing trout population. This is the highest water quality rating. However, owing to the engineered nature of Marsh Run 2, it is not expected to be suitable for trout.

Antietam Creek is a tributary of the Potomac River that drains the north-central portion of Washington County. It is located about 2 miles south of the Site, and converges with the Potomac River 15 miles downstream from its junction with Marsh Run 2. Antietam Creek is estimated to flow between 100 and 1,000 cubic feet per second (cfs). Antietam Creek is used for fishing and recreational purposes. There are no municipal surface water intakes located on Antietam Creek within 15 miles downstream from the point of convergence with Marsh Run 2.

For the length of the stream in the vicinity of Marsh Run 2, Antietam Creek is a Class 4 stream, only able to support a stocked population of trout for sport fishing.

2.5.4 Remedial Investigation

EPA accepted the RI report in 2009. The RI report is included in the Administrative Record. This ROD presents the Selected Remedy for contaminated soils and principal threat wastes at the Site (OU-1).

Field work was performed during the RI in three separate phases, as follows:

> Phase I of the RI occurred in 2003. Phase I sampling included the following media: soil, ground water, surface water and sediment, storm water, and on-Site buildings (which were demolished and disposed of off-Site in 2005).
>
> Phase II of the RI occurred in 2004. Phase II sampling included the following media: soil, ground water, surface water and sediment, and storm water.

Phase III of the RI included supplemental ground water investigations which were performed in 2005, and included sampling of nearby springs.

Soil samples collected during Phase I were analyzed, as follows:

- Target Compound List Volatile Organic Compounds by EPA Contract Lab Program (CLP) Method OLM04.2
- Target Compound List Semi-Volatile Organic Compounds by EPA CLP Method OLM04.2
- Target Analyte Metals by EPA CLP ILM04.1
- Target Compound List Pesticides by EPA CLP Method OLM04.2
- Site specific pesticides: Propargite, Aramite, Diphenamid, Sevin, Coumaphos, Delnav, Guthion, Karathane by EPA Method 8270 Selected Ion Monitoring
- 2,4-DDD Series: 2,4-DDD, 2,4DDE, 2,4-DDT by EPA Method 8081.

Soil samples collected during Phase II were analyzed for a similar list of compounds, identified on Tables 3-2 and 3-3 of the RI report (URS Corporation [URS], 2007 with 2008 change pages).

2.5.5 RI Objectives

The objectives of the RI for the Central Chemical Site included:

- Characterizing the nature and extent of Site-related contamination in the ground water, surface water, sediments and soil.
- Collecting the data necessary to complete a comprehensive assessment of the actual and potential health and environmental risks associated with the Site.
- Obtaining the information necessary to develop and evaluate remedial alternatives.

2.5.6 RI Results

2.5.6.1 Soils and Wastes

Overburden soils at the Site (classified as Hagerstown Site Loam) consist of an uppermost fill layer of brown silt with varying amounts of coarse to fine sand and gravel, underlain by natural soil that generally consists of light orange brown silt and clayey silt. Fill at the Site varies in thickness from 0 to approximately 12 feet bgs. Natural soil varies at the Site from 0 feet (bedrock outcrops are present on the Site) to 44 feet bgs. This variability is typical of weathering of steeply dipping limestone bedrock terrain.

The RI included soil sampling and analysis. A total of 207 surface soil samples and 156 subsurface soil samples were collected at the Site and submitted for laboratory analysis. The locations of the soil samples and specific laboratory analyses are discussed in the RI report, included in the Administrative Record for the Site. The soil sampling identified surface soil and subsurface soil contamination at the Site. The area of the plant formerly occupied by the Site buildings (Domain 1) primarily exhibits surface soil contamination. The area of the Former Waste Lagoon (Domain 2) exhibits surface soil contamination, as well as subsurface soil contamination and the presence of buried powders and sludge. Limited soil contamination has been identified in Domain 3, however, a relatively isolated lens of potential pesticide related waste was identified in the drainage swale (potential sinkhole) located along the western side of this domain.

2.5.6.2 Surface Water, Sediments, Fish Tissue

An evaluation was performed during the RI, to determine whether contamination from the Site has migrated to surface water and sediments via storm water transport.

During the RI, environmental sampling was performed to determine if contamination was migrating from the Site as a result of storm water runoff from the Site. The following media were sampled and analyzed to evaluate the potential for off-Site contaminant migration via this pathway: storm water samples, surface water samples, sediment samples, and fish-tissue samples. Because other sources of pesticide contamination may be present in the Hagerstown Area (agricultural areas, other facilities involved in the manufacture of pesticide products), environmental samples were collected downstream from the Site (Marsh Run 2, Antietam Creek), as well as at locations upstream from the Site (above confluence of Marsh Run 2 and Antietam Creek).

A detailed description of the number and location of samples, the specific laboratory analyses, and analytical results are included in the RI, which is included in the Administrative Record.

Downstream surface water samples, collected in Marsh Run and Antietam Creek, exhibited three Site-related pesticides at low concentrations, 2,4'-DDT, alpha-BHC, and beta-BHC. One of the nine upstream surface water samples, the sample collected within Antietam Creek immediately above the confluence of Marsh Run exhibited two of the three pesticides detected in the downgradient samples; 2,4'-DDT and alpha-BHC.

Pesticides, semi-volatile organic compounds (SVOCs), volatile organic compounds (VOCs), and metals were detected at low concentrations in sediment samples collected downstream from the Central Chemical property (within Marsh Run and Antietam Creek), and upstream of Central Chemical property (upstream of the confluence of Marsh Run and Antietam Creek). In general, the highest organic analyte concentrations were detected in the sediment samples collected from Marsh Run and from Antietam Creek downgradient of Marsh Creek confluence. The metals concentrations were generally similar upstream and downstream with some metals such as chromium and lead being slightly higher in the Marsh Run and downstream Antietam Creek samples.

Fish tissue collected upstream and downstream from the Site exhibited pesticides including 4,4'-DDT and 2,4'-DDT breakdown products, alpha-chlordane, dieldrin, endrin ketone, and gamma chlordane. For rock bass, pesticide concentrations were generally higher upstream of the Site. For foraging fish, pesticide concentrations were generally higher downstream of the Site.

Broadly, environmental data collected as part of the RI, including surface water, sediment, and fish tissue samples, indicate that contamination may have migrated from the Site to surface water, sediment, and fish tissue. A risk assessment was performed to evaluate the potential threat to human health and the environment posed by the Site-related contaminants identified in surface water, sediment, and fish tissue. The risk assessment is discussed below in Section 2.7 (Summary of Site Risk).

2.5.6.3 Storm Water

Samples of storm water were collected during storm events in June 2003. The storm water samples indicated that Site-related pesticides and heavy metals were migrating from the Site via storm water sheet flow. To address this condition, the PRP installed silt fencing at the Site in an attempt to prevent contaminated sediments from migrating from the Site. In addition, the PRPs installed a gravel area at the Site entrance, in an attempt to prevent migration of contaminated soils from the Central Chemical property on vehicle tires. Storm water samples collected in September 2004, after the installation of the silt fencing and gravel area, indicated substantial reduction in concentrations of Site-related pesticides and metals.

2.5.6.4 Ground Water

A Site-related ground water contamination plume was identified during the RI. OU-2 of the Site includes ground water contamination. Delineation of the ground water contamination plume is being performed as part of OU-2. A separate OU-2 RI/FS document will be prepared, and a separate proposed remedial action plan and ROD will be issued by EPA to address ground water contamination.

Based on the RI, ground water contamination plume present beyond the boundaries of the Central Chemical property includes the following potential COCs:

- Aldrin
- Alpha-BHC
- Beta-BHC
- Delta-BHC
- Dieldrin
- Gamma-BHC
- Heptachlor
- Heptachlor epoxide
- Toxaphene
- Atrazine
- Diphenamid
- 1,2-dichloroethane
- 1,4-dichlorobenzene
- 1,2,4-trichlorobenzene
- Chlorobenzene
- Tetrachloroethylene
- Arsenic

- Manganese
- Thallium

Based on the human health risk assessment (HHRA), ground water contamination poses a 5.57×10^{-3} cancer risk as well as non-cancer risks to receptors who consume Site-related contaminated ground water obtained from off of the Central Chemical property (although, it should be noted, such receptors are not known to currently exist because of the presence of the public water supply). A depiction of the BHC-portion (all isomers) of the ground water contamination plume is included as Figure 9. The Site-related ground water contamination plume extends at least 2,700 feet to the southwest, and 2,200 feet to the northeast of the Site.

Sources of ground water contamination at the Central Chemical property are believed by EPA to include:

- The Former Waste Lagoon.
- Contaminated soils.
- Potentially other areas of buried principal threat waste not identified during the RI.

The remedial action objectives for the Site (Section 2.8), and the Selected Remedy (Section 2.12) address sources of ground water contamination on the Central Chemical property.

2.5.7 Conceptual Site Model

During the RI/FS, a conceptual site model (CSM) was established to evaluate potential routes of exposure between Site-related contaminants and human and ecological receptors. The CSM for the HHRA and ERA are described further below in Section 2.7 (Summary of Site Risk), and on Figure 10 (HHRA CSM), and Figures 11 and 12 (terrestrial and aquatic ERA CSM, respectively).

2.6 CURRENT AND POTENTIAL FUTURE LAND AND RESOURCE USES

The Central Chemical property is currently vacant land, occupied by concrete slabs associated with former Central Chemical buildings. The reasonably anticipated future use of the Site is light industrial development and/or commercial office park development. These Site uses are consistent with the recommendations of the Central Chemical Superfund Redevelopment Pilot Project, prepared by the City of Hagerstown in 2003, and current zoning at the Site.

The Site is bordered on the south and east by Mitchell Avenue, beyond which lies "Maryland Metals," an industrial property; on the west by active railroad tracks, beyond which are commercial and residential properties; on the northwest by the Brighton Manor residential subdivision; and on the northeast by residential townhouses. An electrical substation, owned by the City of Hagerstown, is also located to the northeast of the Site, beyond which lies a partially empty shopping center. Central Chemical Corporation sold the substation property to the Hagerstown Municipal Light Company in 1985.

Ground water is not currently used on the Central Chemical property for any purpose, or within one-mile of the Site for consumption purposes. The source of potable water in the vicinity of the Site is the Hagerstown/Williamsport Municipal System. The system, which serves a total of approximately 75,000 persons, draws water from an intake located on the Potomac River northwest of Williamsport, Maryland. This intake is upstream from the confluence of Antietam Creek and the Potomac River. The service area of the public water supply system extends beyond a 3-mile radius from the Site. Prior to distribution, municipal water is treated at the Richard Wilson Filtration Plant located on the Potomac River in Williamsport, Maryland.

Currently, domestic use of ground water in the Site vicinity is limited to areas farther than one-mile northwest of the Central Chemical property. However, as part of the OU-2 (ground water) RI/FS, EPA is evaluating the use of ground water in the vicinity of the Site for irrigation purposes. Additional information and evaluation regarding ground water usage in the vicinity of the Site will be included in the OU-2 proposed remedial action plan and subsequent ROD, when issued by EPA.

2.7 SUMMARY OF SITE RISK

2.7.1 Summary of Human Health Risk Assessment

The baseline risk assessment estimates what risks the Site poses if no action were taken. It provides the basis for taking action and identifies the contaminants and exposure pathways that need to be addressed by the remedial action. This section of the ROD summarizes the results of the baseline risk assessment for this Site.

WHAT IS HUMAN HEALTH RISK AND HOW IS IT CALCULATED?

A Superfund HHRA estimates the "baseline risk." This is an estimate of the likelihood of developing cancer or non-cancer health effects if no cleanup action were taken at a site. To estimate baseline risk at a Superfund site, EPA undertakes a four-step process:

Step 1: Analyze Contamination
Step 2: Estimate Exposure
Step 3: Assess Potential Health Dangers
Step 4: Characterize Site Risk

In Step 1, EPA looks at the concentrations of contaminants found at a site as well as past scientific studies on the effects these contaminants have had on people (or animals, when human studies are unavailable). Comparisons between site-specific concentrations, and concentrations reported in past studies helps EPA to determine which concentrations are most likely to pose the greatest threat to human health.

In Step 2, EPA considers the different ways that people might be exposed to the contaminants identified in Step 1, the concentrations that people might be exposed to, and the potential frequency and duration of exposure. Using this information, EPA calculates a "reasonable maximum exposure" (RME) scenario, which portrays the highest level of exposure that could reasonably be expected to occur.

In Step 3, EPA uses the information from Step 2 combined with information on the toxicity of each chemical to assess potential health risks. In Step 3, EPA compiles and interprets information about the potential adverse health effects of the Site-related chemicals of concern and develops quantitative relationships between exposure levels and potential human responses in sensitive populations.

In Step 4, EPA determines whether site risks are great enough to cause health problems for people at or near the

Superfund site. The results of the three previous steps are combined, evaluated and summarized. EPA adds up the potential risks from the individual contaminants and exposure pathways and calculates a total site risk. EPA considers two types of risk: cancer and non-cancer risk. The likelihood of any kind of cancer resulting from a Superfund site is generally expressed as an upper bound probability; for example, a "1 in 10,000 chance." In other words, for every 10,000 people that could be exposed, one extra cancer may occur as a result of exposure to site contaminants. An extra cancer case means that one more person could get cancer than would normally be expected to from all other causes. For non-cancer health effects, EPA calculates a "hazard index." The key concept here is that a "threshold level" (measured usually as a hazard index of less than 1) exists below which non-cancer health effects are no longer predicted.

Potential receptors and exposure pathways were identified based on the current and future land use and the impacted media (soil, ground water, etc) identified by the RI findings. The populations evaluated during the human health portion of the risk assessment were trespassers, commercial/light industrial workers, construction workers, residents, and recreational users of the Antietam Creek (discussed further below). Exposure routes (i.e. ingestion, dermal contact, and inhalation) were evaluated as appropriate for the receptors potentially affected by the impacted media. EPA's acceptable risk range for carcinogenic risks is $1x10^{-4}$ to $1x10^{-6}$, and the benchmark for non-carcinogenic risks is a hazard index (HI) of less than 1. In other words, the Agency considers a cancer risk greater than 1 in 10,000 and an HI of greater than 1 to be unacceptable. A cancer risk of 1 in 10,000 can also be written as "$1x10^{-4}$", or "1E-4" in scientific notation. Carcinogenic and non-carcinogenic risks were estimated for potential human exposures with affected soil, ground water, sediment, and surface water at the Site.

The conceptual site model used for the HHRA is attached to this ROD as Figure 10.

2.7.1.1 Soil on the Central Chemical property

Based on the results of the risk assessment, the following COCs are present in soils on the Central Chemical property:

- 2,4-DDT
- 4,4-DDT
- Aldrin
- alpha-Chlordane
- Dieldrin
- gamma-BHC
- Heptachlor Epoxide
- Toxaphene
- Heptachlor
- 2,4-DDD
- Arsenic
- Delta-BHC
- Benzo(a)pyrene (a SVOC)
- 4,4-DDD
- Gamma chlordane
- Beta-BHC
- Alpha-BHC

AR305496

Table 9, attached to the ROD, includes a summary of information pertaining to the COCs identified at the Site, including range of detected concentrations, frequency of detection, and exposure point concentration used to estimate risk. In addition, Tables 10 and 11, attached to the ROD, include a summary of toxicity data for the COCs at the Site.

Contaminated soils on the Central Chemical property were evaluated for risk to the following groups:

- Trespassers: Individuals (juveniles (age 5 to 18) or adults) who might be exposed to Site surface soils or airborne chemicals released from or associated with soil/dust, on an infrequent basis during unauthorized trespass.
- Commercial/Light Industrial Site workers: Full-time workers who could be exposed to Site surface soils or airborne chemicals released from or associated with soil/dust, on a daily basis, throughout the year, over multiple years.
- Construction workers: Individuals who might be exposed to Site surface and subsurface soils, or airborne chemicals released from or associated with soil/dust, during typical excavation activities such as construction, or utility repair.
- Future Residents: This scenario includes both small children (0 to 6) and adults who would live on the Site and who would be exposed to Site surface and subsurface soils. This scenario is not consistent with the anticipated reuse of the Central Chemical property (see above), however it was evaluated as part of the RI.

Each risk group was evaluated separately for each of the three Domain areas (see Figure 3).

Based on the risk assessment, unacceptable risks were identified in each of the three Site Domain Areas. Risks in Domain 1 were unacceptable for each group evaluated (trespassers, Site workers, construction workers, future residents). Risks in Domain 2 were also unacceptable for each group evaluated (trespassers, Site workers, construction workers, future residents).

Risks in Domain 3 were unacceptable for three of the groups evaluated (trespassers, Site workers, and future residents). The calculated risk levels are included in Table 1. The risks posed to people in Domains 1, 2 and 3 were attributable to surface soil contamination (top 6 inches of soil), whereas the risks in Domain 2 were also influenced by the presence of contaminated soils in the Former Waste Lagoon. As indicated in Section 2.11 of this ROD, principal threat wastes are present in the Former Waste Lagoon, including powders and sludge.

2.7.1.2 Soil in Residential Areas Adjacent to the Central Chemical Property

The HHRA included an evaluation of risk for residents who live adjacent to the Central Chemical property. This scenario includes both small children (0 to 6 years old) and adults who would live adjacent to the Site and who would be exposed to surface and subsurface soils on a daily basis.

Previous investigations included the collection of soil samples from current residential areas to the northwest and northeast of the Central Chemical property, and along the railroad tracks adjacent to the west of the Central Chemical property. Site-related contaminants were identified in the soil samples collected adjacent to the Central Chemical property, including 4,4'-DDE, 4-4'-DDD, 4-4'-DDT. Although the risk assessment did not reveal unacceptable cancer risks at the adjacent residential properties for exposure to soils, the risk assessment did determine that non-cancer risks may exceed acceptable levels. Specifically, the reasonable maximum exposure (RME) hazard index from exposure to soil for current adjacent residents is slightly above the threshold of 1.0. This is due to elevated laboratory detection limits increasing the exposure point concentration for the pesticide "heptachlor epoxide." This potential concern will be addressed during the pre-remedial design investigation, as discussed below in Section 2.12.

The calculated risk levels for residents adjacent to the Site are included in Table 2.

During the pre-RDI, additional soil samples will be collected at adjacent properties and analyzed for Site-related contaminants to determine if there is an unacceptable risk posed by the soils.

2.7.1.3 Surface Water, Sediment, Fish Tissue

As described above, environmental data collected as part of the RI, including surface water, sediment, and fish tissue samples, indicates that some contamination (pesticides, metals, SVOCs) may have migrated from the Central Chemical property to surface water, sediment, and fish tissue. Therefore, as part of the HHRA, the following groups were evaluated for exposure to Site contamination in Antietam Creek, at locations upstream, and downstream from the Site:

- Swimming/wading users of the Antietam Creek: Swimming/wading users of the Antietam Creek are assumed to be members of the local community. As such, risks associated with this scenario should be representative of off-Site residents who live near the creek. Risks for upstream and downstream swimming/wading users were evaluated separately to address background (non Site-related) and potentially Site-related risk. This scenario includes both juveniles (age 5 to 18) and adults who could be exposed to surface water or sediment in the creek on an infrequent basis while wading, playing, or swimming in the creek.

- Anglers who catch and consume fish from Antietam Creek: Anglers are assumed to be members of the local community. As such, risks associated with this scenario should be representative of off-Site residents who live near the creek. Risks for upstream and downstream anglers are evaluated separately to address background (non Site-related) and potentially Site-related risk. Upstream fish samples were collected above a dam upstream of the Site to ensure that the upstream and downstream samples represented two distinct populations of fish. This scenario includes both juveniles (age 5 to 18) and adults who would ingest fish caught in Antietam Creek.

Based on the risk assessment, unacceptable cancer or non-cancer risks associated with Site-related contaminants were not identified for the swimmers/waders and anglers using Antietam

Creek at upstream or downstream locations and no Site-related response actions are required at this time for surface water or sediment.

2.7.2 Summary of Ecological Risk Assessment

WHAT IS ECOLOGICAL RISK AND HOW IS IT CALCULATED?
An ERA evaluates the potential for contaminants at a site to adversely affect the plants and animals that make up the local ecosystem. The ERA process follows a phased approach similar to that of the HHRA. The risk assessment results are used to help determine what measures, if any, are necessary to protect plants and animals.

ERA includes three steps:

Step 1: Problem Formulation
Step 2: Risk Analysis
Step 3: Risk Characterization

The problem formulation includes:

- Compiling and reviewing existing information on the site habitat, plants, and animals.
- Evaluating how the plants and animals may be exposed to the chemicals detected at the site. Routes of exposure (e.g., ingestion of soil; uptake of chemicals into worms and ingestion of worms by birds) are identified during this step.
- Selecting receptors for the risk evaluation. Instead of attempting to evaluate every species that may be present at the site, representative species are used for the quantitative evaluation. For example, insect-eating birds may be represented by an American robin, while carnivorous mammals may be represented by the red fox.
- Developing how the risk will be estimated for the complete exposure pathways. A complete exposure pathway is one for which the selected receptor will take into its body or tissue the site chemicals. If the exposure pathway is not complete, then there is no potential risk.

The second step of the ERA is the risk analysis. During this step, the potential exposure of an ecological receptor to the site chemicals is estimated.

The third step in the ERA is risk characterization, in which the potential exposure for each receptor is combined with toxicity information to estimate the potential for an adverse effect. This evaluation takes into account the fact that the metals present at the site may be due to background conditions and not to any industrial or waste disposal activities. Also considered in this step are the uncertainties (potential degree of error) that are associated with the predicted risk evaluation and their effects on the conclusions that have been made.

Similar to the non-cancer hazard analysis for human health, exposure levels for ecological receptors were compared to protective levels in order to calculate a hazard quotient (HQ). HQs are used to estimate whether risk or harmful effects are likely due to the contaminant. An HQ greater than 1 is considered by EPA to be indicative of potential unacceptable risk. HQs were developed for ecological receptors by dividing maximum and average exposure levels by the No Observed Adverse Effects Levels (NOAELs) and the Lowest Observed Adverse Effects Levels (LOAELs).

The ERA concluded that Site-related contaminants in surface water and sediment did not pose a significant threat to ecological receptors. With respect to soil, the ERA concluded that the Site contaminants may pose a risk to wildlife inhabiting the Central Chemical property, including small birds and mammals (e.g. short-tailed shrew, American robin). The following soil COCs were identified for ecological receptors:

- 4,4-DDT
- Aldrin
- Toxaphene

- Endrin ketone

The conceptual Site models used for ERA are attached to this ROD as Figures 11 and 12.

2.7.3 Basis for Taking Action

Based on the results of the HHRA and ERA, 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 hazardous substances into the environment.

2.8 REMEDIAL ACTION OBJECTIVES

To protect the public and the environment from potential current and future health risks, the RAOs, listed in Table 4, have been developed to address the contaminated soils and principal threat wastes which constitute OU-1.

2.9 DESCRIPTION OF ALTERNATIVES

During the FS, alternatives were prepared to achieve the RAOs identified above. A complete description of the evaluated alternatives is included in the FS, which is in the Administrative Record for the Site. A summary of each of these remedial alternatives is presented below. The alternatives are numbered to correspond with the numbering used in the FS report.

EPA's Preferred Alternative is *Alternative 2A – S/S treatment of Former Waste Lagoon; excavation/on-Site consolidation/capping of contaminated soils; near-lagoon ground water monitoring, extraction and treatment system.*

Several of the remedial alternatives considered as part of the FS, except the "no action" alternative, contain certain common elements that were considered in the evaluation process. These common elements include a pre-Remedial Design Investigation, institutional controls, the use of low-permeability cover systems, the use of ground water monitoring, extraction, and treatment systems, excavation and off-Site disposal of contaminated media (soil, waste), management of the concrete slabs and foundations that remain on the Site, and long-term operation, maintenance and monitoring activities. These common elements are described further, as follows:

1. <u>Pre-Remedial Design Investigation</u>: A pre- RDI would be necessary for any of the remedial alternatives (excluding Alternative 1, the no action alternative). The pre-RDI would be specific to each remedial alternative, but could include additional soil sampling and analysis to define soil excavation areas, aquifer pump testing for design of the ground water monitoring, extraction, and treatment system, etc.

2. <u>Institutional Controls</u>: The reasonably anticipated future use of the Site is light industrial development and/or commercial office park development. These Site uses are consistent with the recommendations of the Central Chemical Superfund Redevelopment Pilot Project, prepared by the City of Hagerstown in 2003, and

current zoning at the Site. As discussed above in Section 7 (Summary of Site Risk), current concentrations of Site-related contaminants on the Central Chemical property pose an unacceptable threat to the health of future workers at the Site. Therefore, EPA has established Site-specific Soil Remediation Standards (Table 13) that will be protective of future workers at the Site. Excavation will be performed at the Site to reduce contaminant concentrations in soils on the Site to meet the Site-specific Soil Remediation Standards. However, the Site-specific Soil Remediation Standards would not be protective of residents living on the Central Chemical property. Therefore, it is necessary to establish institutional controls at the Site to limit future use of the property to commercial/industrial land uses.

Institutional controls will also be necessary to protect low permeability cover systems and ground water extraction and treatment systems, which may limit the reusable area of the Site. For Alternatives 2, 2A, 3 and 4, contaminated soils will be consolidated beneath cover systems on the Central Chemical property, therefore permanent markers or monuments may be possible tools to prevent damage to the cover system, and future exposure of people to the consolidated contaminated soils.

3. <u>Low Permeability Cover System</u>: Several of the remedial alternatives discussed below require that a low permeability cover system be constructed over contaminated soil and the Former Waste Lagoon area on the Central Chemical property. The cover system would be constructed to prevent exposure of human and ecological receptors (e.g. birds, mammals) to contaminated soil and waste. In addition, the cover system would minimize infiltration of precipitation into the contaminated soil and waste, decreasing the potential for further migration of contaminants to ground water. Construction materials for the cover system would be synthetic materials, clays, or other materials, and the cover system would require long-term maintenance. A cover system would incorporate, as necessary, a landfill gas management system, which could include landfill gas vents, and landfill gas monitoring points.

   Remedies which include a low permeability cover system will comply with Federal and State Applicable or Relevant and Appropriate Requirements (ARARs).

4. <u>Ground Water Monitoring, Extraction, and Treatment System</u>: Five of the six remedial alternatives discussed below include the use of a ground water monitoring, extraction and treatment system in the vicinity of the Former Waste Lagoon. The ground water monitoring, extraction, and treatment system would be used to ensure that the principal threat wastes present within and potentially below the bottom of the Former Waste Lagoon (e.g. in bedrock fractures) do not act as a continuing source of ground water contamination through generation of contaminated leachate. The ground water monitoring, extraction and treatment system will ensure that the selected remedy achieves the remedial action objective

of preventing further contaminant migration to ground water from principal threat waste by extracting and treating contaminated leachate/ground water in the vicinity of the Former Waste Lagoon.

Remedies which include a ground water monitoring, extraction and treatment system will comply with Federal and State ARARs.

5. Excavation and Off-Site Treatment/Disposal of Contaminated Soils and Principal Threat Wastes: Several of the alternatives discussed below include excavation of contaminated soils and wastes and off-Site treatment and/or disposal of those materials at appropriate off-Site waste disposal facilities. In addition, excavation and off-Site disposal of contaminated media from the Site is included in EPA's Selected Remedy (Section 2.12). It is expected that most of the contaminated soils in Domain 1 and 3 would not be considered hazardous waste in accordance with the Resource Conservation and Recovery Act (RCRA). However, it is expected that certain waste materials present in the Former Waste Lagoon (e.g. powders, sludge) in Domain 2 may be classified as hazardous waste because of the toxicity characteristic associated with high concentrations of pesticides/heavy metals. Off-Site treatment and/or disposal of contaminated soils and principal threat wastes would be performed at appropriate waste disposal facilities, depending on waste classification.

   Alternatives which include excavation of contaminated soils and principal threat wastes would incorporate dust suppression using water/foaming agents. If necessary, a containment structure could be constructed over the Former Waste Lagoon in Domain 2 during remedial activities.

6. Concrete Slabs and Foundations: With the exceptions of Alternatives 1 and 4, each of the remedial alternatives includes removal of existing floor slabs and foundations in order to facilitate the performance of response actions at the Site.

   Characterization of the concrete slabs and foundations will be dependent upon their final disposition. If the slabs and foundations are to be disposed off-Site waste characterization activities prior to off-Site disposal will be necessary. If re-use of apparently non-contaminated concrete slabs and foundations on-Site or off-Site is found to be desirable during the Remedial Design, characterization activities will be necessary to confirm that on-Site or off-Site reuse of the concrete slabs and foundations will be protective of human health and the environment.

7. Operation and Maintenance and long-term monitoring: Alternatives 2, 2A, 3, 4, and 5 require that operation and maintenance (O&M) be performed for on-Site remedy features, including the low permeability cover system or earthen cap (the exception being Alternative 5, for which no cover system is included), and the ground water monitoring, extraction, and treatment system. In addition, long-term monitoring activities will be required after the remedial action is complete

including monitoring of leachate/ground water concentrations around the Former Waste Lagoon, appropriate monitoring for treated effluent from the ground water monitoring, extraction, and treatment system, etc. Long-term monitoring of ground water, and surface water/sediment (as potential discharge points for contaminated ground water) will be addressed in the proposed remedial action plan for OU2 (ground water contamination).

The following section is a summary of the cleanup alternatives that were considered during the Feasibility Study and the Proposed Remedial Action Plan and their associated costs.

2.9.1 Alternative 1

No Action

Capital Cost:	$0
Annual O&M Costs:	$0
Total O&M Costs:	$0
Total Present Worth Cost:	$0

Under Alternative 1, no remedial action would be taken at the Site. The "no action" alternative is included because the NCP requires that a "no action" alternative be developed as a baseline for evaluating other remedial alternatives.

This alternative would not reduce human health or ecological risks to acceptable levels, and would not achieve the remedial action objectives. This alternative would not be protective of human health, and will not be considered further.

2.9.2 Alternative 2

Excavation/on-Site consolidation/capping of contaminated soils and Former Waste Lagoon; near-lagoon ground water monitoring, extraction and treatment system

Capital Cost:	$ 7,576,289
Annual O&M Costs:	$ 465,000
Total O&M Costs:	$ 2,642,687
Total Present Worth Cost:	$10,408,289

Under Alternative 2, the following remedial actions would take place:

Pre-Remedial Design Investigation

- Perform a pre-RDI.

Floor Slabs and Foundations

- Remove, decontaminate and dispose off-Site the existing floor slabs and foundations.

- Perform characterization of the soils beneath the slabs for contamination.

Soils

- Excavate contaminated soils above Site-specific remediation standards from each of the three Domains Areas (1, 2 and 3) and consolidate the excavated soils in the Former Waste Lagoon area. The Site-specific remediation standards for soil are included in this ROD in the description of the Selected Remedy (Section 2.12).
- Perform confirmation testing to ensure that all contaminated soils have been excavated.
- Backfill excavated areas with clean fill and re-vegetate.

Low Permeability Cover System

- Construct a low permeability cover system over the area of the consolidated soils and Former Waste Lagoon.

Ground Water Monitoring, Extraction and Treatment System

- Install a ground water monitoring, extraction and treatment system around the Former Waste Lagoon to capture and treat contaminated ground water or leachate in the vicinity of the Former Waste Lagoon.

Institutional Controls

- Limit the reuse of the Central Chemical property to commercial/industrial use. Prevent disturbance of the low permeability cover system and ground water monitoring, extraction and treatment system, through establishment and implementation of institutional controls.

Implementation of Alternative 2 would allow for reuse of the Site in accordance with institutional controls.

2.9.3 Alternative 2A

S/S treatment of the contents of the Former Waste Lagoon; excavation/on-Site consolidation/capping of contaminated soils; near-lagoon ground water monitoring, extraction and treatment system

Capital Cost:	$11,518,772
Annual O&M Costs:	$ 465,000
Total O&M Costs:	$ 2,642,687
Total Present Worth Cost:	$14,350,772

Under Alternative 2A, the following remedial actions would take place:

Pre- Remedial Design Investigation

- Perform a pre-RDI.

Floor Slabs and Foundations

- Remove, decontaminate and dispose off-Site the existing floor slabs and foundations.
- Perform characterization of the soils beneath the slabs for contamination.

Solidification/Stabilization of Former Waste Lagoon

- Prior to consolidation of soils from the three Domain areas, the contents of the Former Waste Lagoon will be treated through the use of in-situ S/S technology. S/S refers to a group of cleanup methods that prevent or slow the release of harmful chemicals from contaminated materials, such as soil or waste. These methods usually don't destroy the chemicals; rather they prevent them from moving into the surrounding environment. Solidification refers to a process that binds the polluted soil or waste and cements it into a solid block. Stabilization refers to changing the chemicals so they become less harmful or less mobile.

Soils

- Excavate contaminated soils above Site-specific remediation standards from each of the three Domains Areas (1, 2, and 3) and consolidate the excavated soils in the Former Waste Lagoon area. The Site-specific remediation standards for soil are included in this ROD in the description of the Selected Remedy (Section 2.12).
- Perform confirmation testing to ensure that all contaminated soils have been excavated.
- Backfill excavated areas with clean fill and re-vegetate.

Low Permeability Cover System

- Construct a low permeability cover system over the area of the consolidated soils and Former Waste Lagoon (Consolidation Area).

Ground Water Monitoring, Extraction and Treatment System

- Install a ground water monitoring, extraction and treatment system around the Former Waste Lagoon to capture contaminated ground water or leachate in the vicinity of the Former Waste Lagoon area.

Institutional Controls

- Limit the reuse of the Central Chemical property to commercial/industrial use. Prevent disturbance of the low permeability cover system and ground water monitoring, extraction and treatment system, through establishment and implementation of institutional controls.

Implementation of Alternative 2A would allow for reuse of the Site in accordance with institutional controls.

2.9.4 Alternative 3

Excavation and off-Site disposal of contaminated soils from Domains 1 and 3; capping of Former Waste Lagoon; near-lagoon ground water monitoring, extraction and treatment system.

Capital Cost:	$11,254,559
Annual O&M Costs:	$ 480,000
Total O&M Costs:	$ 2,698,972
Total Present Worth Cost:	$14,142,844

Pre- Remedial Design Investigation

- Perform a pre-RDI.

Floor Slabs and Foundations

- Remove, decontaminate and dispose off-Site the existing floor slabs and foundations.
- Perform characterization of the soils beneath the slabs for contamination.

Soils

- Excavate contaminated soils above Site-specific remediation standards from Domains 1 and 3. Dispose of these excavated soils off-Site. The Site-specific remediation standards for soil are included in this ROD in the description of the Selected Remedy (Section 2.12).
- Excavate contaminated soils above Site-specific remediation standards from Domain 2, outside the foot print of the Former Waste Lagoon. Consolidate these excavated soils in the area of the Former Waste Lagoon. The Site-specific remediation standards for soil are included in this ROD in the description of the Selected Remedy (Section 2.12).
- Perform confirmation testing to ensure that all contaminated soils have been excavated.
- Backfill excavated areas with clean fill and re-vegetate.

Low Permeability Cover System

- Construct a low permeability cover system over the area of the consolidated soils and Former Waste Lagoon.

Ground Water Monitoring, Extraction and Treatment System

- Install a ground water monitoring, extraction and treatment system around the Former Waste Lagoon to capture and treat contaminated ground water or leachate in the vicinity of the Former Waste Lagoon area.

Institutional Controls

- Limit the reuse of the Central Chemical property to commercial/industrial use. Prevent disturbance of the low permeability cover system and ground water monitoring, extraction and treatment system, through establishment and implementation of institutional controls.

Implementation of Alternative 3 would allow for reuse of the Site in accordance with institutional controls.

2.9.5 Alternative 4

Excavation and off-Site disposal of the contents of the Former Waste Lagoon; excavation/on-Site consolidation/capping of contaminated soils; near-lagoon ground water monitoring, extraction and treatment system.

Capital Cost:	$30,618,451
Annual O&M Costs:	$ 491,000
Total O&M Costs:	$ 4,567,875
Total Present Worth Cost:	$35,375,639

Pre- Remedial Design Investigation

- Perform a pre-RDI.

Floor Slabs and Foundations

- Leave in-place existing floor slabs and foundations.

Soils

- Excavate contaminated soils above Site-specific remediation standards from Domains 2 and 3. Consolidate these excavated soils in Domain 1. The Site-specific remediation standards for soil are included in this ROD in the description of the Selected Remedy (Section 2.12).
- Perform confirmation testing to ensure that all contaminated soils have been excavated from Domains 2 and 3.
- Backfill excavated areas with clean fill and re-vegetate.

Cover System

- Once contaminated soils from Domain 2 and 3 have been consolidated in Domain 1, construct an earthen cap over the contaminated soils in Domain 1.

Former Waste Lagoon

- Excavate the contents of the Former Waste Lagoon in Domain 2, and dispose off-Site the contents of the Former Waste Lagoon.

Ground Water Monitoring, Extraction and Treatment System

- Install a ground water monitoring, extraction and treatment system around the Former Waste Lagoon to capture and treat contaminated ground water or leachate in the vicinity of the Former Waste Lagoon Area.

Institutional Controls

- Limit the reuse of the Central Chemical property to commercial/industrial use. Prevent disturbance of the earthen cap and ground water monitoring, extraction and treatment system, through establishment and implementation of institutional controls.

Implementation of Alternative 4 would allow for reuse of the Site in accordance with institutional controls.

2.9.6 Alternative 5

Excavation and off-Site disposal of the contents of the Former Waste Lagoon; excavation and off-Site disposal of contaminated soils; near-lagoon ground water monitoring, extraction and treatment system.

Capital Cost:	$33,342,456
Annual O&M Costs:	$ 425,000
Total O&M Costs:	$ 3,369,353
Total Present Worth Cost:	$36,901,122

Pre- Remedial Design Investigation

- Perform a pre-RDI.

Floor Slabs and Foundations

- Remove, decontaminate and dispose off-Site the existing floor slabs and foundations.
- Perform characterization of the soils beneath the slabs for contamination.

Soils

- Excavate contaminated soils above Site-specific remediation standards from the three Domain Areas. Dispose of these excavated soils off-Site. The Site-specific remediation standards for soil are included in this ROD in the description of the Selected Remedy (Section 2.12).
- Perform confirmation testing to ensure that all contaminated soils have been excavated.
- Backfill excavated areas with clean fill and re-vegetate.

Former Waste Lagoon

- Excavate the contents of the Former Waste Lagoon in Domain 2, and dispose off-Site the contents of the Former Waste Lagoon.

Ground Water Monitoring, Extraction and Treatment System

- Install a ground water monitoring, extraction and treatment system around the Former Waste Lagoon to capture and treat contaminated ground water or leachate in the vicinity of the Former Waste Lagoon area.

Institutional Controls

- Limit the reuse of the Central Chemical property to commercial/industrial use. Prevent disturbance of the ground water monitoring, extraction and treatment system, through establishment and implementation of institutional controls.

Implementation of Alternative 5 would allow for reuse of the Site in accordance with institutional controls. Contaminated soils would no longer be present on the Site. To the extent practicable, principal threat waste would be removed from the Former Waste Lagoon, and no low permeability cover system would be required. Overall, implementation of Alternative 5 is expected to return the largest portion of the Site to commercial/industrial reuse, with the least property use restrictions, relative to the other alternatives under consideration.

2.10 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

As part of the remedy selection process, EPA evaluates each proposed remedy against the nine criteria specified in the NCP, 40 CFR §300.430(e)(9)(iii). The alternative selected must first satisfy the threshold criteria set out in the NCP. Next, the primary balancing criteria are used to weigh the tradeoffs or advantages and disadvantages of each of the alternatives. The modifying criteria, which are State and community acceptance, will be evaluated at the end of the public comment period. This section of the ROD summarizes the relative performance of each alternative against the seven criteria, noting how it compares with the other options under consideration. For additional information on the comparison of the remedial alternatives, refer to the FS report.

Below is a summary of the nine criteria used to evaluate remedial alternatives.

2.10.1 Threshold Criteria

2.10.1.1 <u>Overall Protection of Human Health and the Environment</u>

Evaluates whether an alternative provides adequate protection and how risks posed through each pathway are eliminated, reduced or controlled through treatment, engineering controls, or institutional controls.

2.10.1.2 <u>Compliance with Applicable or Relevant and Appropriate Requirements</u>

Evaluates whether or not an alternative will meet all ARARs of Federal and State environmental statutes and/or justifies a waiver.

2.10.2 Primary Balancing Criteria

2.10.2.1 <u>Long-Term Effectiveness and Permanence</u>

Addresses the ability of an alternative to afford long term, effective and permanent protection to human health and the environment over time.

2.10.2.2 <u>Reduction of Toxicity, Mobility or Volume</u>

Addresses the extent to which an alternative will reduce the toxicity, mobility, or volume of the contaminants causing the Site risks.

2.10.2.3 <u>Short Term Effectiveness</u>

Considers the length of time until protection is achieved and the short term risk or impact to the community, on-Site workers and the environment that may be posed during the construction and implementation of the alternative.

2.10.2.4 <u>Implementability</u>

Considers the technical and administrative feasibility of an alternative, including the availability of materials and services needed to implement that remedy.

2.10.2.5 <u>Cost</u>

Includes estimated capital, O&M, and net present worth costs.

2.10.3 Modifying Criteria

2.10.3.1 <u>State Acceptance</u>

Addresses whether the State concurs with, opposes, or has no comment on the Preferred Alternative.

2.10.3.2 <u>Community Acceptance</u>

Considers whether the public agrees with EPA's analyses of the Preferred Alternative described in the PRAP.

These evaluation criteria relate directly to the requirements of Section 121 of CERCLA, 42 USC §9621, for determining the overall feasibility and acceptability of an alternative. Threshold criteria must be satisfied for an alternative to be eligible for selection. Primary balancing criteria are used to weigh major trade-offs between alternatives. The modifying criteria are formally taken into account after public comment is received on the PRAP.

2.10.4 Detailed Analysis of the Remedial Alternatives

2.10.4.1 <u>Overall Protectiveness of Human Health and the Environment</u>

Based on the risk assessment that was performed during the RI, contaminated soils and wastes at the Site pose unacceptable risks to human health and ecological receptors based on reasonably anticipated future uses of the Site. Alternative 1, the no further action alternative developed in accordance with the NCP, would not require remedial action at the Site to address contaminated soil and waste. Because the threats to human health and the environment would not be addressed by Alternative 1, this remedial alternative is not considered to be acceptable and will not be evaluated further.

Alternatives 2 and 3 include capping of the contaminated soils and wastes present in the Former Waste Lagoon without further treatment. Because of their high concentrations of toxic compounds, the contaminated soils and wastes within the Former Waste Lagoon area are considered to be principal threat wastes (described in Section 2.11). Implementation of Alternatives 2 or 3 would result in permanent capping of these principal threat wastes in place without treatment to reduce toxicity, volume, or mobility. The depth to ground water in the vicinity of the Former Waste Lagoon is expected to vary seasonally in response to rainfall and snow melt conditions. There is a potential that the ground water level may seasonally rise into the contaminated soils and wastes present in the Former Waste Lagoon. If this condition occurs, the contaminated soils and wastes within the Former Waste Lagoon are expected to act as long-term sources of ground water contamination. EPA recognizes that this source of ground water contamination could be mitigated through long-term use of a near-lagoon pump and treat system. However, given the limestone karst geologic environment within which the Site lies, and its resultant tertiary porosity which may result in ground water flow in unanticipated directions and velocities, EPA considers Alternatives 2 and 3 to not provide sufficient protectiveness of the environment, specifically the ground water in the vicinity of the Site. Therefore, Alternatives 2 and 3 will not be evaluated further.

Upon implementation, Alternatives 2A, 4, and 5 are expected to be protective of human health and the environment. For each of these three alternatives, contaminated soils at the Site will be excavated and either consolidated on-Site beneath a low permeability cover system (Alternative 2A), or earthen cap (Alternative 4), or disposed of off-Site at an appropriate off-Site waste disposal facility (Alternatives 4 and 5). In addition, for alternatives 2A, 4, and 5, the highly contaminated soil and waste within the Former Waste Lagoon is either treated in-situ (in the ground) via S/S (Alternative 2A), or is excavated and treated and/or disposed of at an appropriate off-Site waste disposal facilities (Alternatives 4 and 5). Finally, to address contaminated soils and residual wastes which may be left in-place at the bottom or beneath the bottom of the Former Waste Lagoon (e.g. in bedrock fractures), each of the three remaining alternatives includes a near-lagoon pump and treat system. Institutional controls will be implemented at the Site to restrict land use, and to prevent disturbance of remedy features (cover systems, ground water monitoring, extraction, and treatment system, etc).

Alternatives 4 and 5 will include off-Site disposal of contaminated soil/waste, much of which is expected to be classified as non-hazardous waste, without further treatment. Table 5 summarizes the estimates on what volumes of material will be classified as hazardous and non-hazardous from the FS (URS, 2008).

As demonstrated in the table above, Alternatives 4 and 5 will generate an estimated 23,900 cubic yards (cy), and 51,050 cy, respectively, of contaminated soils/waste that is expected to be characterized as non-hazardous and would be disposed of off-Site without further treatment. The NCP §300.430(f) indicates that remedy selection should consider the remedy selection process's preference for treatment as a principal element and the bias against the off-site land disposal of untreated waste.

2.10.4.2 <u>Compliance with Applicable or Relevant and Appropriate Requirements</u>

Based on a review of ARARs generated as part of the FS, it is expected that Alternatives 2A, 4, and 5 will meet Federal and State ARARs. ARARs waivers are not expected to be necessary.

As discussed above, Alternative 2A includes S/S treatment of the contents of the Former Waste Lagoon. Contaminated soils from the Site would be consolidated on top of the solidified/stabilized lagoon, and covered with a low permeability cover system. As stated above, remedies which include a low permeability cover system will comply with Federal and State ARARs. ARARs for the low permeability cover system are included in the ROD (Table 8).

Alternatives 2A, 4, and 5 each include a near-lagoon ground water monitoring, extraction and treatment system which may be required to comply with National Pollutant Discharge Elimination System (NPDES) requirements, or other requirements of the Clean Water Act. The system will include ground water monitoring wells, ground water extraction wells, a treatment plant, and a discharge either to surface water or the sewer system. The treatment system would be designed based on additional information collected during the pre-RDI. Remedies which include a ground water monitoring and extraction system will comply with Federal and State ARARs. ARARs for the ground water monitoring and extraction system are included in the ROD (Table 8).

2.10.4.3 <u>Long-Term Effectiveness and Permanence</u>

Alternative 2A includes the treatment of contaminated soils and wastes within the Former Waste Lagoon with in-situ (in the ground) S/S. Alternative 2A also includes the excavation and on-Site consolidation and capping of the contaminated soils present in Domain 1, Domain 2 (outside the footprint of the Former Waste Lagoon), and Domain 3 on top of the solidified/stabilized area.

After implementation of Alternative 2A, the contaminated soils beneath the low permeability cover system in Domain 2 will have to be managed such that the remedy continues to protect human health and the environment. Performance uncertainties are associated with Alternative 2A, such as overall viability of the treatment technology to reduce the permeability and leachability of the contaminated soils and wastes, such that these materials will not represent a long-term source of ground water contamination. In addition, uncertainty is associated with the long term durability of the solidified/stabilized materials. These uncertainties will be addressed during the pre-RDI by treatability testing of S/S treatment with contaminated materials from the Former Waste Lagoon.

One concern for Alternative 2A is the long-term potential for volatile compounds to accumulate beneath the low permeability cover. This concern will be evaluated as part of the pre-RDI. This evaluation will inform the design of the landfill gas management system, which is contemplated as part of the low permeability cover system included in Alternative 2A (and as discussed in Section 2.9.3).

Alternative 4 includes the excavation of the contaminated soils present in Domain 2 (outside the footprint of the Former Waste Lagoon) and Domain 3, and on-Site consolidation of these excavated soils within Domain 1 (beneath an earthen cap). Alternative 4 also includes the excavation and off-Site treatment and/or disposal of the contaminated soils and wastes present in the Former Waste Lagoon. After implementation of Alternative 4, the contaminated soils beneath the earthen cap in Domain 1 will have to be managed such that the earthen cap continues to prevent contact between the contaminated soils and human or ecological receptors (such as birds, and mammals). In addition, the earthen cap would have to prevent infiltration of precipitation into the contaminated soils, if the contaminated soils would act as a continuing source of ground water contamination. For this reason, Alternative 4 offers a lower degree of long-term effectiveness and permanence in comparison to Alternative 5.

Alternative 5 includes the excavation and off-Site disposal of the contaminated soils present in Domain 1, Domain 2 (outside the footprint of the Former Waste Lagoon), and Domain 3. Alternative 5 also includes the excavation and off-Site treatment and/or disposal of the contaminated soils and wastes present in the Former Waste Lagoon. With the exception of contaminated media (soil, waste) trapped in fractures at and below the bottom of the waste lagoon in bedrock (for which excavation is not expected to be feasible), the majority of contaminated soil and waste would be removed from the Site, treated if necessary, and disposed of at appropriate off-Site waste disposal facilities. For these reasons, Alternative 5 represents the greatest degree of long-term effectiveness and permanence for the alternatives evaluated.

2.10.4.4 Reduction of Toxicity, Mobility or Volume though Treatment

Alternative 2A involves S/S treatment of the principal threat wastes at the Site, including the contaminated soils and waste present within the Former Waste Lagoon. S/S treatment will not reduce the toxicity or volume of hazardous substances present in these principal threat wastes. However, the goal of the S/S treatment is to significantly reduce the mobility of the hazardous substances (pesticides, heavy metals, etc.) within the contaminated soils and wastes, such that the solidified/stabilized materials will not represent a continuing source of ground water contamination. Reduction in mobility of hazardous substances from the solidified/stabilized material will be effected by reducing the permeability and leachability of the treated materials. Specific performance standards for the S/S treatment (specifically, permeability, leachability and strength) are identified below in Section 2.12.

Alternatives 4 and 5 both involve excavation and off-Site treatment and/or disposal of the contents of the Former Waste Lagoon. Waste characterization would be performed to classify the contents of the waste lagoon as hazardous waste or non-hazardous waste. Non-hazardous wastes would be disposed of at an appropriate off-Site waste disposal facility without further treatment. Hazardous waste would be treated, as necessary and in accordance with RCRA, and disposed of at an appropriate off-Site waste management facility. The FS indicates that the hazardous waste portion of the contents of the Former Waste Lagoon would be incinerated, the resultant ash would be subject to stabilization treatment, followed by disposal. Therefore, the toxicity and volume of hazardous substances in the hazardous waste portion would be greatly reduced; however, the hazardous substances present in the non-hazardous portion would not undergo treatment. However, by placement of the excavated materials in appropriate waste disposal facilities, Alternative 4 and 5 would significantly decrease residual contaminant mobility.

2.10.4.5 Short Term Effectiveness

Concerns exist for Alternatives 2A, 4 and 5 regarding air emissions from the Site during excavation and S/S activities. Air emissions could be comprised of dusts, airborne hazardous substances (e.g. pesticides, heavy metals), and odors. Air emissions represent a potential health threat to workers involved in the cleanup of the Site, as well as nearby residents.

For any alternative implemented at the Site, air emissions will be controlled using engineering controls, such as dust suppression and air monitoring. For Alternative 2A, engineering controls to control air emissions could include S/S equipment (auger equipment, excavator equipment, etc.) equipped with vacuum hoods. The vacuum hoods would draw air from the area in the immediate vicinity of the equipment and filter the air prior to discharge, limiting air emissions during the treatment activities. For Alternatives 2A, 4 or 5, it is possible to build a large containment structure over the entire Former Waste Lagoon, such that cleanup work could be performed within an enclosed space (although it should be noted that such a containment structure was not included in the detailed analysis of Alternative 2A in the FS). Engineering controls within the containment structure would allow for climate control, lighting, and air filtration prior to discharge. Although such a structure has the potential to limit air emissions created while addressing the Former Waste Lagoon, it may also pose serious risks to cleanup workers, including working in an enclosed space with high concentrations of airborne hazardous substances, the potential for accidents associated with working with heavy equipment in enclosed spaces, etc. These potential risks to the cleanup workers would be managed through the use of personal protective equipment and worker training.

The in-situ S/S treatment included in Alternative 2A would be performed in the ground, without complete excavation of the contaminated soil and waste in the Former Waste Lagoon. Therefore, Alternative 2A is expected to generate the lowest overall amount of air emissions relative to Alternatives 4 and 5. Alternatives 4 and 5 would involve the complete excavation and loading into trucks for off-Site disposal of the contaminated soil and waste present in the Former

Waste Lagoon. Excavation of these materials is expected to generate more overall air emissions than the in-situ treatment included in Alternative 2A.

A concern with Alternative 2A is the potential volatilization of hazardous substances present within the contents of the Former Waste Lagoon during S/S, and the risk such vapor-phase contaminants may pose to remediation workers on the Central Chemical property and nearby residents. This concern will be evaluated during the pre-RDI, as part of the S/S treatability study.

2.10.4.6 Implementability

S/S, included in Alternative 2A, is a technology used to limit the mobility of contaminants in contaminated media (soil, waste, etc). The effectiveness of S/S will have to be evaluated by performance of a treatability study during the pre-RDI. If it is determined during the pre-RDI that S/S cannot be successfully implemented for the contents of the Former Waste Lagoon, then the contents of the Former Waste Lagoon which cannot be successfully treated by S/S will be excavated and transported off-Site for treatment, as necessary, and disposed of off-Site at an appropriate off-Site waste disposal facility in accordance with CERCLA §121(d)(3). This determination will be made during the pre-RDI. Otherwise, Alternative 2A is expected to be implementable, in terms of available equipment, materials, etc.

Alternatives 4 and 5 include the excavation and off-Site treatment and/or disposal of the contents of the Former Waste Lagoon. No treatability study is required for these two alternatives. It is expected that Alternatives 4 and 5 are implementable with readily available equipment and materials. Materials classified as hazardous waste would require shipment to an appropriate off-Site waste management facility for treatment/disposal. The analysis completed by the PRPs as part of the FS based the costs and implementability of these two alternatives on the treatment/disposal of hazardous wastes at a facility located in the State of Michigan. If these alternatives were implemented, the actual receiving facility would be selected in accordance with 40 CFR §300.440 and other applicable criteria. Although feasible, the appropriate management of the hazardous wastes would require substantial shipping, with associated cost, fuel use, potential for accidents, etc.

2.10.4.7 Cost

The cost estimates for Alternatives 2A, 4 and 5 are summarized in Table 6.

The thirty-year net present worth was calculated based on a 3.52 percent (%) discount rate. Costs for long-term monitoring and Five-Year Reviews are included in the annual O&M costs above.

The detailed cost estimates of remedial alternatives are presented in the FS report.

2.10.4.8 State Acceptance

The State of Maryland concurs with the Selected Remedy identified for OU-1 in this ROD (letter included as Figure 14).

2.10.4.9 Community Acceptance

The local community in the vicinity of the Site expressed overall support for the Preferred Alternative that EPA selected in the PRAP. Some community members, including the City of Hagerstown government, expressed concern with the potential size of the capped area associated with consolidation of contaminated soils on top of the Former Waste Lagoon and placement of a low permeability cover system. Specific concerns raised by the community, and EPA's responses to those concerns, with regard to the Preferred Alternative are discussed in Section 3 of the ROD (Responsiveness Summary).

The PRPs for the Site expressed numerous concerns with regard to the Preferred Alternative. The PRPs' concerns, and EPA's response, are also included in Section 3 of the ROD (Responsiveness Summary).

2.11 PRINCIPAL THREAT WASTE

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a site wherever practicable (40 CFR §300.430(a)(1)(iii)(A)). The "principal threat" concept is applied to the characterization of "source materials" at a Superfund Site. A source material is material that includes or contains hazardous substances, pollutants or contaminants that act as a reservoir for migration of contamination to ground water, surface water or air, or acts as a source for direct exposure. Contaminated ground water generally is not considered to be a source material. Principal threat wastes are those 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.

Based on the results of the prior investigations, summarized below, EPA considers the contents of the Former Waste Lagoon to be principal threat waste.

Review of the contents of the Administrative Record, including the RI, the MDE Expanded Site Inspection (1996), the Phase I Environmental Investigation prepared by Weston (1989), the MDE Screening Site Investigation (1989), and the EPA Aerial Photographic Analysis (1997), indicate that the Former Waste Lagoon was used for the disposal of various liquid and solid waste streams generated by Central Chemical, including waste streams from fertilizer and pesticide-related activities.

MDE has summarized the various borings that have been advanced at the Former Waste Lagoon. Review of the these boring logs indicates that contents of the Former Waste Lagoon are not homogenous, but rather consists of a heterogeneous mixture of materials including fill materials and solid wastes (including wood, glass, concrete, paper), soil and soil-like materials, and other waste materials described variously in boring logs as: white pasty material; white powder; black waste/clayey ooze; multi-colored dumped materials; white clayey powders; black, brown and white powders; white clay powder; black waste/clayey ooze; gray powdery material with rock fragments; green seams (powder) and white powder; yellow powder; gray and black waste material with layered white powder seams; yellow crystalline material; cream colored powder. Various odors have been noted by the personnel advancing soil borings in the Former Waste Lagoon. Descriptions of the odors include: pesticide/fertilizer odor; chemical odor; sweet odor;

fuel-like odor. Fumes were identified during the advancement of certain soil borings, and several soil borings were halted because of health and safety concerns. The MDE summation of boring logs is included in the Administrative Record.

Not all of the waste materials identified within the Former Waste Lagoon during the advancement of soil borings were sampled and analyzed for contaminants. Samples of the waste materials collected from the Former Waste Lagoon and analyzed for pesticide contamination are identified in Table 7.

The bottom of the Former Waste Lagoon is at or near the top of bedrock. No liner system is present beneath the contents of the Former Waste Lagoon. As discussed above, the Former Waste Lagoon and the Site as a whole are located in a karst terrain setting. Aquifers within karst terrain settings may be particularly vulnerable to ground water contamination because of the potential for direct connections of the aquifer to the land surface, and the presence of relatively wide fracture apertures or channel within the bedrock (owing to enlargement by solvent action of circulating ground water) that provide rapid ground water flow with negligible adsorption or breakdown of contaminants (Duigon, 2001). One of the hazardous substances identified in the Former Waste Lagoon (BHC isomers) has been identified in a Site-related ground water contamination plume which extends at least 2,700 feet to the southwest, and 2,200 feet to the northeast of the Site (the ground water RI is currently on-going).

Based on the HHRA, ground water contamination poses a 5.57×10^{-3} cancer risk as well as non-cancer risks to receptors who consume Site-related contaminated ground water obtained from off of the Central Chemical property (although, it should be noted, such receptors are not known to currently exist because of the presence of the public water supply).

Therefore, in the context of the Site, hazardous substances present in the Former Waste Lagoon are considered to exhibit high mobility and toxicity, and constitute principal threat waste.

2.12 SELECTED REMEDY

2.12.1 Summary of the Rationale for the Selected Remedy

Upon completion, EPA's Selected Remedy for OU-1 will be protective of human health and the environment. The contents of the Former Waste Lagoon will undergo S/S treatment in order to minimize future contaminant migration from these wastes. Contaminated soils at the Site will be consolidated on the treated Former Waste Lagoon, and a low permeability cover system will be constructed over the contaminated soils and treated Former Waste Lagoon. The low permeability cover system will serve to prevent contact between human and ecological receptors and the contaminated soils, and will minimize infiltration of precipitation through the contaminated soils. The area of the low permeability cover system will serve as a permanent Consolidation Area for contaminated media (soil, treated principal threat waste) on the Central Chemical property. To the extent that additional principal threat wastes may be present beneath the bottom of the Former Waste Lagoon (e.g. within bedrock fractures), a ground water monitoring, extraction and treatment system will be constructed around the Consolidation Area and operated to capture residual ground water contamination/leachate, as necessary. The ground water monitoring, extraction, and treatment system will prevent ground water contamination from migrating beyond the boundaries of the Consolidation Area.

The contents of the Former Waste Lagoon are considered to be principal threat wastes. Treatment of these principal threat wastes is considered to be practicable, either by in-situ S/S or by off-Site treatment/disposal. If the contents of the Former Waste Lagoon are not treated, EPA believes that these waste materials will continue to represent a threat to human health and the environment.

With regard to treatment of the contents of the Former Waste Lagoon, two options had been evaluated as part of the FS: in-situ S/S and excavation with off-Site treatment and disposal. Overall, EPA believes that treatment of the contents of the Former Waste Lagoon by in-situ S/S will represent less of a threat to workers performing the remediation and the nearby community by minimizing air emissions during the remedial action, and minimizing the necessary transportation effort. Successful treatment of the contents of the Former Waste Lagoon by S/S treatment will be evaluated during the treatability study and based upon achievement of specific S/S performance standards (discussed below, #2 of the Selected Remedy). Also, provided that S/S can successfully reduce the mobility of hazardous substances within the Former Waste Lagoon, treatment of the Former Waste Lagoon via in-situ S/S is cost-effective relative to excavation of the contents of the Former Waste Lagoon and off-Site treatment/disposal. It is noted that although S/S will not reduce the toxicity or volume of hazardous substances present in the Former Waste Lagoon, it will be performed to reduce mobility of the contaminants. As described in the Selected Remedy, principal threat waste materials present within the Former Waste Lagoon which are determined not to be able to be successfully solidified/stabilized during the pre-RDI, will be excavated, treated if necessary, and disposed of off-Site.

2.12.2 Description of Selected Remedy and Performance Standards

EPA's Selected Remedy consists of the following:

1. Conduct a pre-RDI. The pre-RDI will include:

    a.) Additional soil sampling and analyses to further define extent of soil excavation areas in Domains 1, 2, and 3.

    b.) Subsurface investigation to evaluate areas of the Site where Site-related principal threat waste materials may have been buried. These areas are located within Domain 2 and Domain 3, and will be identified by EPA during the pre-RDI work planning. Principal threat wastes include containers of hazardous substances, non-aqueous phase liquids, powders, and sludge.

    c.) Additional characterization in the vicinity of the Liquid Pesticide building, and an area of petroleum impacted soil that was identified during the RI.

    d.) Perform a treatability study of Solidification/Stabilization technology on the contents of the Former Waste Lagoon. The lagoon contents include contaminated soil, sludge and powders. The treatability study will be performed by collecting samples of the contents of the Former Waste Lagoon and treating the samples with Solidification/Stabilization agents. The treated samples will be subject to permeability testing, leaching tests, and strength tests to determine if satisfactory Solidification/Stabilization results can be achieved. The goal of the treatability study is to determine if the contents of the Former Waste Lagoon can be treated to achieve the Solidification/Stabilization performance standards listed in #2 below and also to determine the appropriate Solidification/Stabilization agents necessary to achieve such performance standards.

e.) Additional characterization of the physical dimensions and materials present in the Former Waste Lagoon.

f.) Aquifer testing to assist with the design of the ground water monitoring, extraction and treatment system discussed in #7, below.

g.) Additional soil samples will be collected at adjacent properties and analyzed for Site-related contaminants to determine if there is an unacceptable risk posed by the soils.

2. Perform Solidification/Stabilization treatment of the contents of the Former Waste Lagoon which meet the following performance standards (based on the results of the treatability study):

a.) Unconfined compressive strength: Treat the contents of the Former Waste Lagoon using Solidification/Stabilization such that the solidified/stabilized monolith exhibits an average unconfined compressive strength equal to or greater than 50 pounds per square inch (lb/in^2) as measured by ASTM D1633 (or substantial equivalent) with no performance sample testing less than 40 lb/in^2.

b.) Permeability: Treat the contents of the Former Waste Lagoon using Solidification/Stabilization such that the solidified/stabilized monolith exhibits an average permeability equal to or less than $1x10^{-6}$ centimeters per second (cm/sec) as measured by ASTM D5084 (or substantial equivalent). No sample will exhibit permeability greater than $1x10^{-5}$ cm/sec.

c.) Leachability: Treat the contents of the Former Waste Lagoon using Solidification/Stabilization such that leaching of contaminants from the Former Waste Lagoon, as measured by Synthetic Precipitation Leaching Procedure (SPLP) (EPA SW846 Method 1312, or substantial equivalent), is significantly reduced and contaminated leachate from the Former Waste Lagoon will not create ground water contamination above ground water remediation standards at the boundary of the Central Chemical property.

The RI/FS for ground water contamination at the Site is currently being developed. However, for the purposes of the treatability study, interim ground water remediation standards at the Site are included in Table 12.

3. Contents of the Former Waste Lagoon which cannot be successfully treated by Solidification/Stabilization (i.e. do not achieve the Solidification/Stabilization performance standards described in #2, above) will be excavated and transported off-Site, with treatment as necessary, and disposed of off-Site at an off-Site waste disposal facility in accordance with CERCLA §121(d)(3).

4. Excavate contaminated soils above Site-specific Soil Remediation Standards, set forth in Table 13, from Domain 1, Domain 2 (outside footprint of Former Waste Lagoon) and Domain 3. Confirmation sampling will be performed at the completion of excavation activities to demonstrate compliance with the Soil Remediation Standards included in Table 13.

   a.) Concrete slabs and foundations. Remove concrete slabs and foundations to the extent needed to promote efficient remediation of soils. If the concrete slabs and foundations present in Domain 1 are to remain in-place, confirmation sampling beneath the concrete slabs and foundations will be necessary. If the removed slabs or foundations are contaminated, they shall be disposed off-Site in accordance with CERCLA §121(d)(3).

   b.) Demonstration of Attainment of Soil Remediation Standards. A description of the Soil Remediation Standards, included in Table 13, and the method to demonstrate attainment of the Soil Remediation Standards is included as follows:

   Soil Remediation Standards for protection of human health (direct contact)

   Soil Remediation Standards for protection of human health (direct contact) have been established for future indoor site workers on the Central Chemical property (identified as "ISW" on Table 13), and future construction workers on the Central Chemical property (identified as "CW" on Table 13).

   As indicated on Table 13, the Soil Remediation Standards for protection of human health (direct contact) are 95% Upper Confidence Limit (UCL) values. At the completion of excavation of contaminated soil in accordance with the Selected Remedy, attainment of the Soil Remediation Standards will be demonstrated by collection of confirmation soil samples, and generation of a 95% UCL value for each COC based upon protection of human health (direct contact). If the 95% UCL values generated for each COC are less than or equal to their respective Soil Remediation Standard, the Soil Remediation Standards will be deemed attained. However, no single location on the Central Chemical property can exhibit COC concentrations greater than ten times (10x) their respective Soil Remediation Standards.

   A maximum depth of excavation for achievement of the Soil Remediation Standards for protection of human health (direct contact) has been established as 10' below ground surface.

Soil Remediation Standards for protection of ecological receptors

Soil Remediation Standards for protection of ecological receptors have been established for Central Chemical property (identified as "ECO" on Table 13).

As indicated on Table 13, the Soil Remediation Standards for protection of ecological receptors are 95% UCL values. At the completion of excavation of contaminated soil in accordance with the Selected Remedy, attainment of the Soil Remediation Standards will be demonstrated by collection of confirmation soil samples, and generation of a 95% UCL value for each COC based upon protection of ecological receptors. If the 95% UCL values generated for each COC are less than or equal to their respective Soil Remediation Standard, the Soil Remediation Standards will be deemed attained. However, no single location on the Central Chemical property can exhibit COC concentrations greater than ten times (10x) their respective Soil Remediation Standards.

A maximum depth of excavation for achievement of the Soil Remediation Standards for protection of ecological receptors has been established as 2' below ground surface.

Soil Remediation Standards for protection of ground water

Soil Remediation Standards for protection of ground water have been established for Central Chemical property (identified as "GW" on Table 13).

As indicated on Table 13, the Soil Remediation Standards for protection of ground water are not-to-exceed values.

c.) Restoration. The excavated areas shall be backfilled with clean fill and compacted in 6-inch lifts to the original grade. A minimum 4-inch layer of topsoil should be applied, a vegetative cover established, and complete restoration performed over the affected area.

5. Consolidate the excavated soils from #4 above on the footprint of the solidified/stabilized Former Waste Lagoon area. If it is determined during the remedial design, or during the remedial action, that the volume of contaminated soil at the Site cannot be consolidated within the boundaries of the cover system (Consolidation Area) set forth in #6, below, then the excess contaminated soil will be disposed of off-Site at an appropriate off-Site waste disposal facility in accordance with CERCLA §121(d)(3).

6. Construct, maintain, and periodically inspect an engineered low permeability cover system over the consolidated contaminated soils and Former Waste Lagoon area ("Consolidation Area"). The approximate extent of the low permeability cover system/Consolidation Area is depicted in Figure 13, attached to this ROD. As depicted in

Figure 13, the low permeability cover system/Consolidation Area will be present in the northern portion of the Central Chemical property. The approximate dimension of the low permeability cover system/Consolidation Area is 380 feet by 480 feet. The maximum height of the low permeability cover system will be approximately seven to twelve feet above existing grade. Maximum slopes of the cover system will be approximately 18 degrees.

Performance standards for the low permeability cover system are:

a.) Have a permeability of less than or equal to $1x10^{-7}$ cm/sec.

b.) Provide long-term minimization of migration of liquids through cover system, consolidated soils and treated Former Waste Lagoon.

c.) Function with minimum maintenance, for example through the use of warm season grasses and other native vegetation.

d.) Promote drainage and minimize erosion or abrasion of the cover system.

e.) Accommodate settling and subsidence to maintain the cover system's integrity.

7. Capture contaminated ground water/leachate in the vicinity of the Consolidation Area by installation, operation, maintenance, and periodic monitoring of a ground water monitoring, extraction and treatment system. The ground water monitoring, extraction and treatment system shall be designed and operated to ensure that contaminated ground water in the vicinity of the Consolidation Area is captured to prevent migration of contaminated ground water which exceeds the standards on Table 12, beyond the boundary of the Consolidation Area. Treat captured ground water to meet applicable Federal pre-treatment standards.

8. The discharge point for the treated ground water will be the Hagerstown public sewer system in accordance with applicable Federal pre-treatment standards.

9. Use of the Central Chemical property shall be limited to commercial/industrial use, and ensure maintenance and prevent disturbance of the low permeability cover system and ground water monitoring, extraction, and treatment system, through establishment and implementation of institutional controls.

10. Principal threat wastes identified outside of the Former Waste Lagoon area on the Site shall be excavated and transported off-Site, with treatment as necessary, and disposed of off-Site at an off-Site waste disposal facility in accordance with CERCLA §121(d)(3). Principal threat wastes include containers of hazardous substances, non-aqueous phase liquids, powders, and sludge.

11. No further action is included in the Selected Remedy for OU-1 with regard to sediments and surface water.

2.12.2.1 Summary of the Estimated Remedy Costs

A summary of the estimated costs of the Selected Remedy is included in Table 14. The information in this cost estimate summary table is based on the best available information regarding the anticipated 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 Differences, or a ROD Amendment. This is an order of magnitude engineering cost estimate that is expected to be within +50 to -30% of the actual project cost.

Two primary sources of uncertainty exist with regard to the cost of the Selected Remedy. The first source of uncertainty is the extent to which the contents of the Former Waste Lagoon can be successfully treated via S/S. The treatability study for S/S will be performed as part of the pre-RDI. Principal threat wastes present in the Former Waste Lagoon which cannot be successfully treated via in-situ S/S will be excavated, treated if necessary, and disposed of off-Site, the potential costs of which are currently unknown and are not included in the estimated costs of the Selected Remedy. The second major source of uncertainty is the potential presence of other principal threat wastes which may be buried on the Site. This uncertainty will also be evaluated during the pre-RDI by the performance of a subsurface investigation in areas of potential concern.

2.12.2.2 Expected Outcome of the Selected Remedy

At the completion of the Selected Remedy, the contents of the Former Waste Lagoon, which constitute principal threat waste, will be treated by S/S and the mobility of hazardous substances within the Former Waste Lagoon will be significantly reduced. Contents of the Former Waste Lagoon which cannot be successfully treated, as determined by the S/S treatability study, will be excavated and disposed of off-Site in accordance with CERCLA §121(d)(3). If other principal threat wastes are identified on the Site during the pre-RDI, they will be excavated and disposed of off-Site in accordance with CERCLA §121(d)(3). Contaminated soils present on the Site will be consolidated on the solidified/stabilized Former Waste Lagoon, and a low permeability cover system will be constructed over the consolidated contaminated soils. The low permeability cover system will serve to act as a barrier between the contaminated soils and human and ecological receptors, and will prevent infiltration of rainwater into the contaminated soils, which will prevent leaching of hazardous substances from the contaminated soils to ground water. A ground water monitoring, extraction and treatment system will be constructed around the Former Waste Lagoon and consolidated and capped contaminated soils (the Consolidation Area). The ground water monitoring, extraction and treatment system will be operated to capture contaminated ground water and leachate in the vicinity of the Former Waste Lagoon, and prevent migration of contaminated ground water beyond the boundary of the Consolidation Area. The need for continued operation of the ground water monitoring, extraction and treatment system will be evaluated over time. Institutional controls will be implemented at the Site to restrict the Site use to industrial/commercial use only, and to prevent disturbance of the low permeability cover system and ground water monitoring, extraction and treatment system. Ultimately, implementation of the Selected Remedy will allow for the reuse of the Central Chemical property.

2.13 STATUTORY DETERMINATION

Under CERCLA §121 and the NCP, the lead agency must select remedies that are protective of human health and the environment, comply with ARARs (unless a statutory waiver is justified), are cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes as a principal element and a bias against off-site disposal of untreated wastes. The following sections discuss how the Selected Remedy meets these statutory requirements.

2.13.1 Protection of Human Health and the Environment

The Selected Remedy will protect human health and the environment, as follows:

- Principal Threat Waste: Principal threat waste present in the Former Waste Lagoon will be treated via S/S. This treatment will significantly reduce the mobility of hazardous substances present in the Former Waste Lagoon. Contents of the Former Waste Lagoon which cannot be successfully treated via S/S, as determined by the treatability study, will be excavated and disposed of off-Site in accordance with CERCLA §121(d)(3). If other principal threat wastes are identified on-Site during the pre-RDI, those principal threat wastes will be excavated and disposed of off-Site in accordance with CERCLA §121(d)(3). Implementation of the Selected Remedy will either reduce the mobility (on-Site S/S) or the volume and toxicity (excavation; off-Site treatment, if necessary; off-Site disposal) of principal threat waste present on the Site, which will serve to significantly reduce the threats those principal threat wastes pose to human health and the environment. As stated above, excavated materials which are classified as non-hazardous waste are not expected to undergo treatment prior to off-Site disposal; however, by placement of the excavated materials in appropriate waste disposal facilities, residual contaminant mobility of those materials will be significantly reduced.

- Contaminated Soil: Contaminated soil on the Site will be excavated and consolidated on the solidified/stabilized Former Waste Lagoon. A low permeability cover system will be constructed over the consolidated contaminated soils. The cover system will prevent contact between the hazardous substances present in contaminated soils and human and ecological receptors. The cover system will also prevent infiltration of precipitation into the contaminated soils and potential leaching of hazardous substances from contaminated soil which will minimize the potential for future generation of contaminated ground water.

- Contaminated ground water/leachate: Installation and operation of a ground water monitoring, extraction and treatment system around the solidified/stabilized Former Waste Lagoon will serve to capture contaminated leachate and ground water which may be generated during and after the remedial action by un-treated principal threat waste at the bottom and/or below the bottom of the Former Waste

Lagoon (e.g. in bedrock fractures). The ground water monitoring, extraction and treatment system shall be designed and operated to ensure that contaminated ground water in the vicinity of the Consolidation Area is captured to prevent migration of contaminated ground water beyond the boundary of the Consolidation Area.

2.13.2 Compliance with Applicable or Relevant and Appropriate Requirements

The Selected Remedy of S/S of the Former Waste Lagoon, consolidating contaminated soils on the treated Former Waste Lagoon, constructing a low permeability cover system over the consolidated contaminated soils, and installation and operation of a ground water monitoring, extraction and treatment system will comply with the ARARs identified in Table 8.

2.13.3 Cost Effectiveness

The Selected Remedy is cost-effective and represents a reasonable value for the money to be spent. In making this determination, the following definition was used: "A remedy shall be cost-effective if its costs are proportional to its overall effectiveness." (NCP §300.430(f)(1)(ii)(D)). This was accomplished by evaluating the "overall effectiveness" of those alternatives that satisfied the threshold criteria (i.e., were both protective of human health and the environment and ARAR-compliant). Overall effectiveness was evaluated by assessing three of the five balancing criteria in combination (long-term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; and short-term effectiveness). Overall effectiveness was then compared to costs to determine cost effectiveness. The relationship of the overall effectiveness of this remedial alternative was determined to be proportional to its cost and hence this alternative represents a reasonable value for the money to be spent.

During EPA's remedy selection, Alternatives 2A, 4, and 5 were considered to be protective of human health and the environment and ARAR-compliant. Alternative 4 and 5 were considered to be superior to Alternative 2A with regard to long-term effectiveness and permanence, because the contents of the Former Waste Lagoon would be excavated to the extent practicable and treated and disposed of at an off-Site facility. However, Alternatives 4 and 5 are significantly more expensive than Alternative 2A, and are associated with concerns pertaining to the transportation effort involved, and the potential for creation of air emissions which may be a threat to remediation workers and the nearby community. Although containment structures were considered during the FS to address air emission concerns for the nearby community, the same containment structures were considered to pose a potentially elevated threat for the remediation workers.

Although S/S will not reduce the toxicity or volume of the hazardous substances present in the Former Waste Lagoon, this in-situ treatment will significantly reduce the mobility of the hazardous substances. In combination with the low permeability cover system, and the ground water monitoring, extraction, and treatment system, the Selected Remedy will provide an overall level of protection of human health and the environment comparable to Alternatives 4 and 5, at significantly lower cost.

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

EPA has determined that the Selected Remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner at the Site. 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 will include treatment of the contents of the Former Waste Lagoon, which are considered to be principal threat waste, using S/S technology. The S/S treatment will not decrease the toxicity or volume of the hazardous substances present in the Former Waste Lagoon; however, S/S treatment will significantly reduce the mobility of the hazardous substances present in the Former Waste Lagoon. In combination with the low permeability cover system, and the ground water monitoring, extraction and treatment system, the S/S of the Former Waste Lagoon will offer a comparable level of long-term effectiveness and permanence when compared with Alternatives 4 and 5, at significantly less cost. The Selected Remedy will minimize off-Site disposal of untreated hazardous substances by including on-Site, in-situ S/S of the contents of the Former Waste Lagoon, and on-Site consolidation and capping of the contaminated soils. The Selected Remedy will offer superior short-term protectiveness when compared with Alternatives 4 and 5 in that the potential for air emissions during remediation of the Former Waste Lagoon will be minimized to the extent possible (because the treatment will be performed in-situ (in the ground)), and the necessary transportation effort will be significantly less than would be required by excavation and off-Site treatment and disposal of the contents of the Former Waste Lagoon. There are no special implementability issues that set the Selected Remedy apart from the other alternatives that were evaluated.

2.13.5 Preference for Treatment as a Principal Element

By treating the Former Waste Lagoon, which is considered to be principal threat waste, using S/S, the Selected Remedy addresses principal threats posed by the Site through the use of treatment technologies. By utilizing treatment as a significant portion of the remedy, the statutory preference for remedies that employ treatment as a principal element is satisfied. It should be noted that if principal threat wastes are present beneath the bottom of the Former Waste Lagoon, for example in bedrock fractures, those materials are not expected to be treated via S/S as part of the Selected Remedy.

2.13.6 Five-Year Review Requirements

Because the Selected Remedy will result in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, a statutory-review will be conducted within five years after the initiation of remedial action to ensure that the remedy is, or will be, protective of human health and the environment pursuant to CERCLA §121(c), and the NCP, 40 CFR §300.430(f)(5)(iii)(c).

2.14 DOCUMENTATION OF SIGNIFICANT CHANGES

The PRAP for the Central Chemical Site was released for public comment in April 2009. The PRAP identified Alternative 2A as the Preferred Alternative for contaminated soil and waste at the Site. EPA reviewed all written and verbal comments submitted during the public comment period. It was determined that no significant changes to the remedy, as originally identified in the PRAP, were necessary or appropriate.

3.0 RESPONSIVENESS SUMMARY

This Responsiveness Summary documents public participation in the remedy selection process for the Central Chemical Site. It contains a summary of the significant comments received by EPA on the PRAP for the Site and EPA's responses to those comments.

3.1 STAKEHOLDER COMMENTS AND LEAD AGENCY RESPONSES

Comments on the PRAP were received from private citizens, the City of Hagerstown, MD, and the Technical Support Provider associated with the Community Liaison Panel for the Site. Issues identified by these Stakeholders and EPA's responses are included below. Stakeholder comments are *italicized*, and EPA responses are **bolded**:

Comment #1: *A private citizen asked if her home would be destroyed or if she would have to move elsewhere.*

Response: **No. Implementation of the remedy will not include acquisition of private property, or permanent relocation of residents.**

Comment #2: *A private citizen requested that EPA evaluate potential vapor intrusion at the Site.*

Response: **As discussed briefly during the public meeting in April 2009 for the PRAP, EPA will evaluate the potential for vapor intrusion at the Site as part of the OU-2 (ground water) RI.**

Comment #3: *The City of Hagerstown expressed concern regarding the size of the capped area that would consist of the treated Former Waste Lagoon, the consolidated contaminated soils from the Site, and the low permeability cover system.*

Response: **EPA understands and recognizes this issue as being a concern. Performance standards for the capped area are included in the description of the Selected Remedy (Section 2.12) as follows:**

The approximate dimension of the low permeability cover system is 380 feet by 480 feet. The maximum height of the low permeability cover system will be approximately seven to twelve feet above existing grade. Maximum slopes of the cover system will be approximately 18 degrees.

As appropriate, the final dimensions of the capped area will be discussed with the Community Liaison Panel (of which the City's Planning Director is a member). During the Remedial Design, EPA will consider and incorporate, to the extent practicable, the community's input on the final capped area.

Comment #4: *The City of Hagerstown requested that EPA take measures to ensure that future owner/occupants of the Site and local government plan reviewers are alerted* *about the presence of the capped remediation area and the need to avoid this area with Site improvement activities. The City suggested that the capped area be marked in the field with some type of permanent markers/monuments and that a plat be recorded delineating this area by easement, or whatever legal means are appropriate, and prescribing what can and cannot occur on top of this area.*

Response: **EPA understands and agrees with the City of Hagerstown regarding this issue. Institutional controls must be established as part of the Selected Remedy to prevent disturbance of constructed features of the remedy, including the low permeability cover system and ground water monitoring, extraction and treatment system. As described in Section 2.9 (Description of Alternatives) of the ROD, this may include the use of permanent markers and/or monuments. The legal means necessary to prevent disturbance of the constructed features of the Selected Remedy (e.g. recording of a plat, establishment of an easement as suggested by the City) will be evaluated during the remedial design, and implemented during the remedial action.**

Comment #5: *The City's Water and Wastewater Divisions expressed concerns about discharge of wastewater from the ground water monitoring, extraction and treatment system, as follows:*

"The City's Water and Wastewater Divisions have concerns about the plan for discharge of the treated contaminated ground water/leachate and for the removal of the contaminated soils. The City would prefer that the treated ground water not be sent to the public sewer system, since that impacts our plant capacity which is constrained and it would involve permitting issues and pre-treatment discussions."

Response: **The City's comment regarding this issue is noted. The public sewer system was identified within the FS as a viable option for discharge of treated water from the ground water monitoring, extraction and treatment system. During the RD the City's concerns regarding such discharge will be evaluated and incorporated into the final Remedial Design, to the extent considered practicable by EPA. If a discharge point is selected other than the public sewer system, then that decision by EPA will be documented in a separate EPA decision document in accordance with the NCP.**

Comment #6: *The City of Hagerstown Water and Wastewater Divisions expressed concerns about contaminated soils at the Site, as follows:*

"The City's Water and Wastewater Divisions have concerns about the plan for discharge of the treated contaminated ground water/leachate and for the removal of the contaminated soils...The City would like to be assured that contaminated soils will be removed to a sufficient depth that future utility

construction will not have lines placed within contaminated soils. If the removal depth is insufficient, the City is concerned about contamination into the water and sewer systems if water lines break or there is inflow and infiltration into the sewer lines."

Response: **Excavation depths and locations on the Central Chemical property will be guided by the Soil Remediation Standards identified in Table 13. The Soil Remediation Standards for the Central Chemical property are protective of human health (future indoor site workers, and construction workers) and the environment (ecological receptors, and ground water). The Soil Remediation Standards have been established to be protective of ground water, specifically to disallow contaminated soil at the Site from acting as a future source of ground water contamination. Therefore, it is not expected that residual soil contaminant levels will be present at the Site at the completion of the remedial action which will have the potential to represent a threat to human health or the environment via broken water or sewer lines. With regard to protection of construction workers who would be installing/repairing such lines, the Soil Remediation Standards have been calculated to be protective of future construction workers to a depth of 10 feet bgs. As stated in Table 13 of the ROD, if COC concentrations remain in-place beneath 10 feet at the completion of contaminated soil excavation, the establishment of institutional controls may be necessary to ensure that subsurface soil contamination does not act as a potential future threat to human health (for example during future deep construction-related activities). Such institutional controls would be selected by EPA in an appropriate EPA decision document.**

Comment #7: *The City of Hagerstown inquired as to whether a long-term ground water monitoring network would require wells on the Central Chemical property and off of the Central Chemical property.*

Response: **The ground water contamination associated with the Site is currently being evaluated as part of OU-2. However, based on EPA's current knowledge of the Site, ground water contamination currently extends well beyond the SW and NE boundaries of the Central Chemical property. Therefore, at this time, EPA expects that the long-term ground water monitoring network for the Site will include monitoring wells on the Central Chemical property and off of the Central Chemical property.**

Comment #8: *The Technical Support Provider for the Community Liaison Panel provided EPA with the following comments (identified below as (a), (b), and (c)), regarding the S/S of the former waste lagoon:*

(a) "The intent is to perform the processing in-situ, i.e., without removing the waste from the ground. This will be a technical challenge for a number of reasons and introduces a measure of uncertainty into Option 2A. One

difficulty may result from the presence of construction debris mixed with the high concentration of finely divided contaminated materials."

Response: **EPA agrees that in-situ S/S of the contents of the Former Waste Lagoon will represent technical challenges. As indicated in the description of the Selected Remedy, a pre-RDI, including a treatability study, will be performed prior to the treatment of the Former Waste Lagoon via S/S. The results of the pre-RDI will be used to determine how the S/S can be successfully performed, in terms of S/S amendments, equipment, etc. The pre-RDI will better define the geometry and the contents of the Former Waste Lagoon in terms of physical state, contamination levels, etc. To address the comment directly, EPA will evaluate the need to remove debris from the Former Waste Lagoon, prior to S/S treatment, based on the results of the pre-RDI.**

(b) "A second problem is that the location of 100% of the contamination cannot practically be determined, so some material may evade treatment. Once the treatment is completed, it may be difficult to measure its effectiveness against an established performance standard. Nevertheless, EPA has concluded that treatment is preferred over the former Option 2 which involved no treatment prior to capping."

Response: **As stated above, a pre-RDI will be performed prior to S/S of the Former Waste Lagoon to determine the geometry of the lagoon and characterize the lagoon contents. If waste materials are present beneath the bottom of the lagoon, for example in bedrock fractures, those materials will not be treated by S/S. However, a ground water monitoring, extraction and treatment system will be installed around the Former Waste Lagoon to address contaminated ground water/leachate that may continue to be present after the S/S treatment is complete. The pre-RDI, and specifically the S/S treatability study, will be performed to confirm that S/S can significantly reduce the potential for the contents of the Former Waste Lagoon to pose a threat to human health and the environment in the future. This confirmation will be obtained by comparing S/S results from the treatability study to performance standards for the solidified/stabilized materials established in the ROD (Section 2.12). As stated above in the description of the Selected Remedy (Section 2.12), contents of the Former Waste Lagoon that cannot be successfully solidified/stabilized (based on the results of the treatability study), will be excavated and disposed of off-Site. During the remedial action, a construction quality assurance/quality control program will be established to confirm that the solidified/stabilized contents of the Former Waste Lagoon meet the S/S performance standards established in the ROD.**

(c) *"Finally, the addition of stabilization materials, usually concrete, will increase the volume of contaminated material and may increase the size of the final capped repository"*

Response: **EPA agrees that S/S can cause a "swell" effect which will increase the volume of the treated contents of the Former Waste Lagoon. The size performance standards for the capped area (Consolidation Area) are included in the description of the Selected Remedy (Section 2.12) and in response to a comment from the City of Hagerstown (above, Comment #3). As stated above, during the Remedial Design, EPA will consider and seek to incorporate to the extent practicable the community's input on the final capped area.**

Comment #9: *During a public meeting a community member asked whether the capped area of the Selected Remedy (*Consolidation Area covered by low permeability cover system) *would be covered with grass, or if a parking area was possible.*

Response: **The final disposition of the low permeability cover system will be determined during the Remedial Design. Depictions of the capped area, prepared during the FS, exhibited a grass-covered capped area.**

3.2 TECHNICAL AND LEGAL COMMENTS

Comments on the PRAP were received from the PRPs (or Respondents) for the Site. A summary of the comments received from the PRPs follows. The PRPs comments are *italicized*, and EPA's responses are **bolded**:

Major Concern #1: *The PRPs requested that the contingency remedy be removed from the Selected Remedy. (*The contingency remedy that the PRPs are referring to is included in the Selected Remedy, and states that principal threat waste present in the Former Waste Lagoon which cannot be successfully solidified/stabilized (based on the S/S treatability study, and achievement of performance standards) will be excavated and disposed of off-site*). The PRPs have indicated that inclusion of the contingency remedy introduces financial uncertainty in the Selected Remedy which will make it difficult for many of the Respondents to commit to performing the Selected Remedy. The PRPs stated in their comments, "...that the contingency remedy should be eliminated from Alternative 2A in the ROD. In the event that EPA continues to insist on a contingent remedy, then remedies other than excavation and off-site disposal should be allowed to be considered in the event that S/S is needed or fails to meet ROD requirements, including the option of a pumping well system."*

Response: **The FS evaluated options for addressing the principal threat waste present in the Former Waste Lagoon. Ultimately, three basic options were included in the detailed analysis: capping the materials without further treatment, solidifying/stabilizing the materials, and excavating**

the materials and disposing of the principal threat waste present in the Former Waste Lagoon off-Site. The contents of the Former Waste Lagoon are considered by EPA to be principal threat wastes for reasons included in the ROD (Section 2.11). As stated in the NCP, EPA expects to use treatment to address the principal threats posed by a site, wherever practicable. The principal threat wastes associated with the Former Waste Lagoon are presently in an un-lined lagoon, the bottom of which consists of the bedrock surface. The Former Waste Lagoon is sited in karst terrain, which is particularly vulnerable to ground water contamination (Duigon, 2001). Site-related hazardous substances present in the Former Waste Lagoon have been identified in a ground water contamination plume which extends at least 2,700 feet horizontally to the southwest, 2,200 feet horizontally to the northeast, and hundreds of feet vertically into the aquifer at concentrations of concern (the exact dimension of the ground water contamination plume are currently unknown, but are being evaluated as part of the OU-2 RI/FS). Based on the results of the FS, EPA has concluded that it is practicable to treat the principal threat waste present in the Former Waste Lagoon, and capping of these materials without treatment is not appropriate, or consistent with the NCP. As described in the ROD, EPA considers in-situ S/S to be the most appropriate form of treatment for the contents of the Former Waste Lagoon. Although the volume and toxicity of the principal threat wastes will not be reduced by S/S, the mobility of the hazardous substances will be significantly reduced, which will mitigate the threats to human health and the environment posed by the principal threat waste. In-situ treatment of the principal threat wastes will also mitigate potential concerns to the nearby community and remediation workers by minimizing air emissions during the remediation of the Former Waste Lagoon, and by minimizing the transportation effort and associated truck traffic. Successful treatment of the principal threat wastes will be measured by application of specific S/S performance standards during the S/S treatability study (which will be part of the pre-RDI). Although the extent to which the contents of the Former Waste Lagoon can be successfully treated by S/S is not currently known, it will be determined based on the treatability study performed during the pre-RDI. Based on the results of the FS, EPA considers that two options exist for management of the contents of the Former Waste Lagoon: S/S or excavation and off-Site disposal (or a combination of the two approaches, as necessary). The extent to which excavation of the principal threat waste present in the Former Waste Lagoon will be necessary, if at all, will be known at the completion of the pre-RDI. If at the completion of the pre-RDI, the PRPs wish to propose other remedial options for the principal threat waste present in the Former Waste Lagoon which cannot be successfully solidified/stabilized, EPA

will consider them at that time. EPA notes that other remedial options for the Former Waste Lagoon mentioned in the PRPs' comments were not included in the EPA-approved FS report. However, based on the FS, and EPA's review of Site conditions, the option for excavation and off-Site disposal of the contents of the Former Waste Lagoon remains as part of the Selected Remedy.

Major Concern #2: *The PRPs do not feel the contents of the Former Waste Lagoon are principal threat wastes, nor do they require treatment.*

Response: **EPA considers the contents of the Former Waste Lagoon to be principal threat waste, as discussed in Section 2.11 of the ROD.**

Based on the FS report, treatment of the principal threat wastes present in the Former Waste Lagoon is considered to be practicable. As part of the Selected Remedy, the contents of the Former Waste Lagoon will be solidified/stabilized to significantly reduce the mobility of hazardous substances present within the principal threat waste. The extent to which such hazardous substances can be successfully solidified/stabilized will be determined as part of the pre-RDI (specifically the S/S treatability study). Contents of the Former Waste Lagoon which cannot be successfully solidified/stabilized will be excavated, and transported off-Site for treatment, as necessary, and disposed of off-Site at an off-Site waste disposal facility in accordance with CERCLA §121(d)(3).

Major Concern #3: *The PRPs do not feel it is appropriate to establish numeric performance standards for the S/S treatment at this time. Rather, the PRPs feel that performance standards should be established at the conclusion of the pre-RDI. The PRPs comments package states, "The Respondents believe that the ROD should allow flexibility to develop the S/S recipe that best supports the overall goal and addresses source control without being restricted by multiple performance criteria set at the PRP stage. This development could best be done following the pre-RDI stage."*

Response: **The purpose of the ROD is to set forth standards to be attained. The numeric performance standards for the S/S treatment of the principal threat wastes present in the Former Waste Lagoon were established after consultation with the EPA Engineering Technical Support Center within the National Risk Management Research Laboratory, Office of Research and Development. Based on EPA's experience with S/S of waste materials, achievement of the S/S performance standards is considered to be necessary to significantly reduce the mobility of hazardous substances present in the Former Waste Lagoon. EPA does not consider it appropriate to perform a treatability study of S/S treatment, and then establish performance**

standards after review of the testing results. However, EPA recognizes that flexibility with the numeric performance standards may be appropriate at the completion of the treatability study, specifically with regard to the unconfined compressive strength performance standard.

Major Concern #4: *The PRPs feel that the Site-specific remediation standard values are inappropriately set. The PRPs state, "The Respondents believe that the remediation standards for soil in the ROD should reflect ARARs including MDE cleanup guidance and address the entire dataset for each Domain to be consistent with risk assessment practices and EPA guidance."*

Response: **ARARs are substantive cleanup requirements, criteria, or limitations that are promulgated under Federal or State law. MDE cleanup standards represent "To Be Considered" criteria, not ARARs because they are guidance documents and are not promulgated under State law. The Soil Remediation Standards included in the PRAP were developed to meet a cumulative cancer risk of $1x10^{-4}$ and a target organ HI of 1 for direct contact with soil. The cumulative cancer risk represents the upper end of the EPA target risk range, which is generally considered to be protective of human health. The target organ HI of 1 is the commonly accepted threshold value for non-cancer effects.**

The PRPs state that the remediation standards should be applied on a domain basis and that the objective is to address unacceptable risks within a given domain. Although the HHRA evaluated the data with this domain approach, in reality, a receptor may be exposed to soil from more than one domain. For example, it is unlikely that a future industrial worker would experience exposure only to Domain 3 soils and would never venture into Domain 2 or Domain 1. For this reason, one set of Preliminary Remediation Goals (PRGs) was developed to be applied across the Site. The overall goal is not to be protective on a domain-by-domain basis, but to be protective on a Site-wide basis.

The PRPs claim that development of the Soil Remediation Standards was based on the assumptions that all COCs contribute equally to current risks and that COCs are distributed independently across the Site. This is not an accurate statement. The Soil Remediation Standards were based on the assumption that all COCs would contribute equally to future risks. This assumption was necessary for the calculation of specific numeric goals. In addition, the actual distribution of COCs did not enter into the Soil Remediation Standard calculations. As noted above, a receptor may not confine his/her exposure to a single portion of the Site. Thus it should be assumed that a receptor may be exposed to the entire site.

The PRPs assert that the Soil Remediation Standards are not consistent with risk assessment practices or EPA guidance. The primary concern appears to be that the Soil Remediation Standards are being treated as not-to-exceed levels, while baseline risk assessments typically use the 95% upper confidence limit (UCL) as the exposure point concentration. It is agreed that the EPA Risk Assessment Guidance for Superfund identifies the exposure point concentration for the reasonable maximum exposure to be the 95% UCL. However, application of a PRG to a site determined to have actionable risk is not the same process as completion of a baseline risk assessment. EPA guidance on application of remedial goals to soil and sediment (Methods for Evaluating the Attainment of Cleanup Standards, Volume 1: Soils and Solid Media, EPA 230/02-89-042, February 1989) allows the risk manager to select whether a remedial goal represents a not-to-exceed level or the upper-bounding estimate of the mean exposure.

Based on a review of Site conditions, and after consideration of the PRPs' comments, EPA has established Soil Remediation Standards for the Central Chemical property that are included in Table 13 of the ROD. The Soil Remediation Standards are part of the Selected Remedy. A description of the Soil Remediation Standards and the method to demonstrate attainment of the Soil Remediation Standards is included as follows:

<u>Soil Remediation Standards for protection of human health (direct contact)</u>

Soil Remediation Standards for protection of human health (direct contact) have been established for future indoor site workers on the Central Chemical property (identified as "ISW" on Table 13), and future construction workers on the Central Chemical property (identified as "CW" on Table 13).

As indicated on Table 13, the Soil Remediation Standards for protection of human health (direct contact) are 95% UCL values. At the completion of excavation of contaminated soil in accordance with the Selected Remedy, attainment of the Soil Remediation Standards will be demonstrated by collection of confirmation soil samples, and generation of a 95% UCL value for each COC based upon protection of human health (direct contact). If the 95% UCL values generated for each COC are less than or equal to their respective Soil Remediation Standard, the Soil Remediation Standards will be deemed attained. However, no single location on the Central Chemical property can exhibit COC concentrations greater than ten

times (10x) their respective Soil Remediation Standards. This not-to-exceed value has been established at approximately the upper end of EPA's acceptable risk range for cancer and non-cancer risk for protection of human health.

A maximum depth of excavation for achievement of the Soil Remediation Standards for protection of human health (direct contact) has been established as 10 feet bgs.

<u>Soil Remediation Standards for protection of ecological receptors</u>

Soil Remediation Standards for protection of ecological receptors have been established for Central Chemical property (identified as "ECO" on Table 13).

As indicated on Table 13, the Soil Remediation Standards for protection of ecological receptors are 95% UCL values. At the completion of excavation of contaminated soil in accordance with the Selected Remedy, attainment of the Soil Remediation Standards will be demonstrated by collection of confirmation soil samples, and generation of a 95% UCL value for each COC based upon protection of ecological receptors. If the 95% UCL values generated for each COC are less than or equal to their respective Soil Remediation Standard, the Soil Remediation Standards will be deemed attained. However, no single location on the Central Chemical property can exhibit COC concentrations greater than ten times (10x) their respective Soil Remediation Standards.

A maximum depth of excavation for achievement of the Soil Remediation Standards for protection of ecological receptors has been established as 2 feet bgs.

<u>Soil Remediation Standards for protection of ground water</u>

Soil Remediation Standards for protection of ground water have been established for Central Chemical property (identified as "GW" on Table 13).

As indicated on Table 13, the Soil Remediation Standards for protection of ground water are not-to-exceed values. The Soil Remediation Standards for protection of ground water have been established as not-to-exceed values because each location where the Soil Remediation Standards are exceeded may act as a source of ground water contamination which would result in the remedy not attaining the following Remedial Action Objective (Section 2.8 of the ROD): "Prevent migration of contaminants from soils that would

result in ground water contamination that exceeds ground water performance standards that are protective of human health and the environment." Therefore, the Soil Remediation Standards for protection of ground water must not be exceeded at any location on the Site at the completion of soil remediation activities.

Specific Comment #1: *The PRPs noted that the concrete slab material may be able to be recycled by a local Hagerstown company. Also, the PRPs note that the concrete slabs may be able to be crushed and used as a type of gravel during cleanup of the Site. The PRPs have concluded that off-Site disposal of the slabs may be unnecessary and requested that the requirement for off-Site disposal of the concrete slabs be removed.*

Response: **EPA concurs with this comment, and the comment has been reflected in EPA's Selected Remedy.**

Specific Comment #2: *The PRPs objected to the use of the terms "sinkhole" and "quarry" to describe a drainage swale in the central portion of the Site, and the Former Waste Lagoon, respectively.*

Response: **As the PRPs have indicated, the term "quarry" is used in several historical documents, including the Maryland Department of Natural Resources publication, "Karst Hydrogeology of the Hagerstown Valley, Maryland" (Duigon, 2001), in reference to the area of the Site identified in the RI as the Former Waste Lagoon. The original disposition of the Former Waste Lagoon is not able to be determined from a review of aerial photographs. The term "quarry" is used in two paragraphs of the ROD, in sections referring to Site history. For clarification, where the term "quarry" is used, the location is clarified by adding "Former Waste Lagoon" in parentheses. Based on a review of historical aerial photographs, specifically the 1937 aerial photograph included in the Administrative Record, there is no indication that the "drainage swale" was excavated. Rather the drainage swale appears to be comprised of a closed topographic contour land surface feature which appeared naturally before the occurrence of the Former Waste Lagoon. Although EPA continues to believe that a solution sinkhole or similar karst-related feature may exist in the area of the drainage swale, and although "sinkhole" is referenced in historical documents related to the Site, EPA has revised the ROD text to indicate "potential sinkhole" where the "sinkhole" term is used.**

Specific Comment #3: *The PRPs requested that a paragraph be removed from the ROD, which pertains to a 1970 field inspection by the MDWR.*

Response: **The paragraph was included as part of the Site history, and is factual. The paragraph cited does not impact the Selected Remedy, and has not been deleted.**

Specific Comment #4: *The PRAP stated, "Based on the B&W study, and a consent agreement with the State of Maryland, Central Chemical closed the Former Waste Lagoon, and a sinkhole located on-site by covering those areas with clay and soil, and vegetative stabilization." The PRPs noted that a notice of compliance was issued by the State of Maryland in December 1979 with regard to the consent agreement. The PRPs also objected to the use of the word "sinkhole."*

Response: **The "sinkhole" issue is addressed in Specific Comment #3 (above). EPA has not been able to locate the Notice of Compliance referenced by the PRPs, nor have the PRPs provided the referenced document for the Administrative Record.**

Specific Comment #5: *The PRPs objected to the use of the term "discovery" in reference to the 1987 sewer line excavation which encountered the Former Waste Lagoon.*

Response: **EPA has revised the text, the term "identification" is used.**

Specific Comment #6: *The PRPs believed the PRAP's description of ground water movement in karst aquifers was oversimplified, in the context of the Site.*

Response: **This section of the ROD has been modified to address the PRP's comment (Section 2.5).**

Specific Comment #7: *The PRPs provided comment on the description of structural geology features identified within the PRAP.*

Response: **This section of the ROD has been modified to address the PRP's comment (Section 2.5).**

Specific Comment #8: *The PRPs objected to the following statement in the PRAP: "It is possible that irrigation wells located approximately one mile to the NE (Fountainhead Country Club) influence ground water flow to the NE." The PRPs indicate that there is no specific evidence to support this statement and it could create the impression that EPA believes there is a concern with Site contaminants at the Country Club.*

Response: **EPA believes there is sufficient evidence to support the statement, which states that it is <u>possible</u> (emphasis added) that irrigation wells influence ground water flow to the NE. At this time, ground water**

contamination which extends to the NE and SW from the Site is being evaluated by EPA as OU-2 of the Site.

Specific Comment #9: *The PRPs objected to the following statement in the PRAP: "The depth to ground water in the vicinity of the Former Waste Lagoon is expected to vary seasonally in response to rainfall and snow melt conditions. There is a potential that the ground water level may seasonally rise into the contaminated soils and waste present in the Former Waste Lagoon (and possibly beneath the bottom of the Former Waste Lagoon." The PRPs indicated that there were no overburden wells screened within the bottom interval of the former lagoon to substantiate this statement. The PRPs also identified that the evaluation of ground water levels within the Former Waste Lagoon, which was identified as a task in the pre-RDI discussed in the FS, was not included in the PRAP's description of the pre-RDI.*

Response: **EPA believes the statements referenced in the PRAP are correct. Ground water level measurements collected in May 2005 indicated that ground water levels rise above the bottom of the Former Waste Lagoon. Therefore, the evaluation of ground water levels within the Former Waste Lagoon proposed by the PRPs is a moot point.**

Specific Comments #10, 11, 12: The PRPs identified several statements in the PRAP which were incorrect with regard to the identification of Site-related contaminants in surface water, sediment, and fish tissue.

Response: **The statements referenced by the PRPs have been corrected in the ROD.**

Specific Comment #13: The PRPs indicated that they do not feel that the contents of the Former Waste Lagoon constitute principal threat waste.

Response: **This issue is addressed in Major Concern #2 above.**

Specific Comment #14: The PRPs sought to clarify that areas of Antietam Creek, are not part of the "Site." The PRPs seem to believe that the term "Site" refers to the Central Chemical property only.

Response: **The use of the term "Site" in the ROD is meant to be consistent with the definition of "on-site" in the NCP, as follows: "On-site means the areal extent of contamination and all suitable areas in very close proximity to the contamination necessary for implementation of the response action." Therefore, areas where Site-related contamination has been identified are described in the ROD as part of the "Site."**

Specific Comment #15: *The PRPs objected to the RAOs included in the PRAP, as being not consistent with those included in the FS report. Also, the PRPs have indicated that there is no basis for establishing a RAO for treatment of what EPA refers to as principal threat waste.*

Response: **As described elsewhere in this Responsiveness Summary, EPA considers the contents of the Former Waste Lagoon to be principal threat waste. The NCP indicates that EPA expects to use treatment to address the principal threats posed by a site, where practicable. Based on the FS, and EPA's evaluation of the Site, and available remedial options, EPA considers treatment of the contents of the Former Waste Lagoon to be practicable. The RAOs are general statements about what the remedial action will accomplish. One of the primary objectives of the cleanup at the Central Chemical Site is the treatment of principal threat wastes at the Site. Such treatment will reduce the toxicity, mobility or volume of the principal threat waste. S/S will be used, to the extent practicable based on the results of the treatability study, to reduce the mobility of the principal threat waste present in the Former Waste Lagoon. Contents of the Former Waste Lagoon which cannot be successfully treated via S/S will be excavated and disposed of off-Site. Prior to such disposal, the principal threat wastes will be subject to characterization and treatment, as necessary pursuant to the requirements of the RCRA. EPA believes that the RAOs included in the PRAP, and ROD, are appropriate for the Site and reflect what implementation of the Selected Remedy is meant to accomplish.**

Specific Comments #16, 17, 18, 21, and 29: *These comments indicate that the ground water monitoring, extraction and treatment system are meant to provide temporary hydraulic control in the vicinity of the Former Waste Lagoon.*

Response: **The Selected Remedy is meant to address the contaminated soils, and principal threat waste at the Site.**

The purpose of the ground water monitoring, extraction and treatment system is to provide capture of Site-related hazardous substances from the area of the Former Waste Lagoon, and to prevent migration of contaminated ground water beyond the boundary of the Consolidation Area (treated Former Waste Lagoon, consolidated contaminated soils, low permeability cover system). EPA recognizes that treatment of principal threat waste at or below the bottom of the Former Waste Lagoon may not be practicable, for example if principal threat waste is present beneath the Former Waste Lagoon in bedrock fractures. Therefore, dependent on hydrogeological conditions at the Site, hazardous substances present in untreated principal threat waste at or near the bottom of the

Former Waste Lagoon may continue to migrate to ground water and result in ground water contamination. The ground water monitoring, extraction and treatment system will include a monitoring component to determine if this possibility is in fact occurring. If ground water monitoring indicates that unacceptable concentrations of hazardous substances are migrating from the Former Waste Lagoon area, the resultant ground water contamination will be captured via operation of the ground water monitoring, extraction, and treatment system to prevent contaminated ground water from migrating beyond the boundary of the Consolidation Area. The timeframe during which operation of the ground water monitoring, extraction and treatment system will be operated is dependent upon the results of ground water monitoring in the vicinity of the Former Waste Lagoon. As appropriate, the ground water monitoring, extraction and treatment system included in the Selected Remedy for OU-1 (soils, principal threat wastes) may constitute a portion of the strategy for ground water cleanup which will be described in a proposed remedial action plan, and subsequent ROD for OU-2 (ground water).

Specific Comment #19: *The PRPs indicate that the hazardous waste classification activities described in the pre-RDI would only be necessary if materials were being excavated and disposed of off-site.*

Response: **EPA agrees with the comment and that portion of the description of the pre-RDI has been revised.**

Specific Comment #20: *The PRP's entire comment #20 pertaining to the PRAP, and specifically to performance standards for S/S treatment and Soil Remediation Standards is included in this Responsiveness Summary, as follows:*

Comment: *Although the PRAP indicates that a "complete description of the evaluated alternatives is included in the FS", the Respondents believe that the Preferred Alternative described in the PRAP contains significant differences from Alternative 2A in the FS. The new remedy components and performance metrics that are included in the PRAP will result in the following changes from Alternative 2A as evaluated in the FS.*

* *Significantly increase the volume of soil to be managed from Domains 1 and 3.*
* *Excavation of Domains 1 and 3 potentially extending to bedrock or as much as 25 feet below ground surface.*
* *Potential increase in the size of the capped area in Domain 2 to accommodate the excavated materials.*

> * *Additional solidification mixture additives to achieve performance standards that will not contribute to the objective of protecting ground water.*
> * *Potentially excavating Domain 2.*
>
> *These changes produce a remedy of unknown cost that potentially exceeds the $25 million threshold for review at higher levels within EPA (National Remedy Review Board).*

The Preferred Alternative in the PRAP calls for excavation of all "contaminated soils about Site-specific remediation standards" from each of three domains. The Site-specific remediation standards were developed based on assumptions that all COCs contribute equally to risk at the Site and that all COCs are distributed independently across the Site. Neither of these assumptions is correct. As evaluated in the RI and the Risk Assessment and proposed in the FS for the Site, areas of contamination were identified based on the evaluation of risk. As part of the risk assessment process, exposure point concentrations for COCs are developed based on procedures described in EPA Guidance (EPA, 1989b) and use the 95% UCL of the mean for the entire dataset for each Domain. Since the overall objective related to the remediation standards for soil is to address risk calculated using the entire dataset for the Domain, evaluation of success should do the same and be based on the entire post-remedy dataset for each Domain. The application of Site-specific standards to each and every particle of soil at the Site is not consistent with this approach and with EPA's overall risk assessment process. The Respondents do not agree with applying numeric criteria as provided in the PRAP to soil data from individual locations. The NCP addresses the evaluation of residual risk remaining at the conclusion of the remedial activities (NCP 300.430 (e)(9)(iii)(c)1). An evaluation using the PRGs as presented in the PRAP indicates that the residual risk is significantly lower than the target risk levels of $1x10^{-4}$. In fact, for most potential exposure pathways, the residual risk using the PRAP PRGs would be below $1x10^{-6}$. This is largely due to the co-location of compounds of concern such that management of compounds that contribute significantly to risk also addresses other Site-related compounds. We also note that the current description of the application of the PRGs to Site cleanup does not distinguish between compounds that are accessible under the defined risk exposure scenarios and compounds that occur below the depths of exposure that are considered in the Risk Assessment. This effectively provides no limit on the depth to which excavation potentially would occur. This uncertainty with regards to depth of excavation will make implementation very difficult and potentially very costly.

A detailed evaluation of the residual risk following remediation of soils at various PRG levels is provided in Attachment No. 3.

Response: **EPA has selected a remedy for the Site in accordance with CERCLA, and the NCP. The Selected Remedy is Alternative 2A, as described in the FS. However, there are unknowns associated with the Selected Remedy. The greatest unknown is the extent to which S/S can successfully reduce the mobility of contaminants within the Former Waste Lagoon. That unknown has been addressed whereby waste materials within the Former Waste Lagoon which cannot be successfully treated by S/S will be excavated and transported off-Site, with treatment as necessary, and disposed of off-Site at an off-Site waste disposal facility in accordance with CERCLA §121(d)(3). EPA notes that the Selected Remedy is based upon the entire Administrative Record, not solely the FS.**

EPA agrees with the PRPs that a maximum excavation depth to achieve direct contact human health remediation standards is appropriate for the Central Chemical property. Table 13 includes the Soil Remediation Standards for the Central Chemical property. The maximum depth of excavation to protect future workers at the Site (indoor site workers, and construction workers) is 10 feet bgs. The depth of 10 feet bgs is expected to address soils that future construction workers will come in contact with during excavation activities, and is expected to be the maximum depth from which subsurface soils may be transported to the surface by drilling, excavating, etc. during future construction activities at the Site. As discussed in Table 13, if soil contamination is present beneath 10 feet at the completion of the remedial action that may represent a future threat to human health or ecological receptors, the establishment of institutional controls to address this condition may be required. However, Soil Remediation Standards which are protective of ground water should be achieved through excavation, because contaminated soils which exceed these Soil Remediation Standards may continue to act as an on-going source of ground water contamination at the Site. Therefore, no maximum excavation depth has been established for achievement of the Soil Remediation Standards based on ground water protection.

The PRPs claim that the development of performance criteria for the S/S mixture has changed Alternative 2A from how it was evaluated in the FS. EPA does not agree with this assertion and feels that there is no basis for this claim. A FS provides a preliminary cost estimate with a level of uncertainty ranging from -30% to +50%. Other than the requirement to meet PRGs, performance criteria generally are not developed at the FS stage. If a remedial alternative is selected as the

preferred alternative, then it becomes necessary to develop performance criteria in order to support the remedial design process. As noted in the response to Major Concern #3, the PRAP and ROD are the appropriate documents to identify initial performance criteria, particularly since the primary goal of the criteria is to ensure long-term attainment of the RAO to protect the environment (ground water). With Alternative 2A, the treated Former Waste Lagoon contents will be left in place in perpetuity.

The PRPs comments pertaining to the derivation of Soil Remediation Standards are addressed in response to Major Concern #4, above.

An evaluation of the residual risk evaluation provided by the PRPs (identified as Attachment No. 3), is included below (Specific Comment #32).

Specific Comment #22: The PRPs referenced an earlier comment on ground water flow and ground water contamination fate and transport

Response: **This issue is addressed in Specific Comment #11.**

Specific Comment #23: The PRPs noted the concerns with long-term durability of solidified/stabilized wastes can only be somewhat reduced during the treatability study, as extrapolations will need to be made regarding long-term strength, permeability, and leachability. The PRPs also indicate that S/S at other Sites provides confidence regarding long-term performance of this technology.

Response: **This comment has been considered.**

Specific Comment #24: The PRPs pointed out that a containment structure over the Former Waste Lagoon was not included in the FS as part of Alternative 2A.

Response: **EPA agrees with this comment and has revised the section referenced by the PRPs.**

Specific Comment #25: The PRPs objected to the use of numeric performance standards for the S/S element of the Selected Remedy. The PRPs proposed qualitative performance standards for the ROD.

Response: **A purpose of the ROD is to set forth standards to be achieved. The alternate performance criteria suggested by the PRPs are not acceptable. First, the PRPs desire the unconfined compressive strength and permeability criteria to depend on the test results. Generally, performance criteria are developed prior to testing to ensure that the process meets the project requirements, as opposed**

to defining the project requirements based on what the process can achieve. Because the leachability criterion suggested by the PRPs omits the requirement that leachate not result in ground water contamination that exceeds performance standards, use of the PRPs' criterion may result in failure to attain the RAO to protect the environment.

Specific Comment #26: *The PRPs requested some degree of flexibility in the selection of test methods that will be used to demonstrate compliance with S/S leachability performance standard.*

Response: **The Selected Remedy includes the following language regarding the leachability performance standard associated with S/S treatment:**

"Leachability: Treat the contents of the Former Waste Lagoon using S/S such that leaching of contaminants from the Former Waste Lagoon, as measured by SPLP (EPA SW846 Method 1312, or substantial equivalent), is significantly reduced and contaminated leachate from the Former Waste Lagoon will not create ground water contamination above ground water remediation standards at the boundary of the Central Chemical property."

The testing method identified in the Selected Remedy is "EPA SW846, Method 1312, or substantial equivalent." The language "or substantial equivalent" allows flexibility during the pre-RDI for selection of the testing methodology used to demonstrate compliance with the leachability performance standard, at the discretion of EPA.

Specific Comment #27: *The PRPs requested that the contingency remedy be removed from the Selected Remedy, which requires excavation and off-site treatment of the principal threat waste in the Former Waste Lagoon which cannot be successfully treated via S/S, as evidenced by the pre-RDI (and specifically the S/S treatability study), based on the application of the S/S performance standards.*

Response: **This comment is addressed above as Major Concern #1.**

Specific Comment #28: *The PRPs indicated that soil samples have been collected at locations adjacent to the Central Chemical property in the past and analyzed for contaminants. The PRPs indicated that EPA and MDE reviewed the analytical results associated with such soil samples and informed the property developer that the pesticide concentrations on the adjacent properties were within acceptable limits for residential use. The PRPs indicate that the inclusion of residential-based soil remediation standards within the ROD is not necessary. The PRPs also indicate that* *air monitoring will be performed during "intrusive activities" to minimize the potential for airborne migration of contaminants.*

Response: **As stated in the Selected Remedy (Section 2.12), additional soil samples will be collected at adjacent properties and analyzed for Site-related contaminants to determine if there is an unacceptable risk posed by the soils. The purpose of this task is to verify that excavation of contaminated soils is not necessary beyond the boundary of the Central Chemical property in order for the OU-1 remedy to be protective of human health and the environment.**

Specific Comment #30: The PRPs suggested that one of the elements of the Preferred Alternative be modified to indicate that principal threat wastes identified at the Site outside of the Former Waste Lagoon area be excavated and disposed of off-site, as opposed to all principal threat waste at the Site requiring excavation and off-site disposal.

Response: **EPA agrees with the comment and has revised the appropriate element of the Selected Remedy.**

Specific Comment #31: The PRPs provided a comment that the definitions of surface soil and subsurface soil in the PRAP were not the same as those in the HHRA of the RI.

Response: **The performance of a HHRA as part of a remedial investigation is not the same task as establishing Soil Remediation Standards in a ROD. Surface soil is defined in the ROD as 0-2 feet bgs in order to be protective of ecological receptors (the top 2 feet of soil represents the zone of biological activity). For direct contact of workers with subsurface soil, the ROD defines subsurface soil as 2-10 feet as this is the maximum depth of soil that future construction workers on the Site are expected to encounter, and is the maximum depth from which subsurface soil is expected to be transported to the surface during future construction activities at the Central Chemical property.**

Specific Comment #32: The PRPs entire comment is included:

Tables 4, 5, and 6 – Central Chemical Interim Ground water Remediation Standards (Table 4) and Central Chemical Soil Remediation Standards (Table 5)

Remediation Standards were calculated with the assumption that all contaminants of potential concern (COPCs) equally contribute to risk, which is not the case. For example, of the 16 carcinogenic COPCs listed in Table A.9 of the PRG calculations for soil (separate document from

HGL), 2,4-DDT, 4,4-DDT, Aldrin, Dieldrin, and Toxaphene contribute over 90% of the carcinogenic risk for the site worker (Table 9.1.4 RME from the HHRA [URS, 2007 with 2008 change pages]). Appropriate remediation standards should focus on the primary risk drivers, especially since the drivers tend to be co-located with other COPCs in soil. In applying the PRGs, the PRAP moves from a domain averaging approach to evaluation risk and deciding which areas of the Site require remediation to an approach requiring comparison of individual data points to risk-based concentrations. This is not consistent with risk assessment practice or with the approach that was used in the approved HHRA that was incorporated in the RI. The result is higher remedy costs for no additional protection of human health and the environment. As provided in Attachment No. 3 of these comments, we have compared the residual risk of the PRGs and the approach indicated in the PRAP to the residual risk using only a threshold value for 4,4-DDT. The results of the comparison indicate that the residual risk in both cases was below $1x10^{-5}$ *and the hazard index was below 0.1. However, the approach described in the PRAP results in the management of an additional 7,960 cubic yards of material considering only the upper two feet of soil (see details in Attachment No. 3). Therefore, the costs associated with the approach used in the PRAP greatly exceed any potential benefit in terms of reduced risks.*

Response: **The PRGs were not calculated with the assumption that all COCs contribute equally to current risk, but that all contribute equally to future risk. The PRGs were established to attain a cumulative cancer risk of $1x10^{-4}$ and a target organ HI equal to 1. In addition, the PRGs consider ecological receptors and the soil-to-ground water migration pathway. The analysis provided by the PRPs considers only direct contact and not the other RAOs which the preferred alternative must also achieve. While a few compounds contribute greater than 90% of the risk, if the other compounds also result in unacceptable health effects, they too must be considered in the PRGs. If, as the PRPs contest, it is not necessary to consider the secondary risk drivers because they are collocated with the greatest risk drivers, then the inclusion of PRGs for the secondary risk drivers should not substantially affect the remedial volume. As noted in responses to previous comments, the PRPs' statement that PRGs should be developed for individual domains is flawed. Attainment of RAOs should be considered on a Site-wide basis, not a domain basis. It would be odd indeed to have two sets of PRGs applied to soil separated by a distance of 100 feet, when the potential ecological and human receptors would not necessarily confine their activities to the boundaries of a given domain.**

The PRPs' analysis provided in Attachment No. 3 was reviewed. First, the analysis reflects the PRPs' contention that the PRGs should be applied as a 95% UCL. Table 13 of the ROD establishes that the direct contact Soil Remediation Standards (future indoor site workers, and future construction workers) are 95% UCL values. Second, the data set used in Attachment 3 for each compound consists of estimated concentrations in grids not excavated combined with a large number of zero values to represent excavated grids. For example, based on the information provided by the PRPs, it appears that the data set for remediation based on 11.1 milligrams per kilogram (mg/kg) 4,4'-DDT would contain 187 zeros for each COC, and 72 nonzero values. This approach dilutes the residual contamination (because the excavated grids may not in fact exhibit COC contaminant concentrations of zero) to allow the PRPs the opportunity to decrease the remedial area to be less than the actual area of contamination above PRGs. This approach is not appropriate.

Based on a review of Site conditions, and after consideration of the PRPs' comments, EPA has established Soil Remediation Standards for the Central Chemical property that are included in Table 13 of the ROD. A description of the Soil Remediation Standards and the method to demonstrate attainment of the Soil Remediation Standards is included in response to Major Comment #4, above.

Specific Comment #33: *The PRPs provided several comments (listed below as a), b), c) etc.) on the preparation and application of Soil Remediation Standards for ecological receptors, as follows:*

a) The PRPs indicated that a Soil Remediation Standard protective of ecological receptors does not need to be calculated for dieldrin, because the concentrations of dieldrin identified at the Site do not represent a concern to ecological receptors.

Response: **EPA concurs with this comment.**

b) The PRPs indicated that a Soil Remediation Standard for only one COC (4,4-DDT) is necessary to protect ecological receptors.

Response: **Based on a review of the PRPs' comment, EPA believes that the PRPs' request that ecological PRGs should be limited to 4,4'-DDT only for the following reasons:**

- **Aldrin, dieldrin, endrin ketone, and toxaphene were detected in only a few samples. The detection limits for non-detect results were elevated due to the need to dilute the samples because of**

4,4'-DDT. The elevated detection limits likely resulted in overestimation of the exposure point concentration.

- **Aldrin, dieldrin, endrin ketone, and toxaphene are in large part collocated with 4,4'-DDT.**

With respect to the first bullet, the conclusion that the elevated detection limits artificially increased the exposure point concentration cannot be supported by the data. The fact that their detection limits were high means that other pesticides could have been present at substantial concentrations, but their presence was masked by the 4,4'-DDT. In this situation, the absence of a detection does not necessarily equate to the absence of the compound, and the exposure point concentration based on one-half the detection limit may underestimate the actual concentration. As noted in Table 9 of the ROD, aldrin, dieldrin, endrin ketone and toxaphene were detected in soils at the Site.

With respect to the second bullet, if the pesticides are primarily collocated, then the development of PRGs for each compound should have a limited effect on the remedial volume. If these pesticides are not collocated with the 4,4'-DDT, then PRG development is required to ensure that residual pesticide contamination does not pose a threat to ecological receptors.

c) The PRPs indicated in their comments that Soil Remediation Standards for ecological receptors should not be developed for soil invertebrates.

Response:

For this part of the comment, the PRPs focused on 4,4'-DDT. The PRG selected for 4,4'-DDT is based on exposure by a shrew, not a soil invertebrate. The only PRG listed in Tables 5 and 6 that is based on the soil invertebrate is the one for toxaphene. The toxaphene toxicity reference value (TRV) used in the baseline ERA and PRG development for the soil invertebrate was 3 mg/kg. A study by Bezchlebova, et. al. (2007) identified a no observed effects concentration of 2.5 mg/kg and a lowest observed effects concentration of 3.7 mg/kg for reproduction impacts associated with exposure of *Folsomia candida* to toxaphene. Based on this study, 3 mg/kg appears to be an appropriate TRV for toxaphene. While the toxaphene in the Site soils may not be fully bioavailable, the baseline risk assessment provides no mean of ascertaining the contaminant's degree of bioavailability. Finally, depending on how the toxaphene is distributed relative to the 4,4'-DDT, risk management decisions based solely on exposure of mammals and birds to 4,4'-DDT may not be an effective means of ensuring that the terrestrial

invertebrate population at the Site is not adversely affected by toxaphene.

d) The PRPs indicated that Soil Remediation Standards for surface soil should be based on LOAEL, and not NOAEL endpoints.

Response:

EPA guidance indicates that cleanup goals should be between the LOAEL and the NOAEL. On sites such as this where risk is present for multiple endpoints, the NOAEL to LOAEL range must be considered for all receptors (i.e., endpoints). This is particularly true when Site-specific toxicity values are not established and cannot be used to develop Site-specific cleanup goals as recommended by EPA guidance. In instances such as this, the selection of PRGs within the NOAEL-LOAEL range is more heavily influenced by the uncertainty associated with the lack of Site-specific values, resulting in the selection of PRGs at the NOAEL end of the range. Given the overall remedial strategy for the Site, the establishment of PRGs based on NOAELs is appropriate and does not result in an inappropriate increase in the remedial footprint when compared with the other cleanup criteria.

e) The PRPs indicated that Soil Remediation Standards for ecological receptors should be based on a 0-1 feet bgs depth.

Response:

EPA does not agree with the PRPs on this point. Typically, the top 2 feet of soil is considered to be the primary zone of biological activity.

f) The PRPs indicated that Soil Remediation Standards for protection of ecological receptors should be developed only for the portion of the Site identified as the "Undeveloped Exposure Domain."

Response:

Simply because the ERA did not consider the residential areas beyond the boundary of the Central Chemical property does not mean that there is no potential risk posed by Site-related pesticides. The adjacent residences have grassy backyards in which terrestrial invertebrates, robins, and other animals could live and/or forage. While the PRPs provided no calculations to assess the potential threat posed by the potential for endrin ketone contamination beyond the boundary of the Central Chemical property, it is reasonable to assume that this contamination could pose a similar threat to that found on the Central Chemical property. As stated in the ROD, during the pre-RDI soil samples will be collected beyond the boundary of the Central Chemical property to determine if an unacceptable risk is present.

The Soil Remediation Standards (included on Table 13 of the ROD), which are protective of ecological receptors apply to the Central Chemical property.

g) The PRPs concluded that a concentration of 11.1 ppm of 4,4-DDT would be a sufficient Soil Remediation Standard for protection of ecological receptors.

Response: **As described in the above responses to the comment subparts, development of a single ecological PRG for 4,4'-DDT is not appropriate. Due to elevated detection limits, other pesticides may be present at relatively high concentrations. 4,4'-DDT toxicity to birds and mammals should not be used as a surrogate for the toxicity of other pesticides, such as toxaphene, to soil invertebrates.**

4.0 REFERENCES

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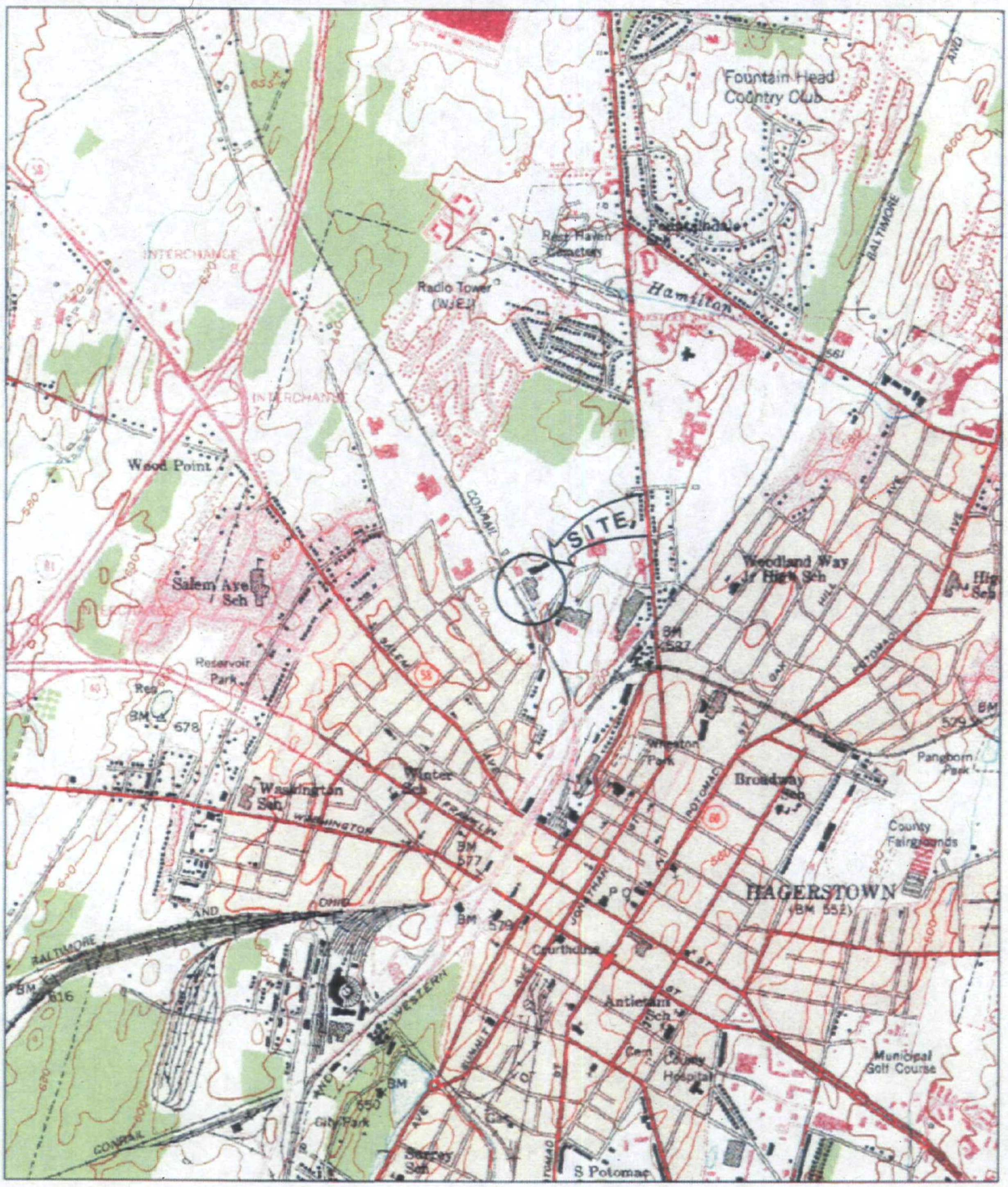
FIGURES



MAP SOURCE

HAGERSTOWN, MD–PA. QUADRANGLE,
U.S. GEOLOGICAL SURVEY, 1953
PHOTOREVISED 1971

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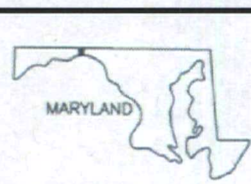
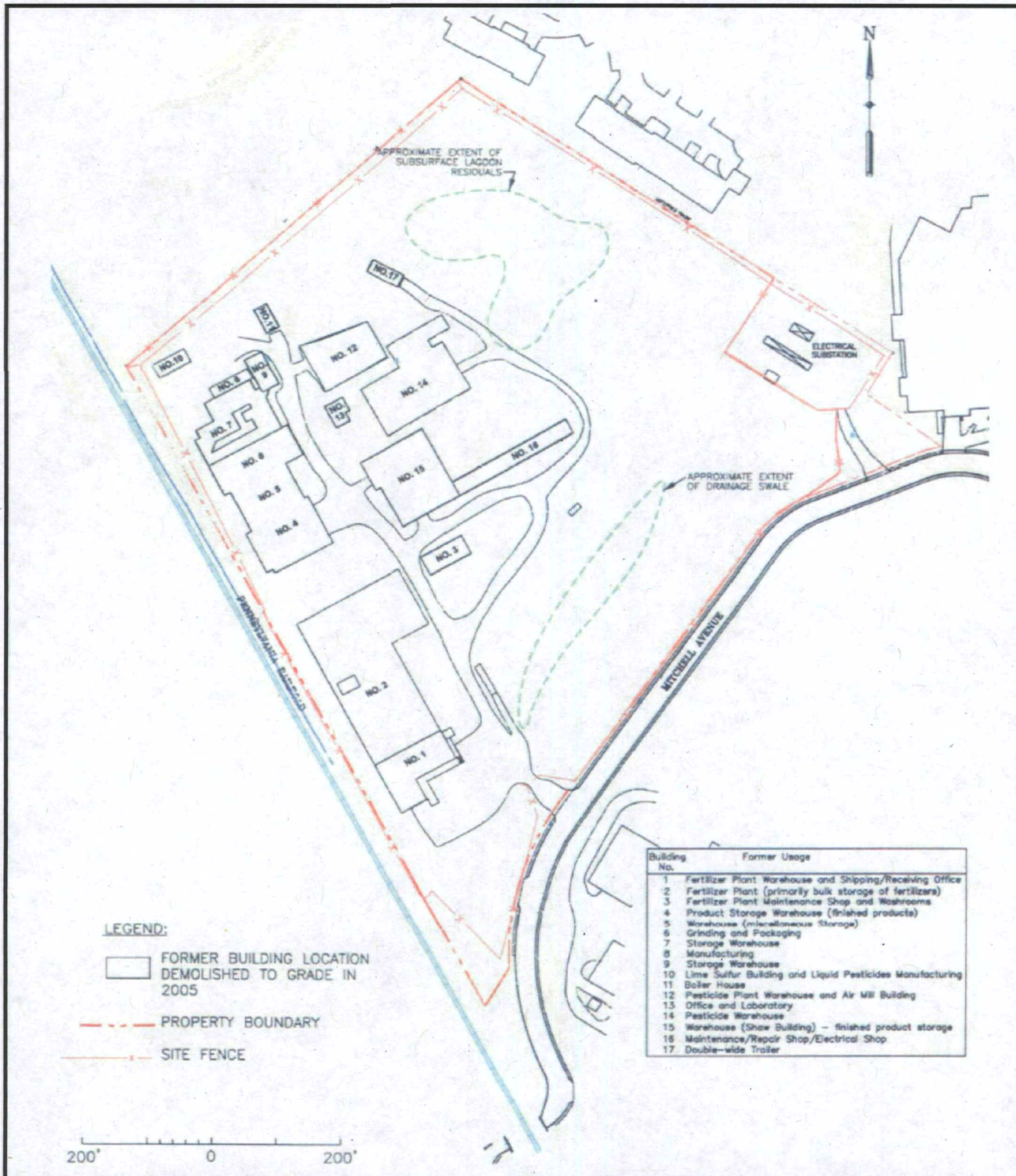
Site_Location.cdr
Revised: 09/18/09 TH
Source: Figure 2-1, Remedial Investigation
Report, Vol.1(URS, 2007 with 2008 Change pages)



QUADRANGLE LOCATION

Figure 1
Site Location
Central Chemical NPL Site
Hagerstown, Maryland



Building No.	Former Usage
1	Fertilizer Plant Warehouse and Shipping/Receiving Office
2	Fertilizer Plant (primarily bulk storage of fertilizers)
3	Fertilizer Plant Maintenance Shop and Washrooms
4	Product Storage Warehouse (finished products)
5	Warehouse (miscellaneous Storage)
6	Grinding and Packaging
7	Storage Warehouse
8	Manufacturing
9	Storage Warehouse
10	Lime Sulfur Building and Liquid Pesticides Manufacturing
11	Boiler House
12	Pesticide Plant Warehouse and Air Mill Building
13	Office and Laboratory
14	Pesticide Warehouse
15	Warehouse (Shaw Building) – finished product storage
16	Maintenance/Repair Shop/Electrical Shop
17	Double–wide Trailer

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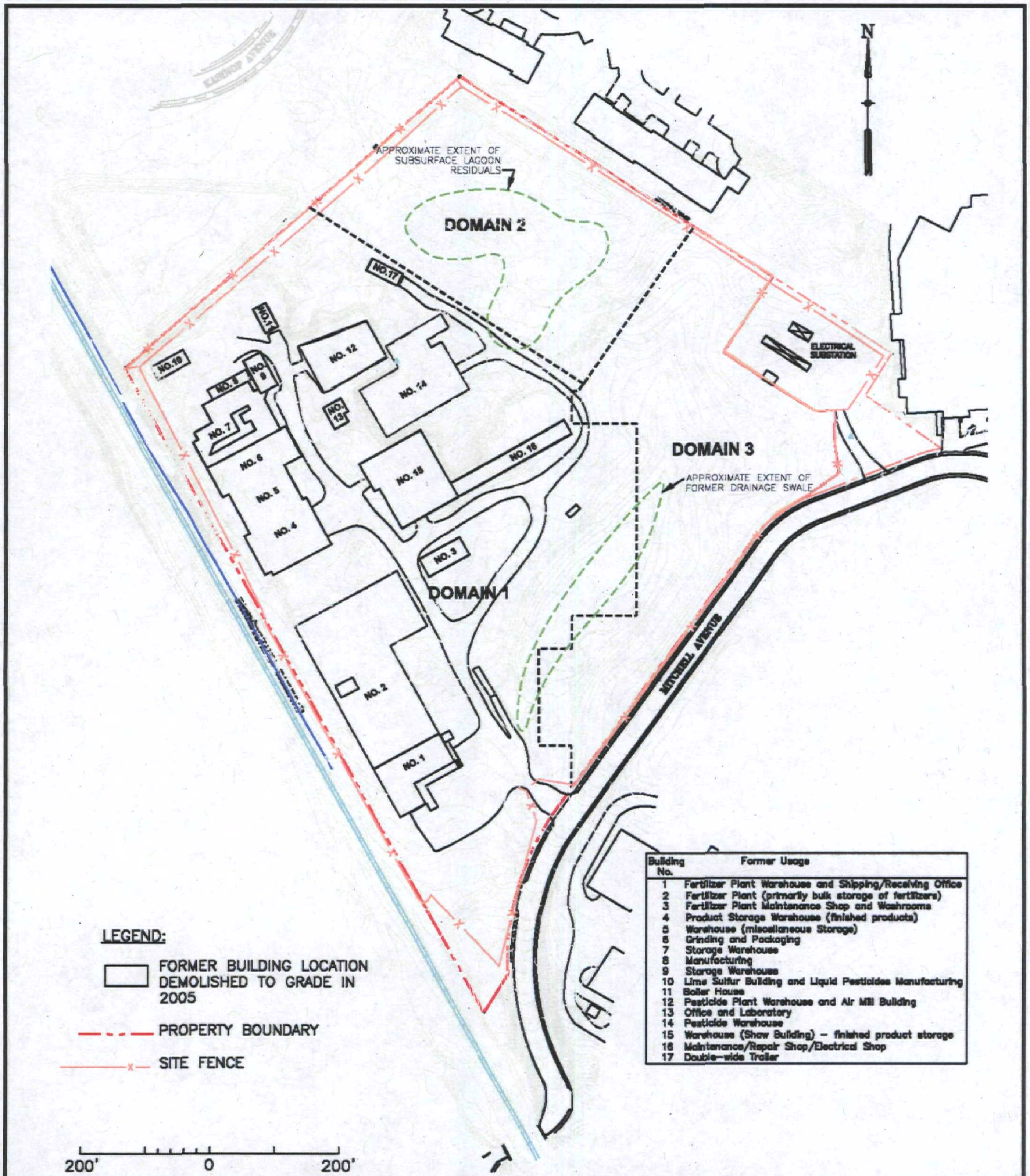
Site_Layout.cdr
Revised: 09/21/09 TB
Source: Figure 2-2, Remedial Investigation Report, Vol.1
(URS, 2007 with 2008 Change pages)

Figure 2
Waste Disposal Areas
Central Chemical NPL Site
Hagerstown, Maryland



Building No.	Former Usage
1	Fertilizer Plant Warehouse and Shipping/Receiving Office
2	Fertilizer Plant (primarily bulk storage of fertilizers)
3	Fertilizer Plant Maintenance Shop and Washrooms
4	Product Storage Warehouse (finished products)
5	Warehouse (miscellaneous Storage)
6	Grinding and Packaging
7	Storage Warehouse
8	Manufacturing
9	Storage Warehouse
10	Lime Sulfur Building and Liquid Pesticides Manufacturing
11	Boiler House
12	Pesticide Plant Warehouse and Air Mill Building
13	Office and Laboratory
14	Pesticide Warehouse
15	Warehouse (Shaw Building) – finished product storage
16	Maintenance/Repair Shop/Electrical Shop
17	Double-wide Trailer

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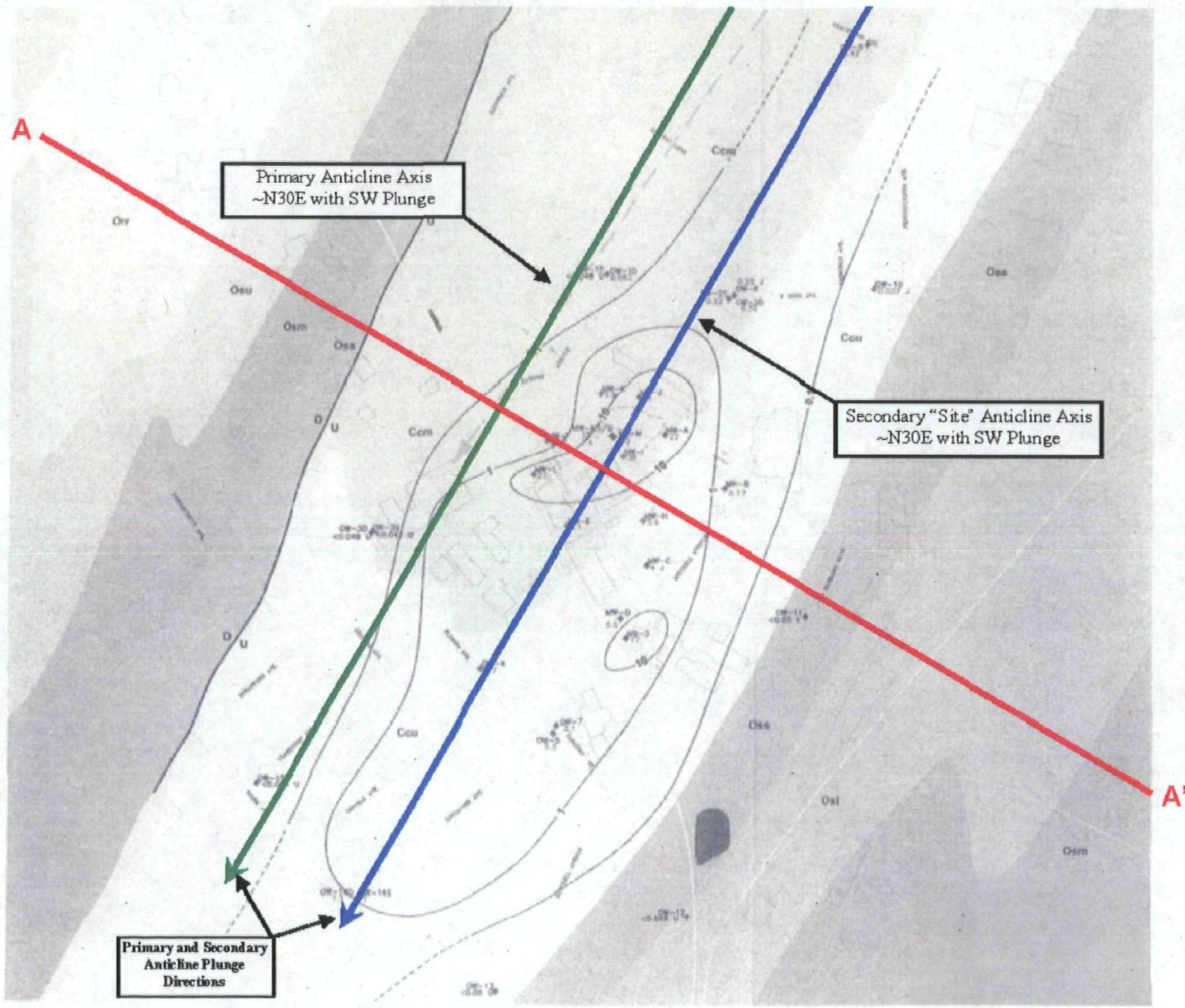
Site_Layout.cdr
Revised: 09/25/09 TH
Source: Figure 2-2, Remedial Investigation Report, Vol.1
(URS, 2007 with 2008 Change pages)

Figure 3
Depiction of "Domain" Areas
Central Chemical NPL Site
Hagerstown, Maryland

Figure 4
Geologic and Cross-section Map
Central Chemical NPL Site
Remedial Investigation
Hagerstown, Maryland



Legend

GEOLOGY:

- Orr – Rockdale Run Formation

STONEHEDGE FORMATION:

- Osu – Upper Limestone Facies
- Osm – Middle Ribbon Carbonate Facies
- Osl – Lower Biohermal Limestone Facies
- Oss – Stoufferstown Member

CONOCOCHEAGUE FORMATION:

- Ccu – Upper Member
- Ccm – Middle Member
- Former Lagoon Area
- Quarry Pond

Approximate Fold Axis

D/U Fault

A — A' Cross-Section Location

LEGEND:

- OW-11 WELL LOCATION
- 21 DETECTED CONCENTRATION EXCEEDS RBC (>0.037 ug/L)
- —10— MICROGRAMS PER LITER
- PARAMETER NOT DETECTED ABOVE LABORATORY REPORTING LIMIT
- J RESULT ESTIMATED

NOTE: AT WELL CLUSTER LOCATIONS THE MAXIMUM CONCENTRATION CONTOURED.

Adapted from URS OU 2 RI Map

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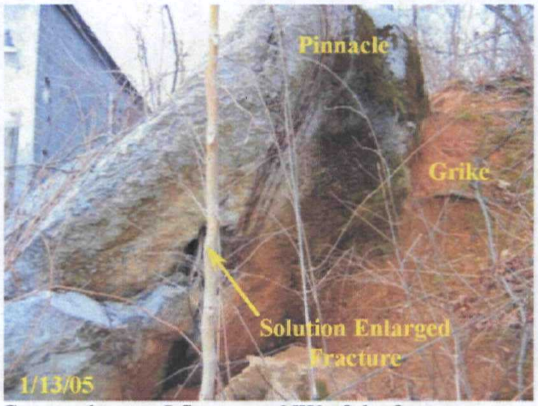
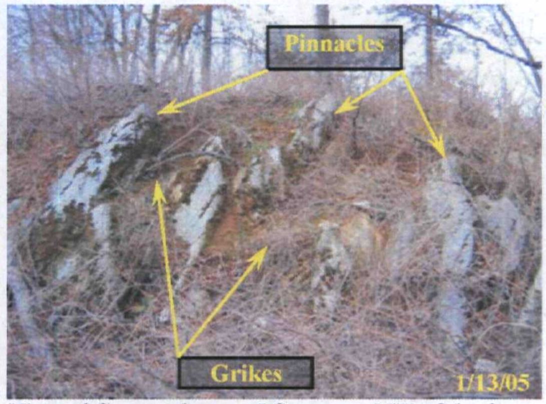
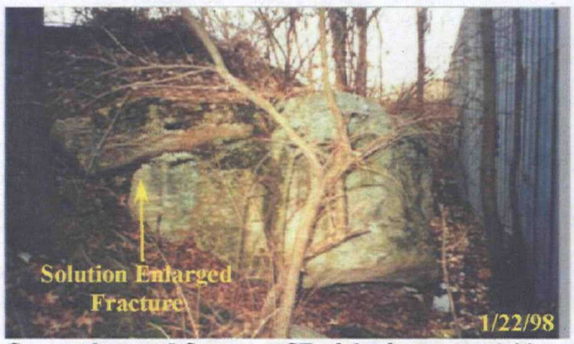
Geology.cdr
Revised: 09/25/09 TH
Maryland Department of the Environment



Conococheague LS outcrop NW of the former pesticide plant showing a pinnacle, grike, and solution cavity. This outcrop is most likely on the western limb of the anticline that trends NE across the site.

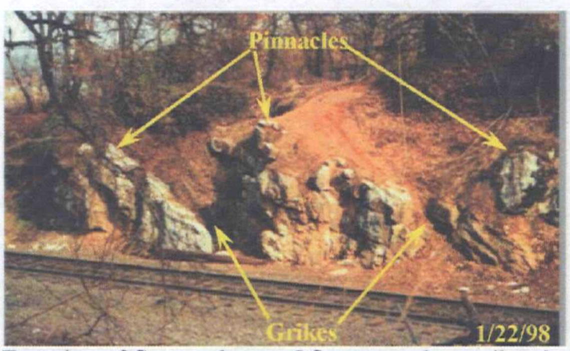


View of Conococheague LS outcrop NW of the former pesticide plant showing a pinnacles and grikes. This outcrop is most likely on the western limb of the anticline that trends NE across the site.

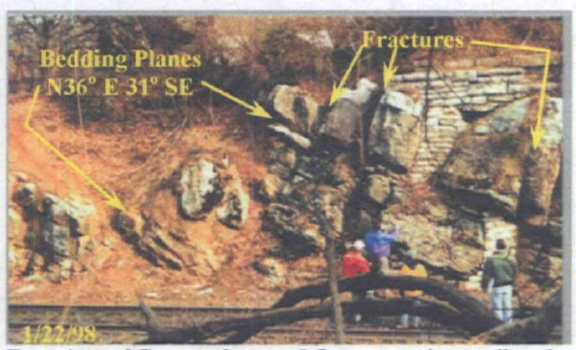


Conococheague LS outcrop SE of the former pesticide plant. This outcrop is on the eastern limb of the anticline that trends NE across the site.

Another view of Conococheague LS outcrop SE of former pesticide plant. This outcrop is on the eastern limb of the anticline that trends NE across the site.



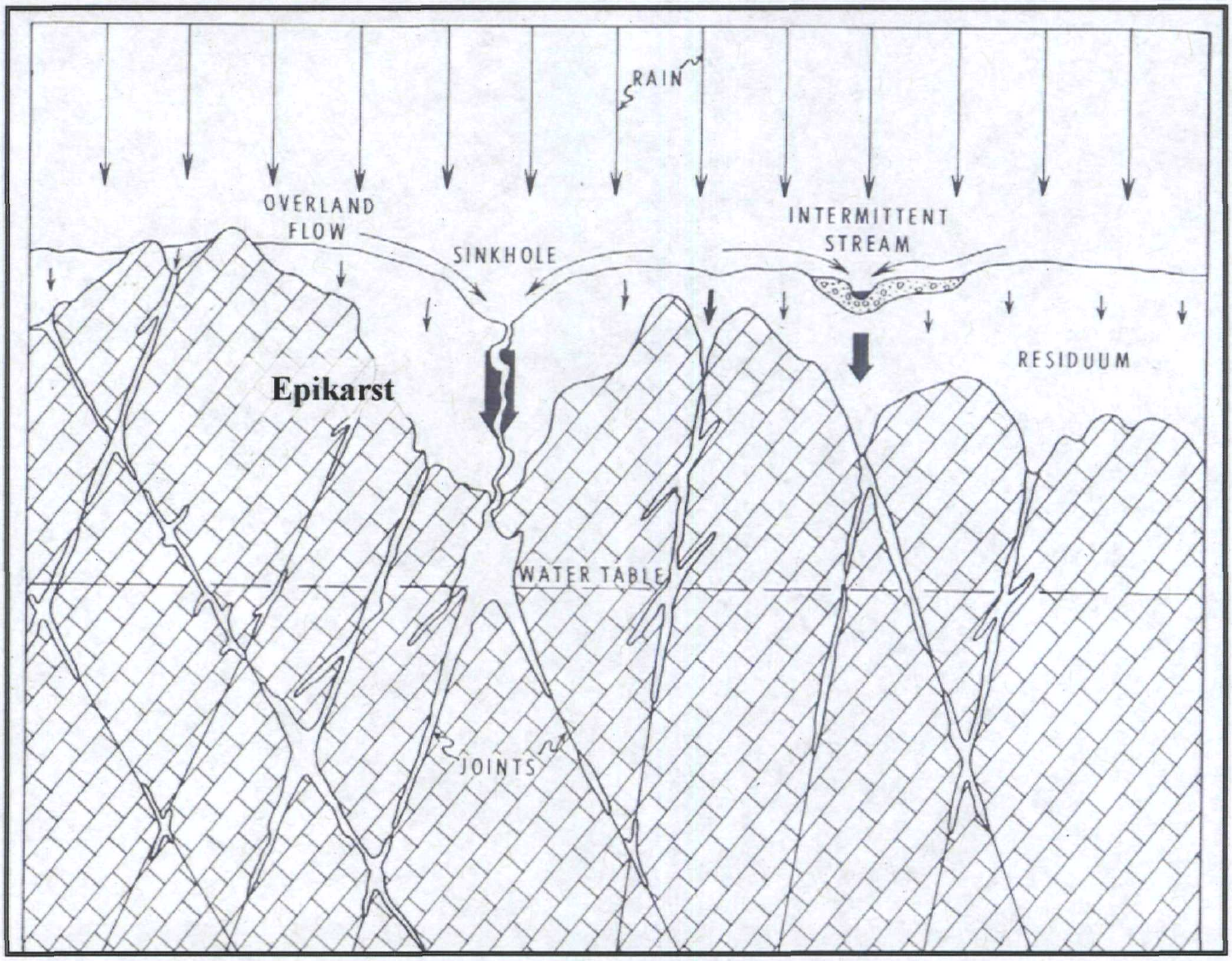
East view of Conococheague LS outcrop along railroad tracks adjacent to and west of NW corner of site.



East view of Conococheague LS outcrop along railroad tracks adjacent to and west NW corner of site. Note bedding planes and multiple fracture directions.

X:\EPA010\Central_Chemical\Final_ROD
Outcrops.cdr
Revised: 09/25/09 TH
Source: Maryland Department of the Environment

Figure 5
Depiction of "Pinnacle and Grike" Karst Terrain Features
Central Chemical NPL Site
Hagerstown, Maryland



X:\EPA010\Central_Chemical\Final_ROD
Geology_Profile.cdr
Revised: 09/25/09 TH
Source: Nutter, L.J., 1973
Maryland Department of the Environment

Figure 6
Depiction of Epikarst
Central Chemical NPL Site
Hagerstown, Maryland

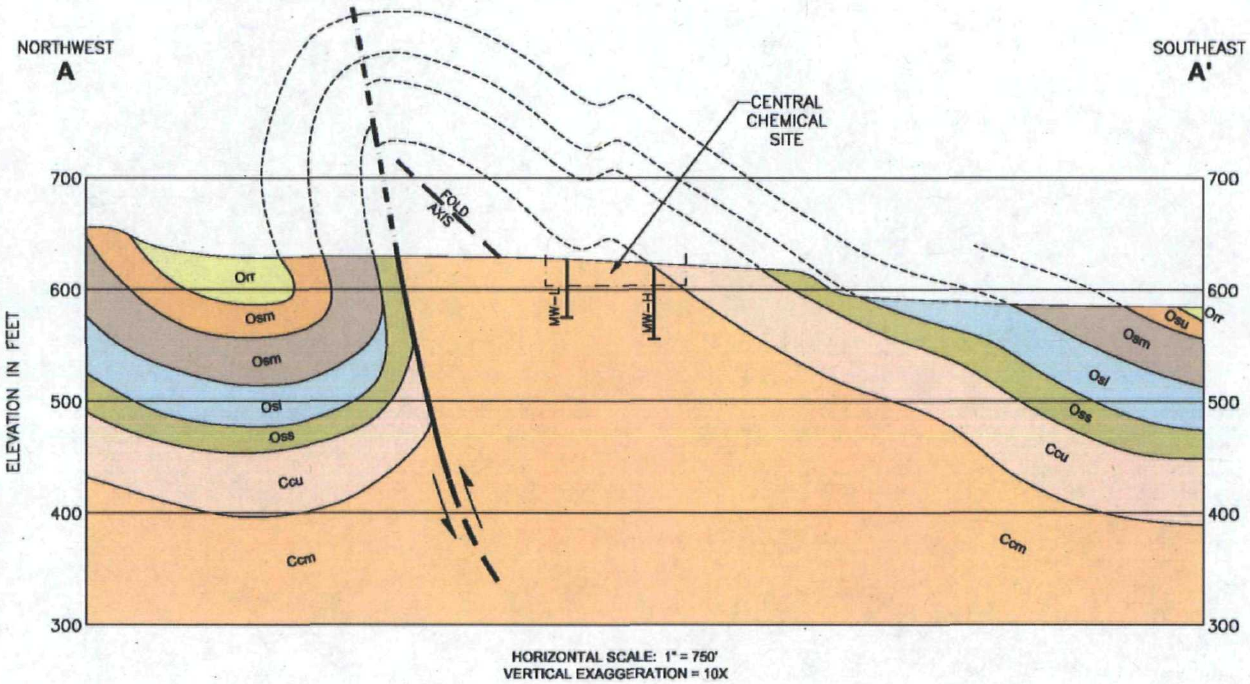


Figure 7
Geologic Cross-section
Central Chemical NPL Site
Hagerstown, Maryland

Legend

GEOLOGY

- Orr - Rockdale Run Formation

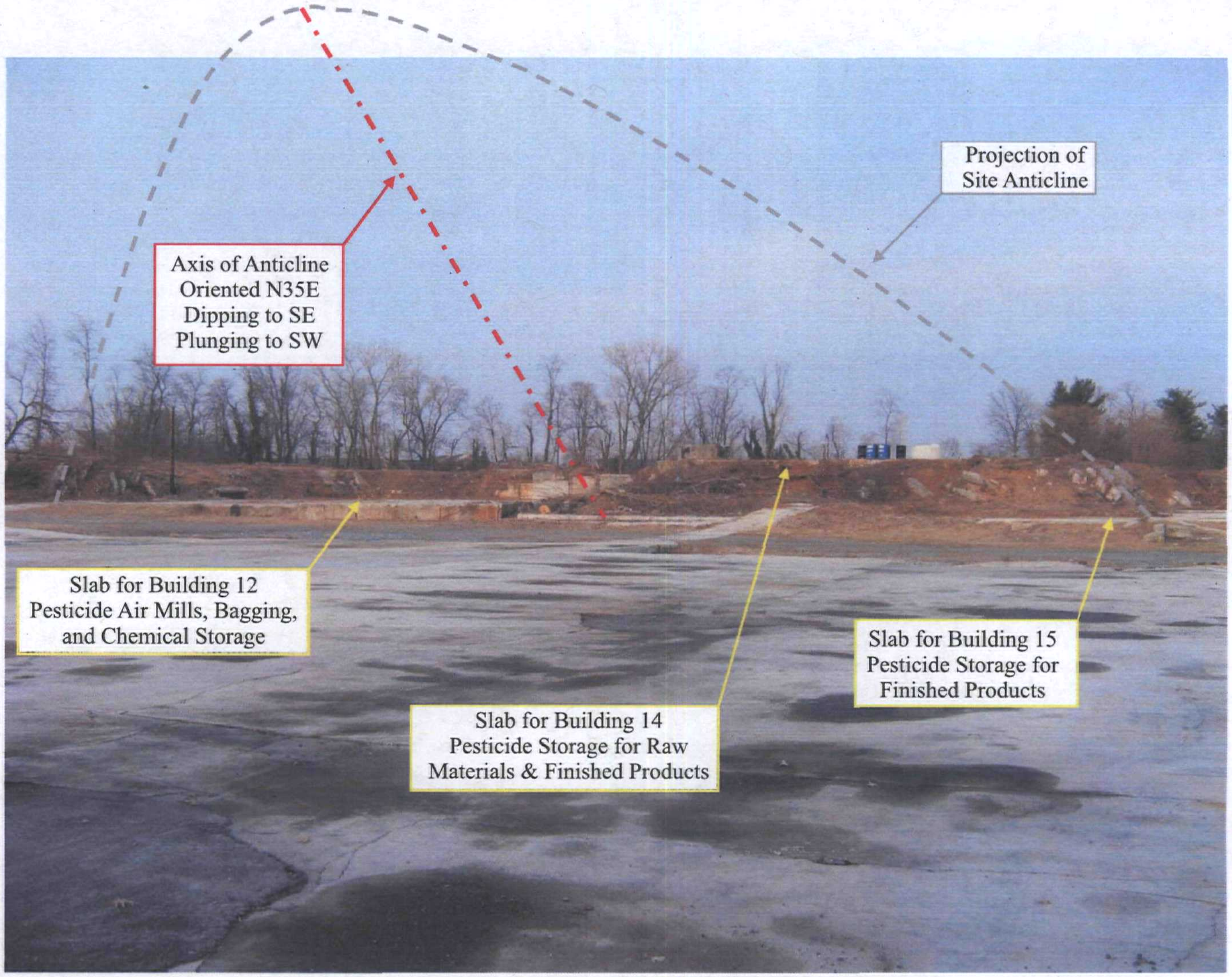
STONEHENGE FORMATION

- Osu - Upper Limestone Facies
- Osm - Middle Ribbon Carbonate Facies
- Osl - Lower Biohermal Limestone Facies
- Oss - Stoufferstown Member

CONOCOCHEAGUE FORMATION

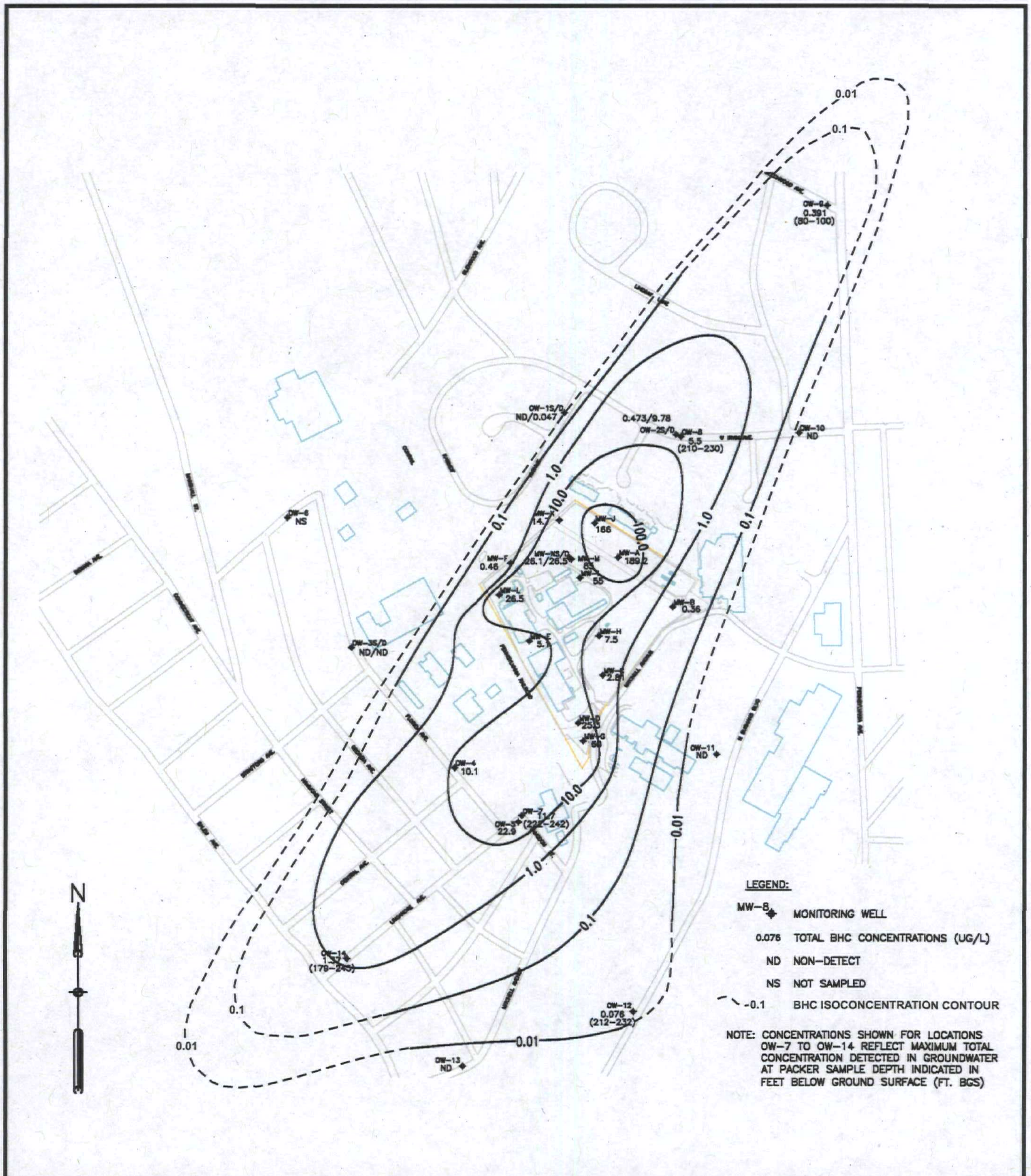
- Ccu - Upper Member
- Ccm - Middle Member

X:\EPA010\Central_Chemical\Final_ROD
Cross_Section.cdr
Revised: 09/25/09 TB
Source: Figure 4-8B,
Remedial Investigation Report, Vol.1
(URS, 2007 with 2008 Change pages)



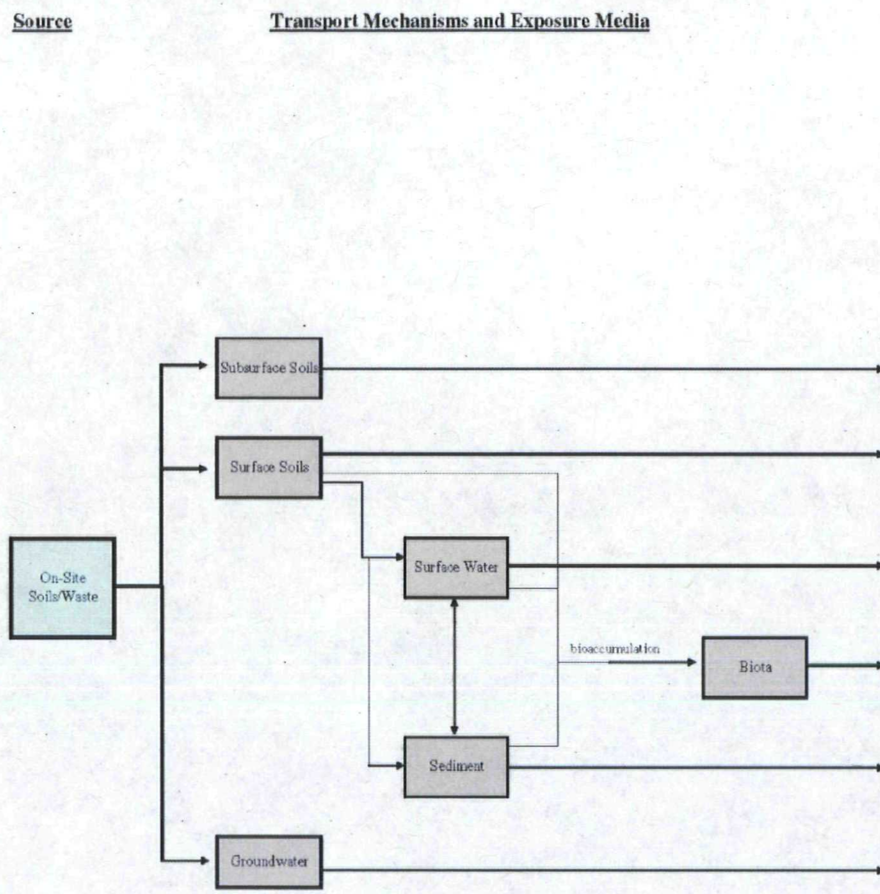
X:\EPA010\Central_Chemical\Final_ROD
Anticline.cdr
Revised: 09/18/09 TH
Source: Maryland Department of the Environment

Figure 8
Depiction of Anticline Feature
Central Chemical NPL Site
Hagerstown, Maryland



X:\EPA010\Central_Chemical\Final_ROD
BHC_Extent.cdr
Revised: 09/21/09 TB
Source: Modified Figure 1: Groundwater Summary Report (April 2003 to August 2006) (URS, 2007)

Figure 9
Depiction of Site-related Ground Water Contamination Plume
Central Chemical NPL Site
Hagerstown, Maryland



Receptors — Human

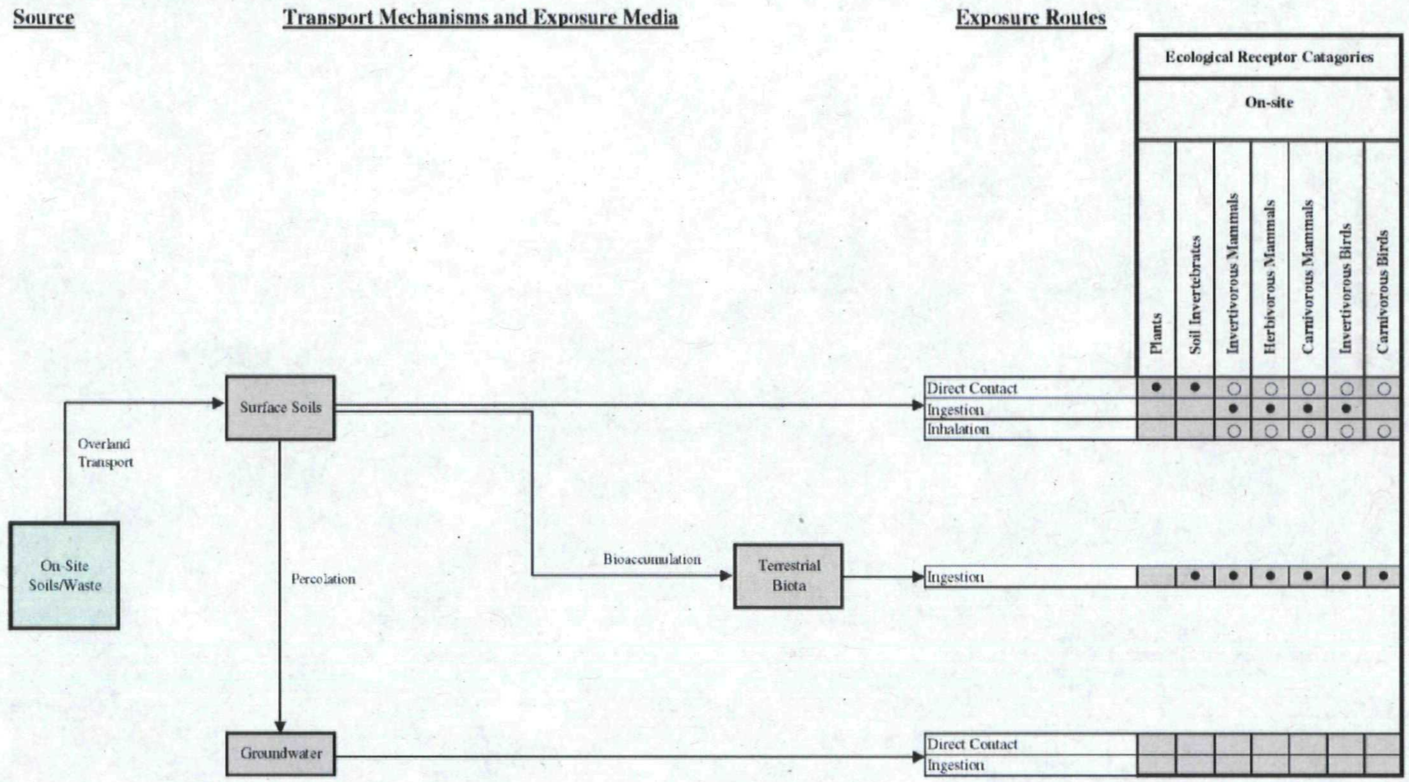
Exposure Media	Exposure Route	On-Site Current: Industrial Site Worker	On-Site Current: Trespassers	On-Site Current: Construction Workers	On-Site Future: Industrial Site Worker	On-Site Future: Trespassers	On-Site Future: Construction Workers	On-Site Future: Hypothetical Future Residents	Off-Site Current: Juvenile Recreator	Off-Site Current: Adult Recreator	Off-Site Current: Residents	Off-Site Future: Juvenile Recreator	Off-Site Future: Adult Recreator	Off-Site Future: Hypothetical Future Residents
Subsurface Soils	Dermal Contact						●	●			●			●
	Ingestion						●	●			●			●
	Inhalation						●	●			●			●
Surface Soils	Dermal Contact		●		●	●	●	●			●			●
	Ingestion		●		●	●	●	●			●			●
	Inhalation		●		●	●	●	●			●			●
Surface Water	Dermal Contact								●	●		●	●	
	Ingestion								●	●		●	●	
	Inhalation													
Biota	Ingestion								●	●		●	●	
Sediment	Dermal Contact								●	●		●	●	
	Ingestion								●	●		●	●	
	Inhalation													
Groundwater	Dermal Contact							●						●
	Ingestion							●						●
	Inhalation							●						●

NOTE:
● = POTENTIAL EXPOSURE PATHWAY
BLANK = INCOMPLETE OR INSIGNIFICANT PATHWAY

DATA PRESENTED AS FIGURE W-1 IN REMEDIAL INVESTIGATION REPORT VOL. 3
APPENDIX W NOVEMBER 2007 WITH MARCH 2008 CORRECTED PAGES

X:\EPA010\Central_Chemical\Final_ROD
Conceptual_Model.cdr
Revised: 09/25/09 TH
Source: Figure W-1, Remedial Investigation Report, Vol.3
Appendix W (URS, 2007 with 2008 Change pages)

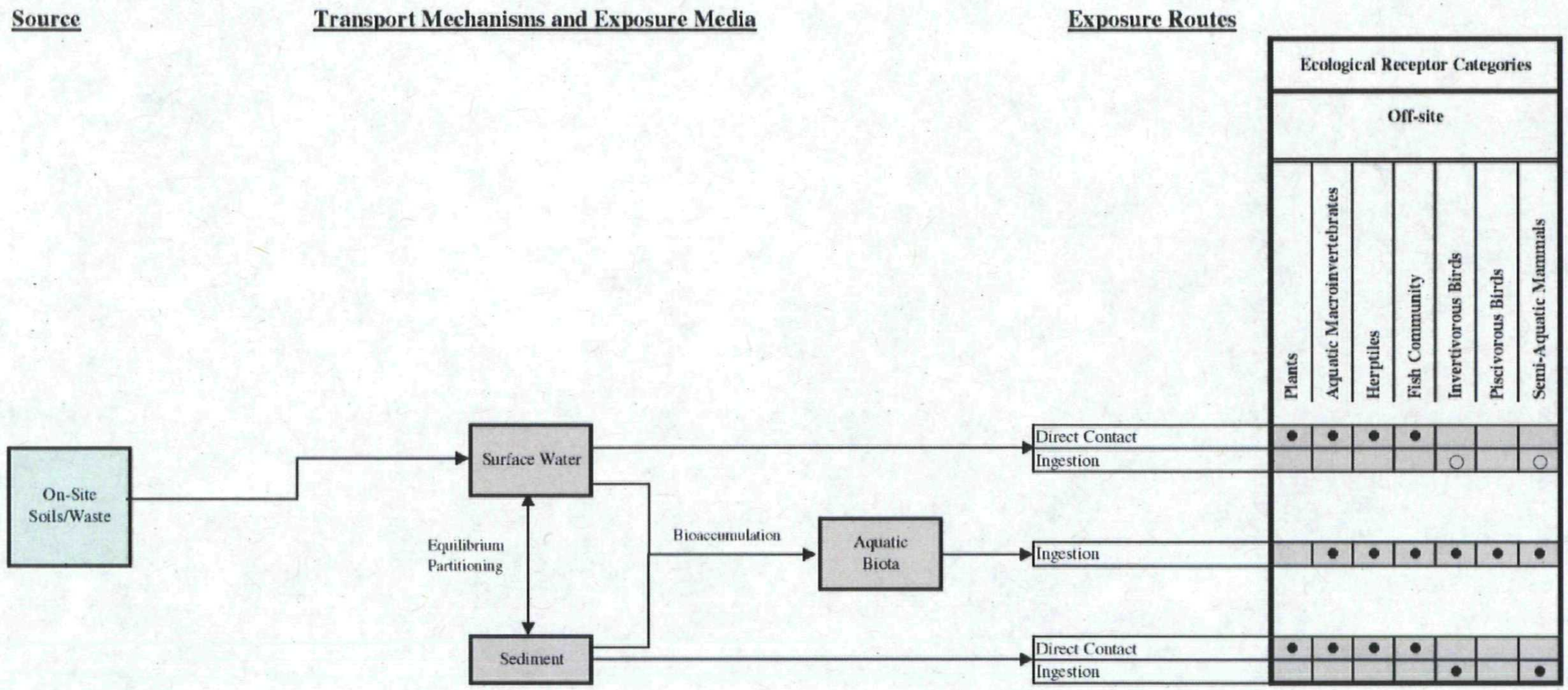
Figure 10
Conceptual Site Model
Human Health Risk Assessment
Central Chemical NPL Site
Hagerstown, Maryland



NOTE:
● = POTENTIAL EXPOSURE PATHWAY
○ = MINOR PATHWAY
BLANK = INCOMPLETE OR INSIGNIFICANT PATHWAY

X:\EPA010\Central_Chemical\Final_ROD
Terrestrial_Mode.cdr
Revised: 09/25/09 TH
Source: Figure 3-1, Remedial Investigation Report, Vol.4
Appendix X (URS, 2007 with 2008 Change pages)

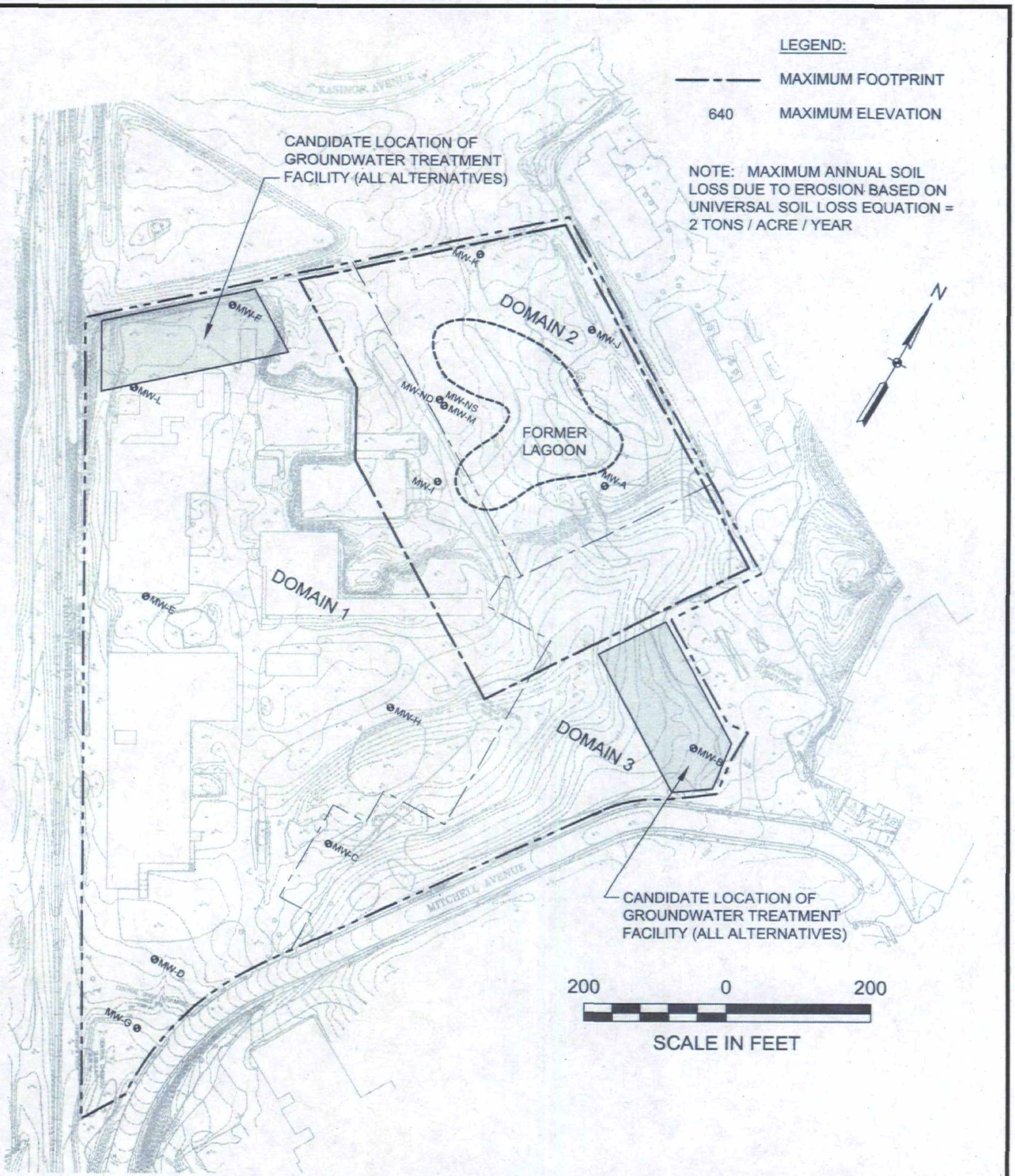
Figure 11
Conceptual Site Model
Terrestrial Ecological Risk Assessment
Central Chemical NPL Site
Hagerstown, Maryland



NOTE:
● = POTENTIAL EXPOSURE PATHWAY
○ = MINOR PATHWAY
BLANK = INCOMPLETE OR INSIGNIFICANT PATHWAY

X:\EPA010\Central_Chemical\Final_ROD
Aquatic_Model.cdr
Revised: 09/25/09 TH
Source: Figure 3-2, Remedial Investigation Report, Vol.4
Appendix X (URS, 2007 with 2008 Change pages)

Figure 12
Conceptual Site Model
Aquatic Ecological Risk Assessment
Central Chemical NPL Site
Hagerstown, Maryland



X:\EPA010\Central_Chemical\Final_ROD
Cover_System.cdr
Revised: 09/25/09 TH
Source: Drawing 3-1A, Feasibility Study Report (URS, 2008)

Figure 13
Depiction of Low-Permeability Cover System
Central Chemical NPL Site
Hagerstown, Maryland

MDE

MARYLAND DEPARTMENT OF THE ENVIRONMENT
1800 Washington Boulevard • Baltimore MD 21230
410-537-3000 • 1-800-633-6101

Mitch Cron
Remedial Project Manager
U.S. EPA Region III
Hazardous Site Cleanup Division (3HS22)
1650 Arch Street
Philadelphia PA 19103-2029

Re: Record of Decision, Central Chemical Superfund Site – Operable Unit 1, Hagerstown, MD

Dear Mr. Cron:

The Land Restoration Program of the Maryland Department of the Environment (Department) has reviewed the above-referenced document. The Department issued an earlier letter regarding this Record of Decision (ROD) which documents the EPA's remedial decision for Operable Unit 1 (OU1) at the Central Chemical site. This letter supersedes that letter.

The remedy selected (Alternative 2A) by the EPA as outlined in the Central Chemical OU-1 ROD includes the solidification/stabilization (S/S) of the former waste lagoon contents, excavation and consolidation of contaminated site soils from Domains 1 and 2 over the S/S materials within Domain 3, capping of contaminated soils with a low permeability cover system, installation of a groundwater/leachate containment system in the vicinity of the former lagoon, pre-remedial design investigations (pre-RDI) as described in the ROD, and implementation of institutional controls to limit the reuse of the Central Chemical property. The selected remedy also states that contents of the former waste lagoon which cannot be successfully treated by solidification/stabilization (i.e. do not achieve the solidification/stabilization performance standards described in the selected remedy) will be excavated and transported off-site for treatment, as necessary, and disposed of off-site at an off-site waste disposal facility in accordance with CERCLA §121(d)(3).

Based upon the acceptable level of protection to human health and the environment provided by the remedy, the Department concurs with the selected remedy. If you have any questions, please contact me at (410) 537-3437.

Sincerely,

James Carroll
Program Administrator
Land Restoration Program

cc: Mr. Horacio Tablada

TABLES

Table 1
Risk Levels on Central Chemical Property

Area of the Site	Receptor	Media	Exposure	Hazard Index*	Cancer Risk*
Domain 1	Juvenile Trespasser	Surface soil	Incidental Ingestion Dermal Contact Inhalation (dust)	16.7	1.18×10^{-3}
Domain 1	Adult Trespasser	Surface soil	Incidental Ingestion Dermal Contact Inhalation (dust)	1.96	1.4×10^{-3}
Domain 1	Combined Juvenile and Adult Trespasser	Surface soil	Incidental Ingestion Dermal Contact Inhalation (dust)	Not evaluated**	1.956×10^{-3}
Domain 1	Site Worker	Surface soil	Incidental Ingestion Dermal Contact Inhalation (dust)	17.5	2.53×10^{-3}
Domain 1	Construction/Excavation Worker	Surface and subsurface soil	Incidental Ingestion Dermal Contact Inhalation (dust)	42.8	1.47×10^{-4}
Domain 1	Hypothetical Future Resident	Surface and subsurface soil	Incidental Ingestion Dermal Contact Inhalation (dust)	474	1.36×10^{-2}
Domain 2	Juvenile Trespasser	Surface soil	Incidental Ingestion Dermal Contact Inhalation (dust)	0	7.58×10^{-5}
Domain 2	Adult Trespasser	Surface soil	Incidental Ingestion Dermal Contact Inhalation (dust)	0	9.19×10^{-5}
Domain 2	Combined Juvenile and Adult Trespasser	Surface soil	Incidental Ingestion Dermal Contact Inhalation (dust)	Not evaluated**	1.33×10^{-4}
Domain 2	Site Worker	Surface soil	Incidental Ingestion Dermal Contact Inhalation (dust)	0	1.81×10^{-4}
Domain 2	Construction/Excavation Worker	Surface and subsurface soil	Incidental Ingestion Dermal Contact Inhalation (dust)	21.1	2.79×10^{-4}
Domain 2	Hypothetical Future Resident	Surface and subsurface soil	Incidental Ingestion Dermal Contact Inhalation (dust)	218	2.42×10^{-2}
Domain 3	Juvenile Trespasser	Surface soil	Incidental Ingestion Dermal Contact Inhalation (dust)	0	5.86×10^{-5}
Domain 3	Adult Trespasser	Surface soil	Incidental Ingestion Dermal Contact Inhalation (dust)	0	7.04×10^{-5}

Table 1
Risk Levels on Central Chemical Property (continued)

Area of the Site	Receptor	Media	Exposure	Hazard Index*	Cancer Risk*
Domain 3	Combined Juvenile and Adult Trespasser	Surface soil	Incidental Ingestion Dermal Contact Inhalation (dust)	Not evaluated**	$1.02x10^{-4}$
Domain 3	Site Worker	Surface soil	Incidental Ingestion Dermal Contact Inhalation (dust)	0	$1.31x10^{-4}$
Domain 3	Construction/Excavation Worker	Surface and subsurface soil	Incidental Ingestion Dermal Contact Inhalation (dust)	0	$6.94x10^{-6}$
Domain 3	Hypothetical Future Resident	Surface and subsurface soil	Incidental Ingestion Dermal Contact Inhalation (dust)	13.3	$6.22x10^{-4}$

*Based on Reasonable Maximum Exposure parameters.
**The cumulative non-cancer hazard indices were not evaluated for combined juvenile and adult receptor scenarios because the separate evaluations of the adult and juvenile scenarios provided a sufficient evaluation of non-cancer hazards.

Table 2
Risk Levels on Adjacent Residential Properties

Area of the Site	Receptor	Media	Exposure	Hazard Index*	Cancer Risk*
Adjacent residential properties to NW and NE of Central Chemical property	Resident	Surface and subsurface soil	Incidental Ingestion Dermal Contact Inhalation (dust)	1.99	6.01×10^{-5}

*Based on Reasonable Maximum Exposure parameters.

Table 3
Risk Levels – Antietam Creek

Area of the Site	Receptor	Media	Exposure	Hazard Index*	Cancer Risk
Antietam Creek – Upstream of Site	Juvenile recreator/swimmer (combined small child and juvenile)	Surface water and sediment	Incidental Ingestion Dermal Contact	0	$3.86x10^{-6}$
Antietam Creek – Upstream of Site	Adult recreator/swimmer	Surface water and sediment	Incidental Ingestion Dermal Contact	0	$2.48x10^{-5}$
Antietam Creek – Upstream of Site	Combined Juvenile and adult recreator/swimmer	Surface water and sediment	Incidental Ingestion Dermal Contact	Not evaluated*	$1.44x10^{-5}$
Antietam Creek – Upstream of Site	Juvenile recreator/angler (combined small child and juvenile)	Fish tissue	Ingestion	0	$2.19x10^{-5}$
Antietam Creek – Upstream of Site	Adult recreator/angler	Fish tissue	Ingestion	0	$3.08x10^{-5}$
Antietam Creek – Upstream of Site	Combined Juvenile and adult recreator/angler	Fish tissue	Ingestion	Not evaluated*	$3.61x10^{-5}$
Antietam Creek – downstream of Site	Juvenile recreator/swimmer (combined small child and juvenile)	Surface water and sediment	Incidental Ingestion Dermal Contact	0	$6.29x10^{-6}$
Antietam Creek – downstream of Site	Adult recreator/swimmer	Surface water and sediment	Incidental Ingestion Dermal Contact	0	$3.53x10^{-5}$
Antietam Creek – downstream of Site	Combined Juvenile and adult recreator/swimmer	Surface water and sediment	Incidental Ingestion Dermal Contact	Not evaluated*	$2.67x10^{-5}$
Antietam Creek – downstream of Site	Juvenile recreator/angler (combined small child and juvenile)	Fish tissue	Ingestion	0	$1.15x10^{-5}$
Antietam Creek – downstream of Site	Adult recreator/angler	Fish tissue	Ingestion	0	$1.67x10^{-5}$
Antietam Creek – downstream of Site	Combined Juvenile and adult recreator/angler	Fish tissue	Ingestion	Not evaluated*	$2.18x10^{-5}$

* The cumulative non-cancer hazard indices were not evaluated for certain combined juvenile and adult receptor scenarios because the juvenile scenario provided a more conservative evaluation for non-cancer hazards.

Table 4
Remedial Action Objectives

Environmental Media	Remedial Action Objective
Soil	For Human Health: Prevent exposure (direct contact, ingestion, inhalation) to contaminated soils that would result in unacceptable levels of risk to human health. For Environmental Protection: Prevent exposure (direct contact, ingestion, inhalation) of ecological receptors to contaminated soils that would result in unacceptable levels of risk. For Environmental Protection: Prevent migration of contaminants from soils that would result in ground water contamination that exceeds ground water performance standards that are protective of human health and the environment.
Principal Threat Waste (including contents of the Former Waste Lagoon, powder, sludge, etc.) – Discussed further in Section 2.11	For Human Health: Prevent exposure (direct contact, ingestion, inhalation) to contaminated principal threat wastes that would result in unacceptable levels of risk to human health. For Environmental Protection: Prevent exposure (direct contact, ingestion, inhalation) of ecological receptors to contaminated principal threat wastes that would result in unacceptable levels of risk. For Environmental Protection: Prevent migration of contaminants from principal threat waste that would result in ground water contamination that exceeds ground water performance standards that are protective of human health and the environment. For Environmental Protection: Treat principal threat wastes identified at the Site to reduce the toxicity, volume, and/or mobility of Site wastes.

Table 5
Off-Site Remediation Volumes for Alternatives 4 and 5

Alternative	Hazardous Waste – Requiring Treatment Prior to Disposal	Non-Hazardous Waste – Off-Site Disposal Only without Treatment
4	15,100 cubic yards (cy)	23,900 cy
5	15,100 cy	51,050 cy

Table 6
Cost Estimates for Remedial Alternatives

	Alternative 2A	Alternative 4	Alternative 5
Capital Costs:	$11,518,772	$30,618,451	$33,342,456
Annual Operation and Maintenance (O&M) Costs	$465,000	$491,000	$425,000
Total O&M costs	$2,642,687	$4,567,875	$3,369,353
Present Worth for Capital and 30-year O&M costs	$14,350,772*	$35,375,639	$36,901,122

*Costs associated with Alternative 2A assume that solidification/stabilization treatment will be effective for addressing the Former Waste Lagoon contents.

Table 7
Summary of Borings in Former Waste Lagoon

Boring Installer	Boring ID#	Depth of Sample (feet bgs)	Material Sampled	Contaminant Concentrations (ppm)
URS	B-1	3-5	White pasty material	Total DDX*: 30,000 Total Chlordane** : 4,000 Toxaphene: 37,000
URS	B-5	7.5-9.5	Soil with a trace of decomposing paper (exhibited pesticide/fertilizer odor)	Total DDX: 10,200 Total BHC***: 5,660 Total Chlordane: 109 Toxaphene: 9,100
Weston	BH-4	4-6	White clayey powder	Total DDX – 96,840
Weston	BH-2	12-14	Black fibrous shiny goopy clay	Total DDX – 31,000
Weston	BH-1	6-8	Yellow powder (exhibiting very strong pesticide odor)	Total DDX: 6,840 Total BHC: 370
URS	B-3	9.5-11.5	Yellow crystalline material	Total DDX: 144,700 Total BHC: 1,300
URS	B-7	5-7	Soil, decomposing paper, "impacted material"	Total DDX: 17,000 Total BHC: 2,330 Total Chlordane: 930 Dieldrin <100 Heptachlor 230 Toxaphene: 140,000

* Total DDX: summation of DDT isomers and breakdown products (4,4-DDT, 2,4-DDT, 4,4-DDD, 2,4-DDD, 4,4-DDE, 2,4-DDE)
** Total Chlordane: summation of chlordane isomers.
*** Total BHC: summation of BHC isomers
ID# = identification number
URS = URS Corporation
Weston = Roy F. Weston, Inc.
bgs = below ground surface
ppm = parts per million

Table 8
Description of ARARS for Selected Remedy

Authority	Medium	Requirement	Status	Synopsis of Requirement	Action to be Taken to Attain Requirement
Contaminant-Specific Applicable or Relevant and Appropriate Requirements (ARARS)					
Federal	Ground water	Clean Water Act – National Pretreatment Standards 40 Code of Federal Regulations (CFR) Part 403, Sections 403.5 and 403.6(c) through (e)	Applicable	Sets standards to control pollutants which pass through or interfere with treatment processes in publicly owned treatment works (POTW) or which may contaminate sewage sludge.	The Selected Remedy will comply with the substantive portions of these ARARs by treating extracted ground water/leachate prior to discharge to a POTW.
State	Principal threat waste	Hazardous Waste Regulations Code of Maryland Annotated Relations (COMAR) 26.13.02.04(A)(2), .07 thru .09, and .15 - .19	Applicable	Establishes criteria for identification, classification, etc. of hazardous waste in Maryland.	Principal threat waste will be classified, as necessary, in accordance with the substantive portions of this ARAR.
Action-Specific ARARS					
State	Remedial design, remedial action and operation and maintenance (O&M)	COMAR 26.13.05.02E	Relevant and Appropriate	Establishes security requirements for Hazardous Waste Treatment, Storage, Disposal facilities.	The substantive portions of this requirement will be complied with during the remedial action and during long-term O&M activities to ensure that access to the Site is restricted as necessary, that the remedy is protective of human health, and that the integrity of the constructed elements of the Selected Remedy are maintained.
State	Remedial design, remedial action and O&M	COMAR 26.13.05.02F	Relevant and Appropriate	Establishes inspection requirements for Hazardous Waste Treatment, Storage, Disposal facilities.	The substantive portions of this requirement will be complied with during long-term O&M to ensure that the remedy is protective of human health and the integrity of the constructed elements of the Selected Remedy is maintained.
State	Remedial design, remedial action and O&M	COMAR 26.13.05.03B	Relevant and Appropriate	Establishes design and operation requirements for Hazardous Waste Treatment, Storage, Disposal facilities.	The substantive portions of this requirement will be complied with during the remedial design of the constructed elements of the Selected Remedy, and during long-term O&M activities associated with the low permeability cover system, and the ground water monitoring, extraction, and treatment system.

Table 8 (continued)
Description of ARARS for Selected Remedy

Authority	Medium	Requirement	Status	Synopsis of Requirement	Action to be Taken to Attain Requirement
State	Remedial design, remedial action and O&M	COMAR 26.13.05.04	Relevant and Appropriate	Establishes contingency plan and emergency procedure requirements for Hazardous Waste Treatment, Storage, Disposal facilities.	The substantive portions of this requirement will be complied with to establish a contingency plan during the remedial action, and during long-term O&M activities.
State	Remedial design, remedial action and O&M	COMAR 26.13.05.06–.06-7	Relevant and Appropriate	Establishes requirements for releases from Solid Waste Management Units at Hazardous Waste Treatment, Storage, Disposal facilities.	The substantive portions of these requirements will be complied with during preparation of the long-term O&M plan for the Site.
State	Remedial design, remedial action and O&M	COMAR 26.13.05.07	Relevant and Appropriate	Establishes closure and post-closure requirements for Hazardous Waste Treatment, Storage, Disposal facilities.	The substantive portions of these requirements will be complied with during the remedial design, remedial action, and long-term O&M activities at the Site.
State	Remedial design, remedial action and O&M	COMAR 26.13.05.09	Relevant and Appropriate	Establishes requirements for use of containers at Hazardous Waste Treatment, Storage, Disposal facilities.	To the extent the use of on-Site containers is necessary on-Site the substantive portions of these requirements will be complied with during the remedial action, and long-term O&M activities.
State	Remedial design, remedial action and O&M	COMAR 26.13.05.11G	Relevant and Appropriate	Establishes closure requirements for surface impoundments at Hazardous Waste Treatment, Storage, Disposal facilities.	The substantive portions of these requirements will be complied with during response actions at the Former Waste Lagoon.
State	Remedial design, remedial action and O&M	COMAR 26.13.05.12	Relevant and Appropriate	Establishes requirements for waste piles at Hazardous Waste Treatment, Storage, Disposal facilities.	The substantive portions of these requirements will be complied with during the remedial design and remedial action, to the extent those activities involve waste piles.
State	Remedial design, remedial action and O&M	COMAR 26.13.05.13B–D, K	Relevant and Appropriate	Establishes requirements for land treatment at Hazardous Waste Treatment, Storage, Disposal facilities.	The substantive portions of these requirements will be complied with during the solidification/ stabilization (S/S) treatability study and subsequent S/S treatment of the Former Waste Lagoon
State	Remedial design, remedial action and O&M	COMAR 26.13.05.14B–C, J	Relevant and Appropriate	Establishes requirements for landfills at Hazardous Waste Treatment, Storage, Disposal facilities.	The substantive portions of these requirements will be complied with during the construction of the low permeability cover system and ground water monitoring, extraction, and treatment system and subsequent long-term O&M activities involving this feature of the Selected Remedy.

Table 8 (continued)
Description of ARARS for Selected Remedy

Authority	Medium	Requirement	Status	Synopsis of Requirement	Action to be Taken to Attain Requirement
State	Remedial design, remedial action and O&M	COMAR 26.13.02.16–.19	Applicable	Defines those solid wastes that are subject to regulation as hazardous wastes.	As necessary, waste classification during the remedial design and remedial action will comply with the substantive portions these requirements.
Federal	Remedial design, remedial action and O&M	40 CFR Part 50, Sections 50.4 through 50.13	Applicable	Establishes standards from ambient air quality to protect public health and welfare.	The substantive portions of these requirements will be met when there are air emissions during the remedial action, and during certain portions of the pre-remedial design investigation (e.g. treatability study).
State	Remedial design, remedial action and O&M	COMAR 26.17.01.05 and .11 Erosion and Sediment Control	Applicable	Establishes standards and specifications for erosion and sediment control for projects involving ground disturbance.	The substantive portions of these requirements will be complied with during response actions at the Site.
State	Remedial design, remedial action and O&M	COMAR 26.17.02.06A(3); COMAR 26.17.02.08; COMAR 26.17.02.09	Applicable	Requires a storm water management plan. Provides for specific minimum control requirements for storm water management. Describes specific storm water management design criteria.	The substantive portions of these requirements will be complied with during response actions at the Site.
Federal	Remedial action and O&M	40 CFR Part 50, Sections 50.4 through 50.14	Applicable	Establishes standards for ambient air quality to protect public health and welfare.	The substantive portions of these requirements will be complied with for air emission control during the remedial action (e.g. excavation activities), and during long-term operation of the ground water monitoring, extraction and treatment system.
State	Remedial design, remedial action and O&M	COMAR 26.11.06.02 (Visible emissions) COMAR 26.11.06.03 (Particulate matter) COMAR 26.11.06.04 (Carbon Monoxide) COMAR 26.11.06.05 (Sulfur Compounds) COMAR 26.11.06.06 (Volatile Organic Compound) COMAR 26.11.06.09 (Odors)	Applicable	Provides air quality standards, general emission standards and restrictions for air emissions from articles, machines, equipment, etc. capable of generating, causing, or reducing emissions.	Any equipment or construction activities capable of generating, causing, or reducing emissions (e.g. excavation, air-stripper) shall meet the substantive requirements of these regulations. However, no permit will be required.

Table 8 (continued)
Description of ARARS for Selected Remedy

Authority	Medium	Requirement	Status	Synopsis of Requirement	Action to be Taken to Attain Requirement
State	Remedial design, remedial action and O&M	COMAR 26.11.15.03.B (Exemptions) COMAR 26.11.15.04 A and C (Requirements to quantify emissions) COMAR 26.11.15.05 (Control Technology requirements) COMAR 26.11.15.06 (Ambient Impact requirements) COMAR 26.11.15.07 (Demonstrating compliance with Regulation .06) COMAR 26.11.16.03 (Screening Levels) COMAR 26.11.16.06 (Class I Toxic Air Pollutants) COMAR 26.11.16.07 (Existing Sources) COMAR 26.11.16.08 (Nuisance particles) COMAR 26.11.16.09 (Levels Used To Review Ambient Impacts)	Applicable	Requires air emissions of Toxic Air Pollutants ("TAPs") from new and existing sources to be quantified (also describes method of quantification); establishes ambient air quality standards and emission limitations for TAP emissions from new sources; requires best available control technology for toxics for new sources.	The ground water monitoring, extraction and treatment system will be designed and operated to meet these standards. No permit will be obtained (only the substantive requirements shall be complied with).
Federal	N/A	National Historic Preservation Act (NHPA), 16 USC Section 470, et seq., 36 CFR Part 800	Relevant and Appropriate	Establishes policy and procedures for historic preservation of archaeological, historic and other cultural resources.	The substantive portions of these requirements will be complied with to "avoid, minimize, or mitigate" any potential adverse effect on archaeological, historic and other cultural resources.
To Be Considered					
Federal	Air	OSWER Directive 9355.0-28, "Control of Air Emissions from Superfund Air Strippers at Superfund Ground water Sites"	To be considered	Addresses air emissions from air-strippers at Superfund sites.	This To-Be-Considered will be considered during the Remedial Design, and operation of the ground water monitoring, extraction, and treatment system.
Federal	Remedial design, remedial action and O&M	40 CFR 264.19	To be considered	Establishes requirements for a Construction quality assurance program for constructed features at Hazardous Waste Treatment, Storage, Disposal facilities.	This To-Be-Considered will be complied with during the remedial action to ensure that the remedial action is performed in accordance with the remedial design documents.

Table 8 (continued)
Description of ARARS for Selected Remedy

Authority	Medium	Requirement	Status	Synopsis of Requirement	Action to be Taken to Attain Requirement
MDE	Soil/Ground water	State of Maryland – Department of the Environment – Cleanup Standards for Soil and Groundwater, June 2008 (Interim Final Guidance, Update No 2.1)	To be considered	Cleanup standards for soil and ground water	This To-Be-Considered will be considered during the evaluation of background concentrations of metals in Hagerstown area soils.

Table 9
Summary of Remedial Investigation Soil Sample Results

Analyte	CAS_RN	Units	Frequency Detection	Minimum Detection	Maximum Detection	EPC (RME)
DOMAIN 1 – Subsurface Soils						
Pesticides						
2,4-DDD	53-19-0	µg/kg	45/84	0.99	28,000	95,500
2,4-DDE	3424-82-6	µg/kg	14/84	0.45	10,000	17,200
2,4-DDT	78-02-6	µg/kg	71/84	0.74	190,000	2,360,000
4,4-DDD	72-54-8	µg/kg	38/84	0.49	110,000	50,100
4,4-DDE	72-55-9	µg/kg	65/84	0.6	76,000	26,600
4,4-DDT	50-29-3	µg/kg	81/84	2.4	1,400,000	12,800,000
Aldrin	309-00-2	µg/kg	17/84	1.2	17,000	61,400
alpha-BHC	319-84-6	µg/kg	32/84	0.59	58,000	16,000
alpha-Chlordane	5103-71-9	µg/kg	23/84	1.6	4,700	7,370
beta-BHC	319-85-7	µg/kg	55/84	1.1	21,000	6,440
delta-BHC	319-86-8	µg/kg	25/84	1	22,000	5,010
Dieldrin	60-57-1	µg/kg	34/84	2.2	4,100	22,500
Diphenamid	957-51-7	µg/kg	11/84	1.3	270	--
Endrin	72-20-8	µg/kg	9/84	2.5	44	860
Endrin Ketone	53494-70-5	µg/kg	8/84	2.1	2,300	10,200
gamma-BHC	58-89-9	µg/kg	28/84	1.2	3,400	5,020
gamma-Chlordane	5103-74-2	µg/kg	41/84	0.29	280,000	7,280
Heptachlor	76-44-8	µg/kg	18/84	0.37	210,000	5,790
Heptachlor Epoxide	1024-57-3	µg/kg	15/84	1.2	4,600	5,080
Toxaphene	8001-35-2	µg/kg	12/84	120	200,000	539,000
Herbicides						
2,4-D	94-75-7	µg/kg	1/24	28	28	--
SVOCs						
Benzo(a)pyrene	50-32-8	µg/kg	4/60	99	4,500	1,280
Hexachlorobenzene	118-74-1	µg/kg	0/60	0	0	1,580
Metals						
Antimony	7440-36-0	mg/kg	6/63	0.58	29	7.93
Arsenic	7440-38-2	mg/kg	84/84	3.9	118	42.1
Thallium	7440-28-0	mg/kg	44/84	0.16	4.1	1.23
DOMAIN 2 – Subsurface Soils						
Pesticides						
2,4-DDD	53-19-0	µg/kg	26/62	3.2	2,300,000	125,000
2,4-DDE	3424-82-6	µg/kg	13/62	1.5	120,000	62,600
2,4-DDT	78-02-6	µg/kg	54/62	2.5	33,000,000	898,000
4,4-DDD	72-54-8	µg/kg	26/62	0.95	10,000,000	299,000
4,4-DDE	72-55-9	µg/kg	51/62	2.8	920,000	88,600
4,4-DDT	50-29-3	µg/kg	60/62	3.8	130,000,000	5,280,000
Aldrin	309-00-2	µg/kg	11/62	1.1	2,600	25,100
alpha-BHC	319-84-6	µg/kg	25/62	1.1	3,100,000	175,000
alpha-Chlordane	5103-71-9	µg/kg	14/62	2	2,000,000	85,100
beta-BHC	319-85-7	µg/kg	41/62	1.3	240,000	20,400
delta-BHC	319-86-8	µg/kg	15/62	1.2	750,000	40,300
Dieldrin	60-57-1	µg/kg	27/62	3.7	140	31,500
Diphenamid	957-51-7	µg/kg	0/48	0	0	--

Analyte	CAS RN	Units	Frequency Detection	Minimum Detection	Maximum Detection	EPC (RME)
Endrin	72-20-8	µg/kg	6/62	2.4	22	270
Endrin Ketone	53494-70-5	µg/kg	8/62	7.5	42	270
gamma-BHC	58-89-9	µg/kg	17/62	1.2	1,700,000	78,500
gamma-Chlordane	5103-74-2	µg/kg	18/62	2	2,000,000	9,000
Heptachlor	76-44-8	µg/kg	9/62	0.45	840,000	38,600
Heptachlor Epoxide	1024-57-3	µg/kg	5/62	1.5	2.1	230
Toxaphene	8001-35-2	µg/kg	8/62	300	140,000,000	6,510,000
Herbicides						
2,4-D	94-75-7	µg/kg	0/6	0	0	--
SVOCs						
Benzo(a)pyrene	50-32-8	µg/kg	3/56	60	220	3,000
Hexachlorobenzene	118-74-1	µg/kg	1/56	56	56	--
Metals						
Antimony	7440-36-0	mg/kg	7/56	0.59	18.1	7.91
Arsenic	7440-38-2	mg/kg	62/62	3.2	3,440	159
Thallium	7440-28-0	mg/kg	14/62	0.16	5.5	1.1
DOMAIN 1 – Surface Soil						
Pesticides						
2,4-DDD	53-19-0	µg/kg	192/251	2.2	1,900,000	167,000
2,4-DDE	3424-82-6	µg/kg	37/251	2.3	61,000	24,900
2,4-DDT	78-02-6	µg/kg	242/251	6.9	39,000,000	1,270,000
4,4-DDD	72-54-8	µg/kg	75/251	2	3,900,000	73,900
4,4-DDE	72-55-9	µg/kg	234/251	2.6	490,000	34,800
4,4-DDT	50-29-3	µg/kg	251/251	2.8	85,000,000	6,500,000
Aldrin	309-00-2	µg/kg	15/125	3.2	3,100,000	122,000
alpha-BHC	319-84-6	µg/kg	33/125	1.3	730,000	33,900
alpha-Chlordane	5103-71-9	µg/kg	60/125	1.1	120,000	71,700
beta-BHC	319-85-7	µg/kg	53/125	1.1	92,000	12,900
delta-BHC	319-86-8	µg/kg	16/125	1.4	170,000	10,700
Dieldrin	60-57-1	µg/kg	47/125	2.2	670,000	43,700
Diphenamid	957-51-7	µg/kg	19/125	1.5	1,700	--
Endrin	72-20-8	µg/kg	6/125	26	860	860
Endrin Ketone	53494-70-5	µg/kg	10/125	2.2	98,000	20,800
gamma-BHC	58-89-9	µg/kg	24/125	1.7	640,000	10,700
gamma-Chlordane	5103-74-2	µg/kg	67/125	1.3	120,000	87,500
Heptachlor	76-44-8	µg/kg	19/125	1.4	130,000	12,100
Heptachlor Epoxide	1024-57-3	µg/kg	10/125	9.6	83,000	10,800
Toxaphene	8001-35-2	µg/kg	12/125	650	6,200,000	1,150,000
Herbicides						
2,4-D	94-75-7	µg/kg	1/8	36	36	--
SVOCs						
Benzo(a)pyrene	50-32-8	µg/kg	31/117	37	3,800	2,540
Hexachlorobenzene	118-74-1	µg/kg	4/117	63	27,000	2,980
Metals						
Antimony	7440-36-0	mg/kg	30/117	0.51	27.5	8.83
Arsenic	7440-38-2	mg/kg	251/251	2.3	1,080	52.5
Thallium	7440-28-0	mg/kg	41/125	0.13	1.6	1.19
DOMAIN 2 – Surface Soil						
Pesticides						
2,4-DDD	53-19-0	µg/kg	26/43	2.4	460,000	970

Analyte	CAS RN	Units	Frequency Detection	Minimum Detection	Maximum Detection	EPC (RME)
2,4-DDE	3424-82-6	µg/kg	5/43	19	4,000	1,710
2,4-DDT	78-02-6	µg/kg	42/43	4.5	1,700,000	29,500
4,4-DDD	72-54-8	µg/kg	10/43	150	1,500,000	1,710
4,4-DDE	72-55-9	µg/kg	42/43	4.2	270,000	12,400
4,4-DDT	50-29-3	µg/kg	43/43	17	8,600,000	194,000
Aldrin	309-00-2	µg/kg	13/43	1	390,000	6,210
alpha-BHC	319-84-6	µg/kg	9/43	1.1	270,000	38
alpha-Chlordane	5103-71-9	µg/kg	14/43	4.4	2,100	2,100
beta-BHC	319-85-7	µg/kg	21/43	2.5	130,000	2,880
delta-BHC	319-86-8	µg/kg	7/43	1.9	17,000	887
Dieldrin	60-57-1	µg/kg	20/43	4.7	150,000	9,200
Diphenamid	957-51-7	µg/kg	3/35	2.7	6	--
Endrin	72-20-8	µg/kg	2/43	7.6	270	1,710
Endrin Ketone	53494-70-5	µg/kg	3/43	4.9	270	270
gamma-BHC	58-89-9	µg/kg	8/43	8.2	48,000	887
gamma-Chlordane	5103-74-2	µg/kg	15/43	1.4	30,000	1,900
Heptachlor	76-44-8	µg/kg	3/43	29	230	887
Heptachlor Epoxide	1024-57-3	µg/kg	4/43	1.4	230	887
Toxaphene	8001-35-2	µg/kg	4/43	420	3,700	3,700
Herbicides						
2,4-D	94-75-7	µg/kg	0/2	0	0	--
SVOCs						
Benzo(a)pyrene	50-32-8	µg/kg	15/41	49	45,000	10,100
Hexachlorobenzene	118-74-1	µg/kg	3/41	130	290	--
Metals						
Antimony	7440-36-0	mg/kg	4/41	0.57	1	--
Arsenic	7440-38-2	mg/kg	43/43	2.5	152	13.7
Thallium	7440-28-0	mg/kg	5/43	0.069	1.1	--
DOMAIN 3 – Surface Soil						
Pesticides						
2,4-DDD	53-19-0	µg/kg	8/17	8.2	9,500	2,240
2,4-DDE	3424-82-6	µg/kg	3/17	7.7	70	70
2,4-DDT	78-02-6	µg/kg	17/17	56	100,000	45,300
4,4-DDD	72-54-8	µg/kg	2/17	42	9,700	2,190
4,4-DDE	72-55-9	µg/kg	17/17	490	25,000	13,800
4,4-DDT	50-29-3	µg/kg	17/17	250	550,000	284
Aldrin	309-00-2	µg/kg	0/17	0	0	1,200
alpha-BHC	319-84-6	µg/kg	0/17	0	0	1,200
alpha-Chlordane	5103-71-9	µg/kg	3/17	4	460	460
beta-BHC	319-85-7	µg/kg	7/17	1.2	150	150
delta-BHC	319-86-8	µg/kg	0/17	0	0	1,200
Dieldrin	60-57-1	µg/kg	8/17	4.9	860	860
Diphenamid	957-51-7	µg/kg	0/17	0	0	--
Endrin	72-20-8	µg/kg	1/17	5.1	5.1	5.13
Endrin Ketone	53494-70-5	µg/kg	0/17	0	0	2,340
gamma-BHC	58-89-9	µg/kg	0/17	0	0	1,200
gamma-Chlordane	5103-74-2	µg/kg	3/17	2.9	240	240
Heptachlor	76-44-8	µg/kg	0/17	0	0	1,200
Heptachlor Epoxide	1024-57-3	µg/kg	0/17	0	0	1,200
Toxaphene	8001-35-2	µg/kg	2/17	44,000	810,000	158,000

Analyte	CAS_RN	Units	Frequency Detection	Minimum Detection	Maximum Detection	EPC (RME)
Herbicides						
2,4-D	94-75-7	µg/kg	0/0	0	0	--
SVOCs						
Benzo(a)pyrene	50-32-8	µg/kg	5/17	47	1,500	511
Hexachlorobenzene	118-74-1	µg/kg	0/17	0	0	--
Metals						
Antimony	7440-36-0	mg/kg	2/17	8.6	29.9	11.5
Arsenic	7440-38-2	mg/kg	17/17	2.7	25.9	16.2
Thallium	7440-28-0	mg/kg	2/17	1.2	1.9	1.45

Notes:
CAS_RN = Chemical Abstracts Service registry number
µg/kg = micrograms per kilograms
mg/kg = milligrams per kilogram
EPC = exposure point concentration based upon RME
SVOCs = *semivolatile organic compounds*
-- = not applicable
RME = reasonable maximum exposure

Table 10
Cancer Toxicity Data Summary

Chemical of Concern	CAS RN	Oral Cancer Slope Factor	Dermal Cancer Slope Factor	Slope Factor Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YYYY)
Pathway: Ingestion, Dermal							
2,4-DDD	53-19-0	2.4E-01	2.4E-01	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
2,4-DDE	3424-82-6	3.4E-01	3.4E-01	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
2,4-DDT	789-02-6	3.4E-01	3.4E-01	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
4,4-DDD	72-54-8	2.4E-01	2.4E-01	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
4,4-DDE	72-55-9	3.4E-01	3.4E-01	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
4,4-DDT	50-29-3	3.4E-01	3.4E-01	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
Aldrin	309-00-2	1.7E+01	1.7E+01	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
alpha-BHC	319-84-6	6.3E+00	6.3E+00	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
alpha-Chlordane[2]	5103-71-9	3.5E-01	3.5E-01	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
beta-BHC	319-85-7	1.8E+00	1.8E+00	$(mg/kg/day)^{-1}$	C	IRIS	10/25/2005
delta-BHC	319-86-8	1.8E+00	1.8E+00	$(mg/kg/day)^{-1}$	D	IRIS	10/25/2005
Dieldrin	60-57-1	1.6E+01	1.6E+01	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
Endrin	72-20-8	--	--	--	--	--	--
Endrin Ketone[3]	53494-70-5	--	--	--	--	--	--
gamma-BHC (Lindane)	58-89-9	1.3E+00	1.3E+00	$(mg/kg/day)^{-1}$	B2-C	HEAST	7/31/1997
gamma-Chlordane[2]	5103-74-2	3.5E-01	3.5E-01	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
Heptachlor	76-44-8	4.5E+00	4.5E+00	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
Heptachlor Epoxide	1024-57-3	9.1E+00	9.1E+00	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
Toxaphene	8001-35-2	1.1E+00	1.1E+00	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
2,4-Dichlorophenol	120-83-2	--	--	--	--	--	--
2,4,6-Trichlorophenol	88-06-2	1.1E-02	1.1E-02	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
Atrazine	1912-24-9	2.2E-01	2.2E-01	$(mg/kg/day)^{-1}$	C	HEAST	10/25/2005
Benzo(a)pyrene	50-32-8	7.3E+00	7.3E+00	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
Bis(2-ethyhexyl)phthalate	117-81-7	1.4E-02	2.5E-02	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
Diphenamid	957-51-7	--	--	--	--	--	--
Hexachlorobenzene	118-74-1	1.6E+00	1.6E+00	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
Pentachlorophenol	87-86-5	1.2E-01	1.2E-01	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
1,4-Dichlorobenzene	106-46-7	2.4E-02	2.4E-02	$(mg/kg/day)^{-1}$	C	HEAST	10/25/2005

Table 10 (continued)
Cancer Toxicity Data Summary

Chemical of Concern	CAS RN	Oral Cancer Slope Factor	Dermal Cancer Slope Factor	Slope Factor Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YYYY)
1,2-Dichloroethane	107-06-2	9.1E-02	9.1E-02	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
1,2,4-Trichlorobenzene	120-82-1	--	--	--	--	--	--
Benzene	71-43-2	5.5E-02	5.5E-02	$(mg/kg/day)^{-1}$	A	IRIS	10/25/2005
Chlorobenzene	108-90-7	--	--	--	--	--	--
Chloroform	67-66-3	--	--	--	--	--	--
Tetrachloroethene	127-18-4	5.4E-01	5.4E-01	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
Aluminum	7429-90-5	--	--	--	--	--	--
Antimony	7440-36-0	--	--	--	--	--	--
Arsenic	7440-38-2	1.5E+00	1.5E+00	1/mg/kg/day	A	IRIS	10/25/2005
Beryllium	7440-41-7	--	--	--	--	--	--
Iron	7439-89-6	--	--	--	--	--	--
Manganese	7439-96-5	--	--	--	--	--	--
Thallium	7440-28-0	--	--	--	--	--	--
Vanadium	7440-62-2	--	--	--	--	--	--
Zinc	7440-66-6	--	--	--	--	--	--

Chemical of Concern	CAS RN	Unit Risk	Unit Risk Units	Inhalation Cancer Slope Factor	Inhalation Cancer Slope Factor Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YYYY)
Pathway: Inhalation								
2,4-DDD	53-19-0	--	--	--	--	--	--	--
2,4-DDE	3424-82-6	--	--	--	--	--	--	--
2,4-DDT	789-02-6	9.7E-05	$1/\mu g/m^3$	3.4E-01	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
4,4-DDD	72-54-8	--	--	--	--	--	--	--
4,4-DDE	72-55-9	--	--	--	--	--	--	--
4,4-DDT	50-29-3	9.7E-05	$1/\mu g/m^3$	3.4E-01	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005
Aldrin	309-00-2	4.9E-03	$1/\mu g/m^3$	1.7E+01	$(mg/kg/day)^{-1}$	B2	IRIS	10/25/2005

Table 10 (continued)
Cancer Toxicity Data Summary

Chemical of Concern	CAS RN	Unit Risk	Unit Risk Units	Inhalation Cancer Slope Factor	Inhalation Cancer Slope Factor Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YYYY)
alpha-BHC	319-84-6	1.8E-03	1/µg/m^3	6.3E+00	(mg/kg/day)$^{-1}$	B2	IRIS	10/25/2005
alpha-Chlordane(2)	5103-71-9	1.0E-04	1/µg/m^3	3.5E-01	(mg/kg/day)$^{-1}$	B2	IRIS	10/25/2005
beta-BHC	319-85-7	5.3E-04	1/µg/m^3	1.8E+00	(mg/kg/day)$^{-1}$	C	IRIS	10/25/2005
delta-BHC	319-86-8	5.1E-04	1/µg/m^3	1.8E+00	(mg/kg/day)$^{-1}$	B2	IRIS	10/25/2005
Dieldrin	60-57-1	4.6E-03	1/µg/m^3	1.6E+01	(mg/kg/day)$^{-1}$	B2	IRIS	10/25/2005
Endrin	72-20-8	--	--	--	--	--	--	--
Endrin Ketone(3)	53494-70-5	--	--	--	--	--	--	--
gamma-BHC (Lindane)	58-89-9	--	--	--	--	--	--	--
gamma-Chlordane(2)	5103-74-2	1.0E-04	1/µg/m^3	3.5E-01	(mg/kg/day)$^{-1}$	B2	IRIS	10/25/2005
Heptachlor	76-44-8	1.3E-03	1/µg/m^3	4.5E+00	(mg/kg/day)$^{-1}$	B2	IRIS	10/25/2005
Heptachlor Epoxide	1024-57-3	2.6E-03	1/µg/m^3	9.1E+00	(mg/kg/day)$^{-1}$	B2	IRIS	10/25/2005
Toxaphene	8001-35-2	3.2E-04	1/µg/m^3	1.1E+00	(mg/kg/day)$^{-1}$	B2	IRIS	10/25/2005
2,4-Dichlorophenol	120-83-2	--	--	--	--	--	--	--
2,4,6-Trichlorophenol	88-06-2	3.1E-06	1/µg/m^3	1.0E-02	(mg/kg/day)$^{-1}$	B2	IRIS	10/25/2005
Atrazine	1912-24-9	--	--	--	--	--	--	--
Benzo(a)pyrene	50-32-8	8.9E-04	1/µg/m^3	3.1E+00	(mg/kg/day)$^{-1}$	B2	NCEA	10/25/2005
Bis(2-ethyhexyl)phthalate	117-81-7	4.0E-06	1/µg/m^3	1.4E-02	(mg/kg/day)$^{-1}$	B2	NCEA	10/25/2005
Diphenamid	957-51-7	--	--	--	--	--	--	--
Hexachlorobenzene	118-74-1	4.6E-04	1/µg/m^3	1.6E+00	(mg/kg/day)$^{-1}$	B2	IRIS	10/25/2005
Pentachlorophenol	87-86-5	--	--	--	--	--	--	--
1,4-Dichlorobenzene	106-46-7	6.29E-06	1/µg/m^3	2.2E-02	(mg/kg/day)$^{-1}$	C	NCEA	10/25/2005
1,2-Dichloroethane	107-06-2	2.6E-05	1/µg/m^3	9.1E-02	(mg/kg/day)$^{-1}$	B2	IRIS	10/25/2005
1,2,4-Trichlorobenzene	120-82-1	--	--	--	--	--	--	--
Benzene	71-43-2	7.8E-06	1/µg/m^3	2.7E-02	(mg/kg/day)$^{-1}$	A	IRIS	10/25/2005
Chlorobenzene	108-90-7	--	--	--	--	--	--	--
Chloroform	67-66-3	2.31E-05	1/µg/m^3	8.1E-02	(mg/kg/day)$^{-1}$	B2	IRIS	10/25/2005
Tetrachloroethene	127-18-4	5.71E-06	1/µg/m^3	2.0E-02	(mg/kg/day)$^{-1}$	B2	IRIS	10/25/2005
Aluminum	7429-90-5	--	--	--	--	--	--	--
Antimony	7440-36-0	--	--	--	--	--	--	--

Table 10 (continued)
Cancer Toxicity Data Summary

Chemical of Concern	CAS RN	Unit Risk	Unit Risk Units	Inhalation Cancer Slope Factor	Inhalation Cancer Slope Factor Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (MM/DD/YYYY)
Arsenic	7440-38-2	4.3E-03	$1/\mu g/m^3$	1.5E+01	$(mg/kg/day)^{-1}$	A	IRIS	10/25/2005
Beryllium	7440-41-7	2.4E-03	$1/\mu g/m^3$	8.4E+00	$(mg/kg/day)^{-1}$	B1	IRIS	10/25/2005
Iron	7439-89-6	--	--	--	--	--	--	--
Manganese	7439-96-5	--	--	--	--	--	--	--
Thallium	7440-28-0	--	--	--	--	--	--	--
Vanadium	7440-62-2	--	--	--	--	--	--	--
Zinc	7440-66-6	--	--	--	--	--	--	--

(1) Data provided in Tables 6.1 and 6.2 in Appendix E of the URS 2007 (with 2008 corrected pages) HHRA, Appendix W of the Remedial Investigation Report
(2) Toxicity values for Chlordaneare used for alpha and gamma Chlordane
(3) Toxicity values for Endrin are used for Endrin Ketone
HEAST: Health Effects Assessment Summary Table
IRIS: Integrated Risk Systems
NCEA: EPA National Center for Environmental Assessment
CAS RN: Chemical Abstracts Service Registry Number
--: No information available
$(mg/kg/day)^{-1}$: per milligram per kilogram per day
$1/\mu g/m^3$: per microgram per cubic meter
A: Known Human Carcinogen
B1: Probable Human Carcinogen (Limited Human Data)
B2: Probable Human Carcinogen (Inadequate Human Data)
C: Possible Human Carcinogen
D: Not Classifiable as to Human Carcenogenity

Table 11
Non-Cancer Toxicity Data Summary

Chemical of Concern	CAS RN	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 (MM/DD/YYYY)
Pathway: Ingestion, Dermal[1]										
2,4-DDD	53-19-0	Chronic	2.0E-03	mg/kg/day	2.0E-03	mg/kg/day	Spleen	10000	PPRTV	4/16/2007
2,4-DDE	3424-82-6	--	--	--	--	--	--	--	--	--
2,4-DDT	789-02-6	Chronic	5.0E-04	mg/kg/day	5.0E-04	mg/kg/day	Liver	100	PPRTV	10/25/2005
4,4-DDD	72-54-8	Chronic	2.0E-03	mg/kg/day	2.0E-03	mg/kg/day	Spleen	10000	PPRTV	4/16/2007
4,4-DDE	72-55-9	--	--	--	--	--	--	--	--	--
4,4-DDT	50-29-3	Chronic	5.0E-04	mg/kg/day	5.0E-04	mg/kg/day	Liver	100	IRIS	10/25/2005
Aldrin	309-00-2	Chronic	3.0E-05	mg/kg/day	3.0E-05	mg/kg/day	Liver	1000	IRIS	10/25/2005
alpha-BHC	319-84-6	--	--	--	--	--	--	--	--	--
alpha-Chlordane[2]	5103-71-9	Chronic	5.0E-04	mg/kg/day	5.0E-04	mg/kg/day	Liver	300	IRIS	10/25/2005
beta-BHC	319-85-7	--	--	--	--	--	--	--	--	--
delta-BHC	319-86-8	Chronic	3.0E-04	mg/kg/day	3.0E-04	mg/kg/day	Liver, Kidney	1000	IRIS	10/25/2005
Dieldrin	60-57-1	Chronic	5.0E-05	mg/kg/day	5.0E-05	mg/kg/day	Liver	100	IRIS	10/25/2005
Endrin	72-20-8	Chronic	3.0E-04	mg/kg/day	3.0E-04	mg/kg/day	Liver	100	IRIS	10/25/2005
Endrin Ketone[3]	53494-70-5	Chronic	3.0E-04	mg/kg/day	3.0E-04	mg/kg/day	Liver	100	IRIS	10/25/2005
gamma-BHC (Lindane)	58-89-9	Chronic	3.0E-04	mg/kg/day	3.0E-04	mg/kg/day	Liver, Kidney	1000	IRIS	10/25/2005
gamma-Chlordane[2]	5103-74-2	Chronic	5.0E-04	mg/kg/day	5.0E-04	mg/kg/day	Liver	300	IRIS	10/25/2005
Heptachlor	76-44-8	Chronic	5.0E-04	mg/kg/day	5.0E-04	mg/kg/day	Liver	300	IRIS	10/25/2005
Heptachlor Epoxide	1024-57-3	Chronic	1.3E-05	mg/kg/day	1.3E-05	mg/kg/day	Liver	1000	IRIS	10/25/2005
Toxaphene	8001-35-2	--	--	--	--	--	--	--	--	--
2,4-Dichlorophenol	120-83-2	Chronic	3.0E-03	mg/kg/day	3.0E-03	mg/kg/day	Blood	100	IRIS	10/8/2004
2,4,6-Trichlorophenol	88-06-2	--	--	--	--	--	--	--	--	--
Atrazine	1912-24-9	Chronic	3.5E-02	mg/kg/day	3.5E-02	mg/kg/day	Body Weight, Heart	100	IRIS	10/8/2004
Benzo(a)pyrene	50-32-8	--	--	--	--	--	--	--	--	--
Bis(2-ethyhexyl)phthalate	117-81-7	Chronic	2.0E-02	mg/kg/day	1.0E-02	mg/kg/day	Liver	1000	IRIS	10/8/2004
Diphenamid	957-51-7	Chronic	3.0E-02	mg/kg/day	3.0E-02	mg/kg/day	Liver	100	IRIS	10/8/2004
Hexachlorobenzene	118-74-1	Chronic	8.0E-04	mg/kg/day	8.0E-04	mg/kg/day	Liver	100	IRIS	10/8/2004
Pentachlorophenol	87-86-5	Chronic	3.0E-02	mg/kg/day	3.0E-02	mg/kg/day	Liver, Kidney	100	IRIS	10/8/2004
1,2-Dichloroethane	107-06-2	Chronic	--	--	--	--	--	--	--	--

Table 11 (continued)
Non-Cancer Toxicity Data Summary

Chemical of Concern	CAS RN	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 (MM/DD/YYYY)
1,2,4-Trichlorobenzene	120-82-1	Chronic	1.0E-02	mg/kg/day	1.0E-02	mg/kg/day	Kidney, Adrenal	1000	IRIS	10/8/2004
1,4-Dichlorobenzene	106-46-7	Chronic	3.0E-02	mg/kg/day	3.0E-02	mg/kg/day	Liver, Developmental	1000	NCEA	4/16/2007
Benzene	71-43-2	Chronic	4.0E-03	mg/kg/day	4.0E-03	mg/kg/day	Blood, Immune System	300	IRIS	10/8/2004
Chlorobenzene	108-90-7	Chronic	2.0E-02	mg/kg/day	2.0E-02	mg/kg/day	Liver	1000	IRIS	10/8/2004
Chloroform	67-66-3	Chronic	1.0E-02	mg/kg/day	1.0E-02	mg/kg/day	Liver	1000	IRIS	10/8/2004
Tetrachloroethene	127-18-4	Chronic	1.0E-02	mg/kg/day	1.0E-02	mg/kg/day	Liver	1000	IRIS	10/8/2004
Aluminum	7429-90-5	Chronic	1.0E+00	mg/kg/day	5.0E-03	mg/kg/day	CNS-Developmental	100	PPRTV	10/23/2006
Antimony	7440-36-0	Chronic	4.0E-04	mg/kg/day	6.0E-05	mg/kg/day	Blood, Liver	1000	IRIS/ HEAST	10/25/2005
Arsenic	7440-38-2	Chronic	3.0E-04	mg/kg/day	3.0E-04	mg/kg/day	Skin, Vascular System	3	IRIS	10/25/2005
Beryllium	7440-41-7	Chronic	2.0E-03	mg/kg/day	1.4E-05	mg/kg/day	Gastrointestinal	300	IRIS	10/25/2005
Iron	7439-89-6	Chronic	7.0E-01	mg/kg/day	7.0E-01	mg/kg/day	Gastrointestinal	1.5	PPRTV	9/11/2006
Manganese	7439-96-5	Chronic	2.0E-02	mg/kg/day	8.0E-04	mg/kg/day	CNS	1	IRIS	10/25/2005
Thallium	7440-28-0	Chronic	7.0E-05	mg/kg/day	7.0E-05	mg/kg/day	Liver	3000	Other	10/25/2005
Vanadium	7440-62-2	Chronic	1.0E-03	mg/kg/day	2.6E-05	mg/kg/day	Kidney	300	NCEA	4/16/2007
Zinc	7440-66-6	Chronic	3.0E-01	mg/kg/day	3.0E-01	mg/kg/day	Blood Chemistry	3	IRIS	10/25/2005

Table 11 (continued)
Non-Cancer Toxicity Data Summary

Chemical of Concern	CAS RN	Chronic/ Subchronic	Inhalation RfC	Inhalation RfC units	Inhalation RfD	Inhalation RfD Units	Primary Target Organ	Combined Uncertainty/ Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YYYY)
Pathway: Inhalation[1]										
2,4-DDD	53-19-0	--	--	--	--	--	--	--	--	--
2,4-DDE	3424-82-6	--	--	--	--	--	--	--	--	--
2,4-DDT	789-02-6	--	--	--	--	--	--	--	--	--
4,4-DDD	72-54-8	--	--	--	--	--	--	--	--	--
4,4-DDE	72-55-9	--	--	--	--	--	--	--	--	--
4,4-DDT	50-29-3	--	--	--	--	--	--	--	--	--
Aldrin	309-00-2	--	--	--	--	--	--	--	--	--
alpha-BHC	319-84-6	--	--	--	--	--	--	--	--	--
alpha-Chlordane[2]	5103-71-9	Chronic	7.0E-04	mg/m^3	2.0E-04	mg/kg/day	Liver	1000	IRIS	10/8/2004
beta-BHC	319-85-7	--	--	--	--	--	--	--	--	--
delta-BHC	319-86-8	--	--	--	--	--	--	--	--	--
Dieldrin	60-57-1	--	--	--	--	--	--	--	--	--
Endrin	72-20-8	--	--	--	--	--	--	--	--	--
Endrin Ketone[3]	53494-70-5	--	--	--	--	--	--	--	--	--
gamma-BHC (Lindane)	58-89-9	--	--	--	--	--	--	--	--	--
gamma-Chlordane[2]	5103-74-2	Chronic	7.0E-04	mg/m^3	2.0E-04	mg/kg/day	Liver	1000	IRIS	10/8/2004
Heptachlor	76-44-8	--	--	--	--	--	--	--	--	--
Heptachlor Epoxide	1024-57-3	--	--	--	--	--	--	--	--	--
Toxaphene	8001-35-2	--	--	--	--	--	--	--	--	--
2,4-Dichlorophenol	120-83-2	--	--	--	--	--	--	--	--	--
2,4,6-Trichlorophenol	88-06-2	--	--	--	--	--	--	--	--	--
Atrazine	1912-24-9	--	--	--	--	--	--	--	--	--
Benzo(a)pyrene	50-32-8	--	--	--	--	--	--	--	--	--
Bis(2-ethyhexyl)phthalate	117-81-7	--	--	--	--	--	--	--	--	--
Diphenamid	957-51-7	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	118-74-1	--	--	--	--	--	--	--	--	--
Pentachlorophenol	87-86-5	--	--	--	--	--	--	--	--	--
1,2-Dichloroethane	107-06-2	Chronic	2.0E+00	mg/m^3	7.0E-01	mg/kg/day	Liver	90	ATSDR	4/16/2007

Table 11 (continued)
Non-Cancer Toxicity Data Summary

Chemical of Concern	CAS RN	Chronic/ Subchronic	Inhalation RfC	Inhalation RfC units	Inhalation RfD	Inhalation RfD Units	Primary Target Organ	Combined Uncertainty/ Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YYYY)
1,2,4-Trichlorobenzene	120-82-1	Chronic	3.5E-03	mg/m^3	1.0E-03	mg/kg/day	Liver	1000	PPRTV	10/8/2004
1,4-Dichlorobenzene	106-46-7	Chronic	8.0E-01	mg/m^3	2.29E-01	mg/kg/day	Liver	100	IRIS	10/8/2004
Benzene	71-43-2	Chronic	3.0E-02	mg/m^3	8.6E-03	mg/kg/day	Blood, Immune System	300	IRIS	10/8/2004
Chlorobenzene	108-90-7	Chronic	5.0E-02	mg/m^3	1.4E-02	mg/kg/day	Liver, Kidney	1000	PPRTV	10/12/2006
Chloroform	67-66-3	Chronic	4.9E-02	mg/m^3	1.4E-02	mg/kg/day	CNS, Liver, Kidney	100	NCEA	4/16/2007
Tetrachloroethene	127-18-4	Chronic	3.0E-01	mg/m^3	8.0E-02	mg/kg/day	Neurologic	100	ATSDR	4/16/2007
Aluminum	7429-90-5	Chronic	5.0E-03	mg/m^3	1.4E-03	mg/kg/day	CNS	300	PPRTV	10/23/2006
Antimony	7440-36-0	--	--	--	--	--	--	--	--	--
Arsenic	7440-38-2	--	--	--	--	--	--	--	--	--
Beryllium	7440-41-7	Chronic	2.0E-05	mg/m^3	5.7E-06	mg/kg/day	Lungs, Immune System	10	IRIS	10/25/2005
Iron	7439-89-6	--	--	--	--	--	--	--	--	--
Manganese	7439-96-5	Chronic	5.0E-05	mg/m^3	1.43E-05	mg/kg/day	CNS	1000	IRIS	10/25/2005
Thallium	7440-28-0	--	--	--	--	--	--	--	--	--
Vanadium	7440-62-2	--	--	--	--	--	--	--	--	--
Zinc	7440-66-6	--	--	--	--	--	--	--	--	--

(1) Data provided in Tables 5.1 and 5.2 in Appendix E of the URS 2007 (with 2008 corrected pages) HHRA, Appendix W of the Remedial Investigation Report
(2) Toxicity values for Chlordane are used for alpha and gamma Chlordane
(3) Toxicity values for Endrin are used for Endrin Ketone
ATSDR: Agency for Toxic Substances and Disease Registry
PPRTV: United States Environmental Protection Agency provisional peer-reviewed toxicity value
HEAST: Health Effects Assessment Summary Table
IRIS: Integrated Risk Information System
NCEA: EPA National Center for Environmental Assessment
Other: No source listed in the Region III RBC Table, 10/25/2005
--: No information available
mg/kg/day: milligrams per kilogram per day
CNS: Central Nervous System
mg/m^3: milligrams per cubic meter

Table 12
Interim Ground Water Remediation Standards

Contaminant of Concern	Interim Ground Water Remediation Standard (mg/L)
4,4-DDT	3.59E-5
2,4,5-T	3.70E-1
2,4-D	7.00E-2
2,4-DDD	1.43E-4
2,4-DDE	1.16E-4
2,4-DDT	3.56E-5
4,4-DDD	1.45E-4
4,4-DDE	1.16E-4
Aldrin	1.35E-5
Alpha Chlordane	1.3E-4
Alpha-BHC	2.77E-5
Atrazine	1.01E-3
Beta BHC	9.51E-5
Delta BHC	9.66E-5
Dieldrin	9.58E-6
Diphenamid	1.97E-2
Endrin	1.42E-4
Endrin Ketone	1.42E-4
Gamma BHC (Lindane)	1.42E-4
Heptachlor	3.89E-5
Heptachor epoxide	6.96E-6
Toxaphene	1.28E-4
Bis(2-ethylhexyl)phthalate	4.25E-3
Pentachlorophenol	1.75E-4
1,4-Dichlorobenzene	1.2E-3
2,4,6-Trichlorophenol	1.37E-2
Benzene	9.22E-4
1,2-Dichloroethane	3.14E-4
Tetrachloroethene	2.56E-4
Chloroform	4.0E-4
Arsenic	1.65E-4
Chlorobenzene	8.58E-4
1,2,4-Trichlorobenzene	6.64E-5
2,4-Dichlorophenol	1.2E-2
Aluminum*	4.16
Beryllium	9.96E-3
Iron*	5.49
Manganese*	1.35E-1
Thallium	5.2E-5
Vanadium*	9.19E-3
Zinc	1.56

*Verification of these compounds as ground water COCs may be appropriate.

Table 13
Soil Remediation Standards

Contaminant of Concern	Soil Remediation Standard – 0-2 feet bgs	Source	Soil Remediation Standard – 2-10 feet bgs	Source	Soil Remediation Standard – greater than 10 feet bgs	Source
2,4-DDD	55.3	ISW	55.3	ISW		
2,4-DDT	15.8	CW	15.8	CW		
4,4-DDD	55.3	ISW	55.3	ISW		
4,4-DDT	2.2	ECO	15.8	CW		
Aldrin	0.32	ECO	0.781	ISW		
Alpha-BHC	1.63	GW	1.63	GW	1.63	GW
Alpha-Chlordane	14.5	CW	14.5	CW		
Beta-BHC	6.91	GW	6.91	GW	6.91	GW
Delta-BHC	7.37	ISW	7.37	ISW	407	GW
Dieldrin	0.829	ISW	0.829	ISW		
Gamma-BHC	7.94	CW	7.94	CW	645	GW
Gamma-Chlordane	14.5	CW	14.5	CW		
Heptachlor	2.95	ISW	2.95	ISW		
Heptachlor Epoxide	0.465	CW	0.465	CW		
Toxaphene	3	ECO	12.1	ISW		
Benzo(a)pyrene	1.55	ISW	1.55	ISW		
Arsenic	12	GW	12	GW	12	GW
Endrin Ketone	0.26	ECO				
Manganese	272	GW	272	GW	272	GW
Thallium	0.675	GW	0.675	GW	0.675	GW
Atrazine	6.47	GW	6.47	GW	6.47	GW

NOTES: (1) ISW – indoor site worker (2) CW – construction worker (3) ECO – ecological receptor (4) GW – protection of ground water

(5) The Soil Remediation Standards generated for the Central Chemical property have been established to be protective of human heath and the environment.

(6) The Soil Remediation Standards for protection of human health have been established for non-residential exposures based on the reasonably anticipated future land use of the Central Chemical property, specifically future construction workers performing construction tasks, and indoor site workers performing commercial or industrial work, primarily indoors.

(7) The soil remediation standards for protection of the environment considered ecological receptors (including birds and animals), and protection of ground water.

(8) For the Soil Remediation Standards based on protection of human health (ISW and CW), the Soil Remediation Standards are 95% UCL values. However, no single location on the Central Chemical property can exhibit COC concentrations greater than ten times (10x) their respective Soil Remediation Standards (this not-to-exceed value has been established at approximately the upper end of EPA's acceptable risk range for cancer and non-cancer risk).

(9) For the Soil Remediation Standards based on protection of ecological receptors (ECO), the Soil Remediation Standards are 95% UCL values. However, no single location on the Central Chemical property can exhibit COC concentrations greater than ten times (10x) their respective Soil Remediation Standards.

(10) For the Soil Remediation Standards based on protection of ground water (GW), the Soil Remediation Standards are not-to-exceed values.

(11) As outlined in Table 14, the maximum excavation depth at the Site for protection of human health (ISW and CW) is 10' below ground surface. If COC concentrations remain in-place beneath 10' at the completion of contaminated soil excavation, the establishment of institutional controls may be necessary to ensure that subsurface soil contamination does not act as a potential future threat to human health (for example during future deep construction-related activities). Such institutional controls would be selected by EPA in an appropriate EPA decision document.

(12) The Soil Remediation Standards are in parts per million.

(13) The Soil Remediation Standard for Arsenic was generated by EPA and MDE as a background concentration for the Hagerstown area, based on soil sampling data collected in the Hagerstown area. A Soil Remediation Standard generated for the Site for protection of ground water by EPA using the Soil Screening & Remediation Goal (SSRG) Tool (Version 2.0, January 2009) was less than background; therefore, EPA has selected the calculated background concentration for arsenic in soil in the Hagerstown area as the Soil Remediation Standard for Arsenic that will be protective of ground water.

(14) The Soil Remediation Standards for Manganese and Thallium were generated using the Soil Screening & Remediation Goal (SSRG) Tool (Version 2.0, January 2009). However, the values generated for Manganese and Thallium are expected to be less than background concentrations of these metals in western Maryland, based on review of the document, "Cleanup Standards for Soil and Groundwater" (State of Maryland, MDE, June 2008). Therefore, an evaluation of background concentrations of these metals will have be performed during the Remedial Design. If necessary, these Soil Remediation Standards will be revised in an appropriate EPA decision document.

Table 14
Alternative 2A Cost and Present Cost Summary

Phase No.	Phase Description	Alternative 2A
Current Dollar and Escalation Value		
01	Study (Pre-Design Investigation	$520,935
02	Design-Detail	$545,546
03	Remedial Action	$9,003,722
	Institutional Controls	
	Domain 2 Soil Stabilization	
	Foundation Demolition and Offsite Disposal	
	Consolidate and Cap (Domains 1, 2, and 3)	
	Ground Water Extraction System	
04	Operation & Maintenance	$3,531,190
	Ground Water Extraction System O&M (5 Years)	
	Domain 2 RCRA Cap O&M (30 Years)	
05	Long Term Monitoring	$2,449,981
	Five Year Reviews	
	Ground Water Monitoring (5 Years)	
06	Site Closeout	$268,409
	Subtotal in Current Dollars	**$16,319,783**
	Escalation Costs	**$2,240,055**
	Total with Escalation	**$18,559,838**
Present Value of Future Costs		
	Present Value of Capital Costs (Pre-design investigation, design, remedial action, and long-term monitoring)	$11,518,772
	Present Value of O&M Costs (O&M of extraction system [5 years]) and Domain 2 RCRA cap (30 years)	$2,642,687
	Present Value of Periodic Costs (6 Five Year Reviews)	$189,313
	Present Value Combined Cost(1)	**$14,350,772**
Average Annual O&M Costs		
	Ground Water Extraction System (5 years)	$416,000
	Domain 2 RCRA cap (30 years)	$4,900
Average Annual Monitoring Costs		
	Ground Water Extraction System (5 years)	$161,000

(1) Real Discount = 3.52%; Nominal Discount = 6.02%; Inflation = 2.50%

O&M - Operation and Maintenance
RCRA - Resource Conservation and Recovery Act