RECORD OF DECISION AMENDMENT
OPERABLE UNIT 1
SOIL AND OVERBURDEN GROUNDWATER

SPECTRON, INC. SUPERFUND SITE
ELKTON, CECIL COUNTY, MARYLAND

UNITED STATES ENVIRONMENTAL
PROTECTION AGENCY

REGION 3
PHILADELPHIA, PENNSYLVANIA
March 2012

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FIGURES

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APPENDICES

LIST OF ACRONYMS

AR	Administrative Record
ARARs	Applicable or Relevant and Appropriate Requirements
ATSDR	Agency for Toxic Substances and Disease Registry
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
COC	Contaminant of Concern
CSM	Conceptual Site Model
DNAPL	Dense Non-Aqueous Phase Liquid
EPA	United States Environmental Protection Agency
ERAGS	Ecological Risk Assessment Guidance for Superfund
ESL	Ecological Screening Level
FS	Feasibility Study
FFS	Focused Feasibility Study
GAC	Granular Activated Carbon
gpm	Gallons Per Minute
HHRA	Human Health Risk Assessment
HI	Hazard Index
ICs	Institutional Controls
LNAPL	Light Non-Aqueous Phase Liquid
MCL	Maximum Contaminant Level
MDE	Maryland Department of the Environment
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
ND	Non-Detect
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
OU	Operable Unit
O&M	Operation and Maintenance
PCE	Tetrachloroethylene
ppb	Parts Per Billion
ppm	Parts Per Million
PDI	Pre-Design Investigation
RA	Remedial Action
RAO	Remedial Action Objective
RBC	Risk Based Concentration
RI	Remedial Investigation
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act of 1986
SI/GWTS	Stream Isolation and Groundwater Treatment System
SLERA	Screening Level Ecological Risk Assessment
SVOC	Semi-Volatile Organic Compound
TCE	Trichloroethylene
TS	Treatability Study
µg/L	Micrograms Per Liter
VI	Vapor Intrusion
VOC	Volatile Organic Compound

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PART I – THE DECLARATION

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I. THE DECLARATION

A. Site Name and Location

The Spectron, Inc. Superfund Site (the Site) is located approximately 6 miles north of the Town of Elkton, Cecil County, Maryland and consists of a 5 acre property historically operated as a paper mill and solvent recovery facility. The National Superfund Database Identification Number is MDD000218008. This action addresses Operable Unit-1 (OU-1), Soil and Overburden Groundwater. Operable Unit-2 (OU-2), Bedrock Groundwater, will be addressed in a separate decision document. A Site Location Map is included as Figure 1 and the Site Layout is included as Figure 2.

B. Statement of Basis and Purpose

This Record of Decision Amendment (ROD Amendment) modifies the remedy selected by EPA in the September 16, 2004 OU-1 ROD. This is the final action for OU-1, Soil and Overburden Groundwater. The selected remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), 42 U.S.C. § 9601 et seq, as amended, and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R. Part 300, as amended.

This decision document is based on the Administrative Record for the Site, which was developed in accordance with Section 113 (k) of CERCLA, 42 U.S.C. § 9613(k). This Administrative Record file is available for review online at http://www.epa.gov/arweb, at the U.S. Environmental Protection Agency Region III Records Center in Philadelphia, Pennsylvania, and at the Cecil County Library in Elkton, Maryland. The Administrative Record Index (Appendix A) identifies each document contained in the Administrative Record upon which the selection of the remedy is based.

The State of Maryland concurs with the Selected Remedy (Appendix C).

C. Assessment of the Site

The response action selected in this ROD Amendment is necessary to protect human health from actual or threatened releases of hazardous substances into the environment.

D. Description of the Selected Remedy

Site contamination will be addressed in two Operable Units. This ROD Amendment modifies the remedy selected for OU-1, Soil and Overburden Groundwater in the September 16, 2004 OU-1 ROD. OU-2, Bedrock Groundwater, will be addressed separately.

Based on the findings of a Pre-Design Investigation (PDI) and Focused Feasibility Study (FFS) that were conducted following issuance of the 2004 OU-1 ROD, EPA determined that modifications to the remedy were necessary to effectively address OU-1. This ROD Amendment modifies the remedy selected by the 2004 OU-1 ROD, as indicated in the table below and described in more detail in Sections D.1 through D.3.

2004 OU-1 ROD Component		Modified Remedy Component
1	Continued operation and maintenance of the existing Stream Isolation and Groundwater Treatment System (SI/GWTS).	Not modified.
2	Demolition to grade of all structures in the Plant Area.	Not modified.
3	Placement of onsite debris piles under the Resource Conservation and Recovery Act (RCRA) cap.	Not modified.
4	Grading of the Plant Area.	Not modified.
5	Installation of a RCRA modified cap, including a geosynthetic membrane.	Installation of an asphalt (or equivalent) cap.
6	In situ reductive dechlorination of principal threat waste.	In situ thermal treatment of principal threat waste.
7	Monitoring to ensure the effectiveness of the remedy.	Not modified.
8	Land and groundwater use restrictions.	Not modified.

D.1 Modification of Component 5: Installation of RCRA Modified Cap

The 2004 OU-1 ROD required the installation of a RCRA modified cap over the Plant Area at the Site, primarily to meet the Remedial Action Objective (RAO) of eliminating direct contact with contaminated soil and groundwater. In addition to the RCRA modified cap, the 2004 OU-1 ROD also evaluated two different types of soil caps to meet this RAO. Due to concerns that large storm events could cause excess infiltration of precipitation that could overwhelm the SI/GWTS, the RCRA modified cap, including an impermeable geosynthetic membrane, was ultimately selected as a component of the remedy.

The Site is currently covered with a combination of concrete pads, asphalt, and buildings, which have been in place since the 2004 OU-1 ROD was issued. This cover has been effective in minimizing infiltration such that the SI/GWTS has not been impacted during large storm events. Due to the observed performance of the current cover, EPA has determined that a cap constructed of asphalt or equivalent material could meet the RAO of eliminating direct contact with contaminated soil and groundwater as well as minimize infiltration of precipitation that could potentially impact the SI/GWTS. Additionally, the asphalt (or equivalent) cap can be constructed more readily, in a shorter time frame, and at a lower cost than the RCRA modified cap.

Based on these factors, EPA proposes to modify the remedy to include the installation of an asphalt (or equivalent) cap instead of the installation of the RCRA modified cap prescribed by the 2004 OU-1 ROD. Consistent with the currently selected remedy, all onsite structures will be demolished, staged debris will be placed onsite, and the Site will be graded prior to installation of the cap. The condition of existing asphalt and/or concrete areas at the Site will be evaluated during Remedial Design to determine what portions, if any, can be incorporated into the final cover. The asphalt (or equivalent) cap will be installed over the same area as required by the 2004 OU-1 ROD, encompassing the entire Plant Area and Waste Management Area (WMA) as shown on Figure 3.

The asphalt (or equivalent) cap will meet all Applicable or Relevant and Appropriate Requirements (ARARs) specified in the 2004 OU-1 ROD related to closure of RCRA facilities and hazardous waste landfills. However, the Code of Maryland Regulations (COMAR) requirements related to sanitary landfills, which required installation of a cap with an impermeable geosynthetic membrane and vegetated cover, are considered relevant, but not appropriate based on the Site conditions discussed above. The Maryland Department of the Environment (MDE) has concurred with this change. A detailed discussion of compliance with ARARs is included in Section J. Comparative Analysis of Alternatives.

D.2 Modification of Component 6: In-Situ Reductive Dechlorination

The 2004 OU-1 ROD required the treatment of principal threat waste via in-situ reductive dechlorination (IRD), which consisted primarily of injecting material into the overburden to promote the biological breakdown of contaminants. Principal threat waste was defined as Dense Non-Aqueous Phase Liquid (DNAPL) within soil and overburden groundwater. At the time the 2004 OU-1 ROD was issued, it was assumed that DNAPL was present over a large portion of the Plant Area at the Site and IRD would be implemented over that entire area. Natural groundwater flow gradients would be utilized to distribute the IRD amendment materials throughout the treatment area.

The implementability of this remedy was evaluated in a Pre-Design Investigation (PDI), which included a Treatability Study. Data collected during the PDI indicated that DNAPL is only present in a portion of the Plant Area, identified on Figure 4 as the DNAPL Treatment Area, rather than throughout the Plant Area, as assumed by the 2004 OU-1 ROD. Additionally, the Treatability Study indicated that IRD would be effective in reducing DNAPL mass by a maximum of approximately 67%. Finally, Light Non-Aqueous Phase Liquid (LNAPL) that could potentially impact the IRD implementation was identified within the DNAPL Treatment Area during the PDI. LNAPL is also classified as principal threat waste and must be treated as a component of the OU-1 remedy.

Based on the information collected during the PDI, a Focused Feasibility Study (FFS) was conducted to evaluate the ability of various other Remedial Alternatives to treat principal threat waste at the Site. Each alternative was evaluated to treat both DNAPL and LNAPL within the DNAPL Treatment Area, as defined by the PDI. The FFS also evaluated implementation of IRD via a different methodology than that prescribed in the 2004 OU-1 ROD. Currently, the DNAPL Treatment Area encompasses both the Confirmed/Probable DNAPL Zone and the Potential DNAPL Zone. If during Remedial Design, DNAPL is not identified within the Potential DNAPL Zone, the DNAPL Treatment Area may be refined to include the Confirmed/Probable DNAPL Zone only.

EPA's evaluation of the Remedial Alternatives presented in the FFS indicated that Alternative DNAPL-5 – In-Situ Thermal Treatment will be the most effective remedy to treat principal threat waste in soil and overburden groundwater. This Alternative consists of using Electrical Resistance Heating (ERH), a thermal treatment process, to rapidly heat the subsurface by passing electrical current through contaminated soil and groundwater. Heating evaporates and steam strips volatile organic compounds (VOCs) from the subsurface where they are extracted, cooled, and treated in the existing GWTS. Treatment will occur throughout the DNAPL Treatment Area defined in the PDI/FFS, but this area may be further refined during Remedial Design. Based on current information, it is expected that thermal treatment could achieve a maximum reduction in DNAPL mass of 99%.

Replacement of the IRD process as prescribed by the 2004 OU-1 ROD with a thermal treatment process will treat a larger percentage of principal threat waste in the soil and overburden groundwater in a shorter period of time. Thermal treatment also has less risk of adversely impacting the existing SI/GWTS or Little Elk Creek

than IRD. Finally, in contrast to the other Remedial Alternatives that were evaluated, thermal treatment will not be impacted by the heterogeneous nature of the overburden.

D.3 Performance Standards

Installation of Asphalt (or Equivalent) Cap

Install a cap consisting of asphalt or equivalent material over the entirety of the Plant Area at the Site that shall:

1. Eliminate potential direct contact with contaminated soil and overburden groundwater;
2. Provide long-term minimization of migration of liquids;
3. Function with minimum maintenance;
4. Promote drainage of run-on and run-off and minimize erosion or abrasion of the cap;
5. Accommodate settling and subsidence so that the cap's integrity is maintained;
6. Have a permeability less than or equal to the permeability of the natural subsoils present.
7. Incorporate portions of existing asphalt and/or concrete areas if such materials can meet requirements 1 through 6, above.

Thermal Treatment

Conduct thermal treatment throughout the DNAPL Treatment Area (Figures 4 and 10) to achieve maximum treatment of principal threat waste, consisting of the following elements:

1. Install a thermal/vapor cap over the DNAPL Treatment Area that shall insulate the treated area from ambient air, reduce direct water infiltration, and assist in vapor recovery;
2. Heat the overburden[1] to establish and maintain subsurface temperatures of 90° C in the vadose zone and 100° C in the saturated zone throughout the DNAPL Treatment Area to boil groundwater and DNAPL and to boil or reduce the viscosity of LNAPL;
3. Extract vapor, steam, groundwater, DNAPL, and LNAPL using extraction wells;
4. Establish and maintain control of vapor, steam, groundwater, DNAPL, and LNAPL within the DNAPL Treatment Area;
5. Cool and treat extracted vapor, steam, groundwater, DNAPL, and LNAPL. Extracted DNAPL and LNAPL shall be collected and disposed offsite at an approved waste disposal facility. Remaining extracted material shall be treated and discharged onsite using the existing SI/GWTS;

[1] The overburden consists of all material (including natural soils, debris, and fill material) above competent bedrock at the Site.

6. Meet the following performance standards established in Section 11.2.1 of the 2004 OU-1 ROD:
    1. Effluent discharged from the existing SI/GWTS resulting from treated vapor, steam, groundwater, DNAPL, and LNAPL shall meet the substantive requirements of the National Pollution Discharge Elimination System (NPDES) program and the Maryland discharge limitations and monitoring requirements and shall contain less than 100 µg/L of total VOCs. Surface water in Little Elk Creek shall meet the numerical performance standards established in 2004 OU-1 ROD, listed on Table 3;
    2. Air emissions from the existing SI/GWTS resulting from treated vapor steam, groundwater, DNAPL, and LNAPL shall meet the substantive requirements of Maryland general air emissions standards, Maryland regulations governing toxic air pollutants, and federal air emissions standards for process vents. In addition, emissions shall not exceed risk-based standards of 10^{-6} for carcinogenic risks or a hazard index of 1 for non-carcinogenic risks;
    3. Air emissions, if any, from the thermal treatment system during operation shall meet the substantive requirements of Maryland general air emissions standards, Maryland regulations governing toxic air pollutants, and federal air emissions standards for process vents. In addition, emissions shall not exceed risk-based standards of 10^{-6} for carcinogenic risks or a Hazard Index of 1 for non-carcinogenic risks.

7. Reinject treated groundwater within the DNAPL Treatment Area, if determined to be appropriate for thermal treatment and the overburden is determined to be sufficiently permeable;

8. Monitor and report the following parameters continuously throughout treatment:
    1. Temperature in the vadose and saturated zones;
    2. Vapor, steam, groundwater, DNAPL, and LNAPL extraction rates; and,
    3. Groundwater contaminant concentrations;
    4. Air emissions from the thermal treatment system, if any.

9. Conduct saturated soil sampling and analysis prior to, during, and following the conclusion of thermal treatment. Post-treatment sampling shall be conducted a minimum of fourteen (14) days following shutdown of the thermal treatment system.

10. Continue treatment until EPA determines that the following parameters indicate that maximum treatment of principal threat waste within the DNAPL Treatment Area has been achieved:
    1. Temperature in the vadose and saturated zones;
    2. Vapor, steam, groundwater, DNAPL, and LNAPL extraction rates; and,
    3. Groundwater contaminant concentrations;
    4. Saturated soil contaminant concentrations.

11. Monitor and report groundwater contaminant concentrations following treatment until temperatures within the vadose and saturated zones return to ambient levels;

12. Conduct additional thermal treatment within the DNAPL Treatment Area or portions thereof, based on the results of post-treatment saturated soil sampling prescribed in Item 9 above, until EPA determines that maximum treatment of principal threat waste has been achieved.

E. Statutory Determinations

The remedy modification meets the mandates of CERCLA § 121 and the regulatory requirements of the NCP. This remedy, as modified, is protective of human health and the environment, complies with Federal and State

requirements that are applicable or relevant and appropriate requirements (ARARs) to the remedial action, is cost effective, and utilizes a permanent solution to the maximum extent practicable.

The remedy modification also satisfies the statutory preference for treatment as a principle element of the remedy (i.e., reduction of the toxicity, mobility, or volume of hazardous substances) by treating principal threat material (DNAPL and LNAPL) to the maximum extent practicable.

A statutory review will be conducted within five years after initiation of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment. Five year reviews will be conducted at least every five years after the date of the initiation of the remedial action and continue until hazardous substances are no longer present above levels that allow for unlimited use and unrestricted exposure.

F. ROD Certification Checklist

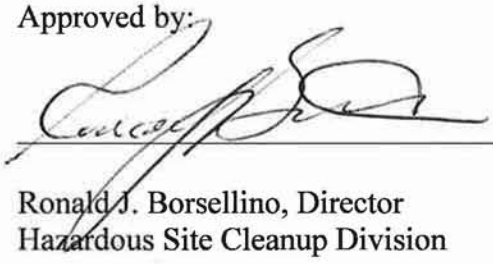
The following information is included in the Decision Summary (Part II) of this ROD Amendment, while additional information can be found in the Administrative Record file for the Site:

- Chemicals of concern (COCs) and their respective concentrations (Table 1);
- Baseline risk represented by the COCs;
- How source materials constituting principal threats are addressed;
- Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater used in the baseline risk assessment and ROD;
- Potential land and groundwater use that will be available at the Site as a result of the Selected Remedy;
- Estimated capital, annual O&M, and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected; and
- Key factors that led to selecting the remedy.

G. Authorizing Signature

This ROD Amendment documents a remedy modification for OU-1, Soil and Overburden Groundwater at the Spectron, Inc. Superfund Site, and is based on the Administrative Record for the Site. EPA selected this remedy modification with the concurrence of the Maryland Department of the Environment (MDE). The Director of the Hazardous Site Cleanup Division (HSCD) for EPA Region III has approved and signed this ROD.

Approved by:



Ronald J. Borsellino, Director
Hazardous Site Cleanup Division

Date:

March 29, 2012

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PART II- THE DECISION SUMMARY

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II. THE DECISION SUMMARY

A. Site Name, Location and Description

The Spectron, Inc. Superfund Site (the Site) (CERCLIS Identification No. MDD000218008) is located approximately six miles north of the Town of Elkton, Cecil County, Maryland in a stream valley formed by Little Elk Creek, which flows through the Site from north to south. The Site consists of the former Spectron, Inc. property, comprised of approximately 5 acres, and the groundwater contaminant plume extending to the southeast of the property. The former Spectron, Inc. property was historically operated as a solvent recovery facility resulting in contaminated soil and overburden groundwater, designated as Operable Unit 1 (OU-1), and bedrock groundwater, designated as Operable Unit 2 (OU-2). Residential, wooded, and agricultural properties surround the Site.

EPA is the lead Agency for the Site and the Maryland Department of the Environment (MDE) is the support Agency. The cleanup is being financed by a Potentially Responsible Party Group (PRP Group). This ROD Amendment addresses OU-1, Soil and Overburden Groundwater. OU-2, Bedrock Groundwater will be addressed in a separate decision document.

B. Site History and Enforcement Activities

This section of the ROD Amendment provides the history of the Site and a discussion of EPA and MDE investigations and response activities. The "Proposed Rule" proposing the Site to the National Priorities List (NPL) was published in the *Federal Register* on October 14, 1992. The "Final Rule" adding the Site to the NPL was published in the *Federal Register* on May 31, 1994.

B.1. History of Activities Leading to Contamination

The Site operated as a paper mill until it was destroyed by fire in 1954. The mill buildings, except for the former Power House building, were subsequently razed. Solvent recycling operations occupied the Site from 1962 to 1988 and reportedly handled more than one million gallons of liquids per year when in operation. The Site was abandoned by the owner in 1988.

Liquid materials processed at the facility included VOCs that are denser than water, such as chlorofluorocarbons, halogenated ethenes and ethanes, and chlorobenzenes as well as VOCs that are less dense than water, such as alkanes and aromatic hydrocarbons. Many of these compounds have a low solubility in water and tend to remain as non-aqueous phase liquids (NAPLs) when released to the environment. VOCs with densities greater than water may sink through the saturated zone until a physical or hydraulic barrier is reached.

Both light and dense NAPLs (LNAPLs and DNAPLs, respectively) were released while the solvent recycling operation was active, resulting in contaminated groundwater and DNAPL seeps along the western bank of Little Elk Creek. Waste sludge containing solvents like trichloroethylene (TCE) and tetrachloroethylene (PCE) was placed into an unlined open air lagoon adjacent to Little Elk Creek. The waste sludge then migrated into the Creek through shallow groundwater or by being washed out of the lagoon during storm events. When the Site was abandoned by the owner in 1988, more than 500,000 gallons of solvents and other liquids were left onsite in tanks and drums.

Soil and overburden material, overburden groundwater, and bedrock groundwater are impacted at the Site as a result of the historic operation of the solvent recycling facility. Residential wells surrounding the Site have been sampled on a regular basis since 1996 and Site-related contaminants have not historically been detected in

these wells. Continued monitoring of residential wells in the vicinity of the Site will be a component of the remedy selected for OU-2 Bedrock Groundwater in a separate decision document.

B.2. History of Previous Environmental Investigations and Response Actions

Multiple permit violations and orders were issued against Spectron, Inc. during its operation. In September 1982, EPA and the predecessor to MDE, the Maryland Department of Health and Mental Hygiene, Office of Environmental Programs, ordered the property owner to remove the upper six inches of contaminated soil and to add an asphalt cover throughout the Site. Concrete perimeter dikes were then constructed around the process and storage areas and the remaining portion of the property was paved with asphalt. This work also included the removal of "Hot Spots" such as the former lagoon. However, subsequent data collection at the Site data indicated that contamination in the shallow soils remained following this action.

In 1983, 42 well points were reportedly installed by the property owner along the western bank of the stream in an attempt to remediate solvents in the shallow groundwater and cut off seepage of VOCs to the stream. Design documents indicate that the well points were to be 10 to 20 ft deep, with an expected total groundwater yield of 20 to 30 gallons per minute (gpm). Extracted water was to be treated by an air stripper, with carbon treatment of the vapor phase, and reinjected through a series of wells reportedly installed on the northwest side of the property. However, the exact locations of these remediation system components are unknown and the effectiveness of the system, if installed, is questionable.

In 1988, the Site was abandoned by the owner with more than 500,000 gallons of solvents and other liquids reportedly remaining onsite in tanks and drums. EPA initiated a removal action in June 1989 to remove the hazardous materials from the property and secure the Site. Pursuant to an August 1989 Administrative Order on Consent, a Potentially-Responsible Party (PRP) Group completed the removal action in 1990 to mitigate potential hazards of fire, explosion, or exposure to these materials. A second AOC was entered into by a PRP Group in October 1991 to control seeps of contaminated ground water that were leaking out of the shallow soil along the bank of Little Elk Creek and posed a potential public health and ecological threat.

On October 14, 1992, the Site was proposed to the National Priorities List (NPL), which is a listing of the most serious uncontrolled or abandoned hazardous waste sites requiring long term remedial action. The Site was formally added to the NPL on May 31, 1994, making it eligible for Federal cleanup funds.

On September 30, 1996, MDE, in cooperation with the Agency for Toxic Substances and Disease Registry (ASTDR), issued a Preliminary Public Health Assessment Report for the Site. The report found that in the 1960's and early 1970's, area residences may have been exposed to airborne contaminants. However, sampling conducted in 1995 and 1996 for that report indicated that there was no current public health hazard from air exposures near the Site. The report recommended a sampling program for local residential wells near the Site, and further recommended treatment of residential wells where contamination was detected. These recommendations have been followed by the Potentially Responsible Parties Group (PRP Group). Continued monitoring of residential wells will be addressed by the OU-2 ROD.

In May 1996, an AOC was issued by EPA requiring the PRP Group to conduct a Remedial Investigation and Feasibility Study (RI/FS) at the Site. The RI/FS for OU-1 was completed in March 2003. The RI for OU-2 was completed in October 2010 and the FS was completed in January 2012; however, the OU-2 remedy will be selected in a separate decision document. The RI/FS Reports for OU-1 help form the basis for the remedy selection presented herein and are discussed in detail in Section E: Site Characteristics.

In April 1998, EPA and MDE required the installation of a Stream Isolation/Groundwater Collection and Treatment System (SI/GWTS) to prevent contaminated groundwater seeps from the Spectron property from

discharging into Little Elk Creek. In the fall of 1998, the PRP Group began construction on the system, consisting generally of the following components:

- Excavation of the creek bed;
- Installation of a passive drain system;
- Installation of an impermeable membrane liner to provide a barrier between the creek and contaminated seeps/ground water.

Construction within the creek bed was completed in 1999. The creek was restored by planting native trees and plants along the banks and in the creek bed itself. Approximately 2,000 cubic yards of affected stream sediments were excavated from Little Elk Creek as part of the SI/GWTS construction. No additional action to address sediment contamination at the Site is necessary as a result of this excavation. Unused materials were stockpiled beneath a covered area (the Drum Storage Building) in the northern portion of the facility.

The SI/GWTS began operation in March 2000. The stream liner system consists of three sections of underdrains (slotted PVC pipes) beneath a flexible, impermeable membrane that is installed beneath the Little Elk Creek streambed. These components are kept in place by rock-filled gabion baskets and mats. The underdrains intercept VOC-bearing groundwater from the overburden and bedrock before it can discharge to the stream. The upstream and downstream ends of each of the three stream liner sections are anchored by a concrete cutoff wall. Each section of underdrain is piped by gravity to one of three collection sumps; water in each sump is then pumped to the GWTS. The water level in each sump is held constant, so that sump effluent flows vary over time.

The groundwater treatment system removes VOCs from the stream liner effluent. Water from each collection sump is treated using an oil/water separator to remove potential NAPL, batch-processed through two powdered activated carbon treatment (PACT) reactors, mixed with molasses and phosphoric acid to stimulate the biological treatment and sent through an aeration blower to provide oxygen to further promote biological growth.

The treated effluent water is discharged back to Little Elk Creek and is monitored for pH and routinely sampled and analyzed for VOCs. The SI/GWTS can handle up to 50 gpm but typically processes between 30 to 45 gpm, depending on flow in the sumps. Over 27,000 lbs of VOCs have been captured and treated by the SI/GWTS since operations began. Because of the improvements in stream water quality due to the SI/GWTS, previous restrictions on the use of the stream for swimming and fishing have been removed.

In March 2003, the United States District Court for the District of Maryland (District Court of Maryland) finalized a settlement which required *de minimis* parties to pay $5.3 million toward the clean-up of the Site. The *de minimis* settlement included approximately 500 parties who historically had sent relatively small amounts of hazardous material to the Site. *De minimis* settlements enable smaller waste contributors to help pay cleanup costs in advance and, in exchange, releases them from future financial obligations at Superfund sites.

EPA issued the Proposed Plan for OU-1 on June 20, 2003 and held a public comment period from that date until August 20, 2003. A public meeting to present the Proposed Plan was held on June 26, 2003. Following consideration of comments, the ROD for OU-1 was signed by EPA on September 16, 2004. The 2004 OU-1 ROD is discussed in detail in Section E: Site Characteristics.

Subsequent to the issuance of the ROD for OU-1, EPA and the PRP Group entered into an AOC for Remedial Design of the OU-1 remedy in July 2006. Additionally, in January 2007, EPA and the PRP Group executed a

Consent Decree (CD), which was entered by the District Court of Maryland, for the PRP Group to perform both the OU-1 and OU-2 remedies at the Site. In accordance with the requirements of both of the aforementioned agreements, a Pre-Design Investigation (PDI), including a Treatability Study and Focused Feasibility Study (FFS), was conducted and serves as the basis for this ROD Amendment. The PDI is discussed in detail in Section E: Site Characteristics.

C. Community Participation

Community Involvement activities conducted at the Site to date consist of an open house in November 1998 to answer community questions regarding the SI/GWTS construction, an event to commemorate the completion of the SI/GWTS in September 1999, a public meeting to present the Proposed Remedial Action Plan for OU-1 in June 2003, and an information session in October 2007 to discuss OU-1 remedial design activities. Fact Sheets and/or public notices were distributed in June 1996, May 1997, February, June and November 1998, September 1999, May 2000, June 2003, September 2007, and November 2011.

During the Proposed Plan process for the OU-1 remedy modification, EPA hosted a public meeting to engage the local community, and distributed a fact sheet to update the community on EPA's activities. These community participation activities meet the public participation requirements in CERCLA § 121 and the NCP 40 CFR § 300.430 (f)(3).

In addition to historic documents already contained in the OU-1 Administrative Record, the PDI/FFS Report and Proposed Plan for the Spectron, Inc. Superfund Site were made available to the public in October 2011. These documents can be found in the Administrative Record file located in the EPA Region III Office, the Cecil County Library in Elkton, Maryland and online at www.epa.gov/arweb. The notice of the availability of these documents was published in the Cecil Whig on October 14, 2011. The public comment period initially was held from October 14, 2011 to November 18, 2011, but was extended to December 19, 2011 in response to a request from the PRP Group.

A fact sheet detailing the Proposed Plan was mailed to local citizens on November 2, 2011. The public meeting was held on November 8, 2011, to present the Proposed Plan to the community and solicit their comments. At this meeting, representatives from EPA and the MDE answered questions about the Site and the remedial alternatives. EPA's responses to comments received during this period are included in the Responsiveness Summary, which is part of this ROD Amendment.

D. Scope and Role of Operable Unit

EPA has organized the work at the Site into two Operable Units (OUs).

- Operable Unit 1: Soil and Overburden Groundwater
- Operable Unit 2: Bedrock Groundwater

As indicated above, EPA selected a remedy for OU-1 in a ROD signed on September 16, 2004. This ROD Amendment will modify that remedy and is expected to be the final action for OU-1. OU-2 will be addressed in a separate decision document.

This ROD Amendment modifies two components of the 2004 OU-1 ROD, as follows:

2004 OU-1 ROD Component		Modified Remedy Component
1	Continued operation and maintenance of the existing Stream Isolation and Groundwater Treatment System (SI/GWTS).	Not modified.
2	Demolition to grade of all structures in the Plant Area.	Not modified.
3	Placement of onsite debris piles under the Resource Conservation and Recovery Act (RCRA) cap.	Not modified.
4	Grading of the Plant Area.	Not modified.
5	Installation of a RCRA modified cap, including a geosynthetic membrane.	Installation of an asphalt (or equivalent) cap.
6	In situ reductive dechlorination of principal threat waste.	In situ thermal treatment of principal threat waste.
7	Monitoring to ensure the effectiveness of the remedy.	Not modified.
8	Land and groundwater use restrictions.	Not modified.

The RCRA modified cap, including a geosynthetic membrane, was selected in the 2004 OU-1 ROD to meet the Remedial Action Objective (RAO) of eliminating direct contact with contaminated soil and overburden groundwater and to minimize infiltration of precipitation that could potentially impact the SI/GWTS. However, data collected since the 2004 OU-1 ROD was issued indicates that the current cover at the Site, consisting of asphalt, concrete, and buildings, has been effective in minimizing infiltration such that the SI/GWTS has not been impacted. Based on this information, EPA determined that a cap constructed of asphalt or equivalent material would be as effective as the RCRA modified cap in minimizing infiltration while still meeting the RAO of eliminating direct contact with contaminated soil and overburden groundwater. The asphalt (or equivalent) cap could also be implemented more easily and more quickly and at a similar or lower cost than the RCRA modified cap. Therefore, the remedy will be modified to require installation of an asphalt (or equivalent) cap instead of a RCRA modified cap. The condition of the existing asphalt and/or concrete areas of the Site will be evaluated during Remedial Design to determine what portions, if any, can be repaired and incorporated into the cap.

In-situ reductive dechlorination (IRD) was selected in the 2004 OU-1 ROD to treat principal threat waste, defined as DNAPL in soil and overburden groundwater. A Pre-Design Investigation (PDI) conducted following the issuance of the 2004 OU-1 ROD indicated that DNAPL is present in a smaller area of the Site than assumed at that time and that LNAPL was also present in this area. Additionally, a Treatability Study was conducted that indicated IRD would not be effective on the full suite of contaminants at the Site and may be difficult to implement based on the hydrogeological conditions of the overburden and the presence of LNAPL. Based on this information, a Focused Feasibility Study (FFS) was conducted to evaluate alternative treatment technologies to address principal threat waste. Thermal treatment, specifically Electrical Resistance Heating (ERH), was identified as the preferred alternative primarily because it can treat the full suite of contaminants at the Site, including LNAPL, in a short timeframe and is not impacted by the heterogeneity of the overburden.

The modified remedy will continue to provide protection of human health in the same manner as the remedy selected in the 2004 OU-1 ROD, while also providing a greater reduction of principal threat waste.

E. Site Characteristics

This section of the ROD Amendment provides an overview of the Site's geology and hydrogeology, the sampling strategy used during Site investigations, and the nature and extent of contamination. Additional information regarding the nature and extent of contamination can be found in the RI/FS and PDI/FFS documents.

E.1. Overview of the Site

The Site is located approximately six miles north of Elkton, Maryland, and is situated in a stream valley formed by Little Elk Creek. Included in the Site are the former Spectron, Inc. property and the groundwater contaminant plume extending to the east and southeast of the property. Soil and overburden material, overburden groundwater, and bedrock groundwater on the former Spectron, Inc. property and bedrock groundwater to the southeast of the property are impacted as a result of the historic operation of the property as a solvent recycling/recovery facility. The Site is bordered by residential properties to the east and south and by wooded areas to the north and west. Little Elk Creek flows through the Site from north to south. Please refer to Figure 1 for a Site Location Map.

Operable Unit 1 (OU-1) consists of soil and overburden material and overburden groundwater impacted by chlorinated and non-chlorinated volatile organic compounds. OU-1 generally encompasses the Plant Area portion of the former Spectron, Inc. property and adjacent areas to the northwest and southeast on the western side of Little Elk Creek. Contaminated soil and overburden material and contaminated overburden groundwater has not historically been identified outside of the Plant Area portion of OU-1. Figure 2 presents the Site Layout showing the extent of OU-1 and Figure 3 shows the extent of the Plant Area.

Contaminated soil identified in the former Office Area on the eastern side of Little Elk Creek and contaminated bedrock groundwater will be addressed under Operable Unit 2 (OU-2).

E.2. Geology and Hydrogeology

The overburden is composed of fill material (reworked sandy soil containing rubble and demolition debris), alluvial sediments from the stream channel, and weathered bedrock (saprolite). In many locations, a clear distinction between fill material and alluvial sediments is not apparent, with the overburden stratigraphy consisting of fill and debris in a sandy matrix. The overburden alluvial sediments can be further sub-divided into an upper layer of sand and silt that is commonly underlain by a basal sand and gravel of varying composition and thickness.

The fill material generally ranges from 1 to 10 ft thick and consists primarily of silty sand containing brick fragments, cinders, gravel, and other rubble. Vestiges of features from previous property uses, such as building foundations, utility trenches, subsurface piping, or areas of demolition debris and where material was imported or excavated for construction purposes are present locally. Remnants of a millrace that reportedly ran through the central portion of the property (dating from its use as a paper mill) may also be present.

Below the fill material, alluvial sediments are present that range in thickness from 3 to 12 ft. These alluvial sediments consist of brown to black sand and sandy silt up to 7 ft thick, and a basal gravelly sand layer about 3 to 10 ft thick. The sandy silt thins toward the center of the Spectron property, and is not present in the vicinity

of former Process Area F (Figure 2). The basal gravelly sand is thickest toward the north end of the property. The finer-grained sediments in the upper portion of the alluvium transition to coarser, more permeable sand/gravel sediments below that directly overlie weathered bedrock (saprolite). Because the gneiss bedrock decays into sand/gravel materials composed mostly of quartz, the delineation between the alluvial sediments and saprolite has been made mostly on the basis of drilling observations.

The overburden overlies hard, fractured, crystalline bedrock composed primarily of gneiss and schist. Bedrock beneath the former Spectron property and to the west of the stream consists of the Little Northeast Creek member of the James Run Formation. The Little Northeast Creek Member, interpreted as a metamorphosed volcanic rock, is characterized as a gray to white, fine to medium-grained, massive granofels with relict phenocrysts of plagioclase and quartz, with some crystals of amphibole and biotite. This formation has a weakly-developed but pervasive foliation caused by the alignment of elongated mineral grains.

Typical groundwater depths in the overburden range from about 2 to 5 ft bg. Based on recent groundwater elevation measurements, short-term changes in groundwater elevations are relatively small, typically less than 1 ft. Over longer, seasonal periods, however, changes in groundwater elevations may be larger in some areas of the Site.

Overburden groundwater flows across the Spectron property generally to the east, toward Little Elk Creek. However, the flow direction is not uniform. Groundwater in the northwestern portion of the property flows to the northeast and in and the southern portion of the property flows to the southeast. In the central portion of the property the groundwater flow is more radial towards the creek with flow directions ranging from north to due east (Figures 6a and 6b).

E.3. Nature and Extent of Contamination and Conceptual Site Model

A Remedial Investigation and Feasibility Study (RI/FS) Report was finalized in March 2003 summarizing the results of previous investigations at the Site conduced between 1991 and 1997. Following the issuance of the OU-1 ROD on September 16, 2004, a Consent Decree was signed between EPA and a PRP Group in January 2007 requiring the PRP Group to perform both the selected OU-1 remedy and the future OU-2 remedy, to be determined by a separate decision document. In accordance with the Consent Decree, a Pre-Design Investigation (PDI), including a treatability study for in situ reductive dechlorination (IRD), were conducted for OU-1 between August 2007 and June 2011. Additionally, a Focused Feasibility Study (FFS) was conducted concurrently with the PDI to evaluate remedial alternatives for a portion of the remedy selected in the 2004 OU-1 ROD and serves as the basis for the remedy modification described herein.

The 2003 RI/FS presented a Conceptual Site Model (CSM) that was summarized in the 2004 OU-1 ROD. The CSM was refined by the PDI and presented in the PDI/FFS Report. The findings and initial CSM from the 2003 RI/FS and 2004 ROD and the revised CSM from the 2011 PDI/FFS are summarized in the following sections. Table 1 presents a list of Contaminants of Concern (COCs) for the Site.

E.3.1 Remedial Investigation and Feasibility Study

The Remedial Investigation and Feasibility Study (RI/FS) for OU-1, finalized in March 2003, combined the results of the following investigations conducted at the Site from 1991 through 1997:

- Interim Remedial Investigation – 1991 to 1992;
- Focused Remedial Investigation – 1993 to 1994;
- Removal Action Pre-Design Investigation – 1996.

These investigations consisted generally of the following tasks:

- Surface geophysical investigations;
  - Seismic refraction;
  - Ground penetrating radar.
- Soil sampling and analysis;
- Observation piezometer installation;
- Geotechnical boring installation;
- Monitoring well installation;
- Groundwater sampling and analysis;
- Direct push groundwater sampling and analysis;
- Hydrogeologic testing (slug test and long-term pumping test);
- Residential well sampling and analysis.

The investigations focused primarily on the Plant Area portion of the Site. The following conclusions comprising the initial Conceptual Site Model (CSM) were presented in the OU-1 RI:

1. Overburden thickness varies from 4 to 16 feet and is thickest in the central area of the Site adjacent to the creek and in the southern portion of the Site, in the vicinity of the Providence Road Bridge. Three distinct intervals are present in the overburden: fill material and rubble; silty sandy alluvial sediment; and coarse basal sandy gravel which lies on top of the bedrock surface. Geophysical mapping and boring investigations indicate an undulating bedrock surface generally dipping toward the creek.

2. Groundwater flow in the overburden system is toward the creek with recharge occurring from the north end of the Site, behind the dam, and from the shallow bedrock system which discharges upward into the overburden sediments. Less lateral recharge is expected to occur from the area west of the Site, and based on hydraulic conductivity values and overall overburden thickness, it is expected that most of the overburden groundwater flow at the Site occurs in the central area of the Site and in the vicinity of the Providence Road bridge.

3. The distribution of contaminants in soil and overburden groundwater identified three primary contaminant source areas: former Process Area F and associated tank farms in the central portion of the Site; former Process Area H and associated tank farms at the south end of the Site; and the former evaporation lagoon at the north end of the Site (Figure 2).

4. Of the 217 samples collected during the four major investigations at the Site, mobile Dense Non-Aqueous Phase Liquid (DNAPL) was visually observed at only one location; creek piezometer PZ-19. Residual DNAPL was observed in one soil boring (B-l) in the area of the former evaporation lagoon. DNAPL behaves as a continuing source of contamination, as up-gradient clean groundwater flows through the Site and comes into contact with the DNAPL. Contamination slowly dissolves from the DNAPLs into the groundwater that eventually flows to the Stream Isolation and Groundwater Treatment System (SI/GWTS), or migrates through the bedrock aquifer. Prior to the installation of the SI/GWTS, DNAPL-type contaminants were detected in the Creek sediment. Currently, DNAPL is being recovered from one bedrock monitoring well (AW-1) below the creek bed.

5. Area F, located in the approximate center of the Site, contains the highest soil contaminant concentrations. Concentrations of TCA, PCE and the other VOC fractions are slightly higher than those of methylene chloride in most of the Site soil samples. At several locations, concentrations of methylene chloride are seen to increase with depth. Concentrations of PCE, vinyl chloride, chlorobenzene and

1,1,2,2-PCE exceeded residential direct contact Risk-Based Concentrations (RBCs) or Maryland Soil Standards in the Site soils.

6. Elevated VOC concentrations were detected in the vicinity of the former evaporation lagoon above the silt layer in this area. Contaminant concentrations indicate that contamination in this area did not migrate below the silt layer. Surface soils from the former lagoon were excavated in 1982.

7. No VOCs were detected in any of the perimeter borings to the north and west of the Site. No VOCs exceeded any RBCs or Maryland Soil Standards in the offsite samples to the south. These results indicated that contamination in soil and overburden groundwater does not extend outside the Plant Area portion of OU-1.

8. Dissolved phase VOCs are present in overburden groundwater. The highest concentrations of VOCs in groundwater extend downgradient between former process areas H and F, toward Little Elk Creek. The four compounds analyzed in the field, methylene chloride, PCE, TCE, and 1,1,1-TCA, were all found to exceed federal Maximum Contaminant Levels (MCLs) or RBCs/MDE Ground Water Standards within overburden groundwater beneath the majority of the Site.

9. Surface water contamination in Little Elk Creek has been monitored since 1995. Prior to the construction of the SI/GWTS, a wide range of VOCs were found in the surface water at the Site. Since the startup of the SI/GWTS in March 2000, total VOC concentrations have greatly decreased. Concentrations of VOCs detected just downstream of the SI/GWTS have consistently been below their respective Maryland Surface Water Quality Standards (MSWQS) and Federal Ambient Water Quality Criteria (AWQC) levels for consumption of fish and drinking water.

E.3.2 Pre-Design Investigation and Focused Feasibility Study

The OU-1 PDI was conducted to supplement the findings of the historic investigations relative to the nature and extent of VOCs in overburden groundwater, including the potential presence of dense non-aqueous phase liquid (DNAPL), and to evaluate physical and hydrogeologic properties of overburden groundwater.

The OU-1 PDI generally consisted of the following tasks:

- Membrane interface probe (MIP) investigation;
- Soil sampling and analysis;
- Overburden monitoring well installation and soil sampling;
- VOC soil saturation sampling;
- Groundwater sampling and analysis;
- DNAPL sampling and analysis;
- Groundwater hydraulic testing tracer study;
- LNAPL sampling and analysis;
- Groundwater pH investigation.

Based on the results of the OU-1 PDI and prior remedial investigation work, the OU-1 CSM was refined. The primary CSM conclusions are summarized as follows:

1. Light non-aqueous phase liquid (LNAPL) is present in groundwater within the central area of the Site and contains elevated concentrations of chlorinated/non-chlorinated VOCs (Figure 5). The presence of LNAPL is a new finding of the PDI and was not considered in the OU-1 remedy prescribed in the 2004 OU-1 ROD.

2. Other than at one monitoring well location (MW-13), DNAPL has not been directly observed in the overburden groundwater. However, the presence of DNAPL at the Site is inferred based on multiple lines of evidence identified during the PDI. For the purposes of the OU-1 remedy, the extent of DNAPL was refined to consist of the DNAPL Treatment Area, as shown in Figure 4. DNAPL is likely present within this area in the saturated zone and in vertical intervals that are only seasonally saturated.

3. The presence of DNAPL is likely the source for sustained VOC concentrations in groundwater within the central portion of the Site. The contaminant plume is comprised of a complex mixture of VOCs:

    - chlorinated ethenes, primarily tetrachloroethylene (PCE)
    - chlorinated ethanes, primarily 1,1,1-trichloroethane (TCA)
    - 1,1,2-trichloro-1,2,2-trifluoroethane (CFC-113)
    - Methylene chloride
    - chlorobenzene and other di-/tri-chlorobenzenes
    - aromatic VOCs, primarily toluene and xylenes

4. Significant VOC biodegradation and other abiotic transformations are occurring in the overburden groundwater, including the source area. Geochemical conditions are favorable for reductive dechlorination by biologic processes that degrade some but not all Site-related VOCs. Biodegradation by native bacteria was confirmed by these data and the results of the treatability study conducted as a component of the PDI.

5. Groundwater flow occurs within the three types of overburden at different rates due to the heterogeneity of these materials and their variable thickness. Groundwater flow in the overburden is toward Little Elk Creek, from recharge areas to the east and west, as expected in a typical stream-valley flow system.

6. Groundwater flow conditions are highly heterogeneous, preferential, and transient in the overburden. Please refer to Figures 6a and 6b for overburden groundwater flow maps.

7. The SI/GWTS currently intercepts and treats dissolved VOCs that would otherwise discharge to the stream. The SI/GWTS has been an effective containment and VOC mass treatment measure since its installation in 2000 and surface water quality meets State and Federal criteria.

8. Current and historic VOC mass flux to the SI/GWTS indicated that most of the overburden VOC mass flux occurs in the central portion of the property, VOC mass flux is reduced between the DNAPL mass and the creek, and the VOC mass flux has decreased over the last 16 years.

9. Based on the available tracer study data, the travel time for groundwater and in situ amendment transport across the property will be highly variable within the overburden; also, the travel time is expected to be relatively short in the more conductive overburden material under natural conditions, which must be considered against possible reaction rates specific to the in situ technology.

A Treatability Study and Focused Feasibility Study (FFS) were conducted concurrently with the PDI. The Treatability Study evaluated the effectiveness of the in situ reductive dechlorination (IRD) component of the remedy prescribed by the 2004 OU-1 ROD for treatment of DNAPL. The FFS evaluated in situ technologies that could be applied as alternatives to IRD to treat DNAPL. Findings of the PDI and Treatability Study were incorporated into the FFS as appropriate and available technologies were evaluated against CERCLA criteria consistent with EPA's FS guidance. However, the evaluation was streamlined to those criteria and evaluations

that differentiate the available in situ technologies for treatment of DNAPL in overburden soil and groundwater. The OU-1 Treatability Study and Focused Feasibility Study are discussed in more detail in Section I: Description of Alternatives.

F. Current and Future Potential Land Use and Water Use

Land use in the vicinity of the Site is primarily residential and agricultural. Despite historical industrial use of the Site, the Property is currently zoned for residential use, according to the zoning board of Cecil County, Maryland. The properties immediately adjacent to the Site are currently used for residential purposes or are zoned for residential use if undeveloped. However, due to the soil contamination and building rubble below the Plant Area, along with the presence of the GWTS building, EPA has determined that the Site cannot reasonably be expected to return to residential use. Instead, potential uses include a community park or access ramp to Little Elk Creek, development of the Site for commercial/light industrial use, or as a county utility vehicle maintenance/parking facility. Public water is not currently or reasonably anticipated to be available in the vicinity of the Site and any future development would need to rely on groundwater as a water source. Such use would be subject to the restrictions imposed by the institutional controls component of the 2004 OU-1 ROD.

The Site was purchased by the PRP Group from the former owner/operator in December 2011. Currently, the SI/GWTS treatment building, the historic power house structure, and an open-air pavilion are located on the Plant Area portion of the Site. The power house and pavilion will be demolished as a component of the OU-1 remedy selected in the 2004 OU-1 ROD. The former office building located in the Office Area portion of the Site was demolished in September 2010. The Plant Area, which comprises most of OU-1, is fenced and generally accessible only to authorized personnel.

G. Summary of Site Risks

This section summarizes the results of the risk assessments that were performed during the RI. These baseline risk assessments (before any cleanup) provide the basis for taking a response action and indicate the exposure pathway(s) that need to be addressed by the remedial action. No additional information related to human health or ecological risk has been collected since the completion of the 2003 RI/FS, therefore, only a brief summary is presented below. For more detailed human health and ecological risk information, please refer to the 2004 OU-1 ROD and 2003 RI/FS.

HOW IS HUMAN HEALTH RISK CALCULATED?

A Superfund human health risk assessment estimates the baseline risk. The baseline risk 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). Comparison 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 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" 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 risks. 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.
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. Generally, cancer risks between 10^{-4} and 10^{-6}, and a non-cancer hazard index of 1 or less are considered acceptable for EPA Superfund sites.

G.1 Human Health Risk Assessment

Current and potential future land use plays a key role when EPA determines the exposure scenarios to be evaluated in the HHRA. Although historically used for industrial purposes, the area defined by OU-1 is currently zoned residential. This is consistent with how the immediately surrounding properties were used during the operation of the facility and continue to be used today. Therefore, EPA evaluated the potential risks associated with a home being built on the area defined by OU-1. However, since it is unlikely that this area could be used for residential purposes because of the contamination and the presence of the groundwater treatment plant, EPA also evaluated the use of the area for commercial/industrial purposes and as a park.

Specifically, the HHRA considered the exposure of workers, trespassers and visitors, and potential future residents to onsite soil and overburden groundwater. Potential risks related to vapor intrusion will be addressed under OU-2.

For utility workers, trespassers, and visitors, the estimated cancer risks from exposure to contaminated soil were within or below Superfund's acceptable risk range of 10^{-6} to 10^{-4}. This was also true of construction worker risks from soil. Industrial worker risks from soil were at the upper end of the acceptable risk range at 1×10^{-4}, primarily due to TCE and 1,1,2,2-tetrachloroethane.

For every receptor that could be exposed to ground water by ingestion, dermal contact, and inhalation of vapors while bathing/showering (industrial and construction workers and residents), cancer risks were above the acceptable Superfund risk range (10^{-6} to 10^{-4}). The groundwater cancer risks ranged from 3×10^{-3} (for construction workers) to 7.4×10^{-1} (for potential future residents). These risks were driven by a large suite of VOCs, along with a few semi-volatiles and pesticides, and possibly arsenic.

Potential future residential use of soil would also have a cancer risk above the Superfund range. This risk is driven by arsenic, which could be due to background conditions, although this has not been conclusively determined.

Non-carcinogenic effects were evaluated using the Hazard Index, which is estimated by dividing the dose that is estimated from the Site by a dose that is expected to be free from adverse effects. The Hazard Index (HI) should generally be 1 or less to rule out potential non-cancer effects. Above 1, effects will not necessarily occur, but can no longer be ruled out.

The HIs for all non-residential receptors exposed to soil were 1 or less. For potential future residents, the soil HI would be 6 for adults and 19 for children and is driven by VOCs and metals, although as indicated above, metals concentrations may be indicative of background conditions.

For all potential ground water users, the HIs would exceed 1, ranging from approximately 430 (construction workers) to approximately 4,700 (child residents). These risks are driven by a variety of organic compounds and metals. Even without the metals, VOCs would yield HIs above 1.

Table 1 presents Contaminants of Concern (COCs) in Soil and Overburden Groundwater for the Site identified in the HHRA.

G.2 Ecological Risk Assessment

An ecological risk assessment was not conducted for OU-1 and will instead be a component of the OU-2 remedy selection. The asphalt and concrete covering the former Plant Area of the Site and the Stream Isolation and Groundwater Treatment System (SI/GWTS) prevent ecological receptors from coming into contact with contaminants; therefore, a risk assessment for OU-1 was determined to be unnecessary by EPA.

G.3 Basis for Remedial Action

In summary, the HHRA for OU-1 demonstrated the presence of unacceptable risks to human health from dermal contact and ingestion of onsite soil and dermal contact, ingestion, and inhalation of vapors from onsite overburden groundwater. EPA determined that remedial actions are necessary to reduce the risks to within or below EPA's acceptable risk range. Therefore, it is EPA's determination that implementation of the remedy modification identified in this ROD Amendment, in conjunction with the components of the remedy selected in the 2004 OU-1 ROD, is necessary to protect human health and the environment from actual or threatened releases of hazardous substances into the environment.

H. Remedial Action Objectives (RAOs)

The 2004 OU-1 ROD identified Remedial Action Objectives (RAOs) to protect the public from potential current and potential future health risks. However, LNAPL detected at the Site during the Pre-Design Investigation (PDI) is considered a principal threat waste; therefore, the RAO addressing the treatment of principal threat waste will be modified to also include treatment of LNAPL, as follows:

2004 OU-1 ROD RAO	Modified RAO
Remove DNAPL in the overburden (principal threat waste), to the maximum extent practicable, to minimize the continuing source of contamination to groundwater.	Treat principal threat waste (DNAPL and LNAPL) in the overburden to the maximum extent practicable, to minimize the continuing source of contamination to groundwater.

The following Revised RAOs will be met by the OU-1 remedy:

1. Ensure continued operation and maintenance of the previously constructed Stream Isolation and Ground Water Treatment System (SI/GWTS), so that Federal Ambient Water Quality Criteria (AWQC) for consumption of fish and drinking water are not exceeded within Little Elk Creek, immediately downstream of the Site. This is necessary to address potential risks to human health and ecological risks that may occur if the operation were discontinued and contamination were to enter Little Elk Creek. Continued operation and maintenance includes ensuring that the ground water treatment plant has adequate capacity. The maintenance of the liner is also necessary to prevent the re-establishment of the seeps along the Creek banks, which existed prior to the installation of the liner;

2. Prevent current or future direct contact with contaminated soils which would result in unacceptable levels of risk to human health;

3. Prevent current or future use (ingestion, direct contact, or vapor inhalation) of contaminated groundwater which would result in unacceptable levels of risk to human health; and,

4. Treat principal threat waste (DNAPL and LNAPL) in the overburden, to the maximum extent practicable, to minimize the continuing source of contamination to groundwater.

I. Description of Alternatives

CERCLA requires that any remedial action selected under CERCLA Section 121, to address contamination at a Superfund site be protective of human health and the environment, cost effective, in compliance with regulatory and statutory provisions that are Applicable or Relevant and Appropriate Requirements (ARARs), and compliant with the NCP, to the extent practicable.

The following components of the OU-1 remedy, as selected by the 2004 OU-1 ROD, will be modified by the remedy modification:

- In situ reductive dechlorination of contaminated groundwater;
- Installation of a RCRA modified cap.

The following components of the OU-1 remedy, as selected by the 2004 OU-1 ROD, will remain unchanged by the remedy modification:

- Continued operation and maintenance (O&M) of the existing SI/GWTS;
- Demolition of onsite structures (Plant Area);
- Relocation of debris piles;
- Grading of the Plant Area;
- Monitoring of remedy effectiveness;
- Property use and well drilling restrictions.

I.1. Common Elements of Each Remedial Component

Elements common to each of the Remedial Alternatives consist of removal of Light Non-Aqueous Phase Liquid (LNAPL), installation of a low-permeability asphalt cap, and refinement of the DNAPL Treatment Area.

LNAPL Removal – LNAPL was discovered at the Site during the Pre-Design Investigation (PDI) and is considered a principal threat waste (Figure 5). Each of the Remedial Alternatives evaluated for the OU-1 remedy modification include removal of LNAPL in the central portion of the Site. Multi-phase extraction (MPE) will be employed to remove LNAPL to the extent practicable. Generally, MPE consists of a vacuum that is applied to lower the water table in an extraction well, causing LNAPL, vapor, and groundwater to flow toward the well. The LNAPL, vapor and groundwater are then extracted and treated using an oil-water and air-water separator. The goal of the MPE system is to minimize the amount of groundwater extracted while maximizing the amount of LNAPL and vapor that flow toward the extraction point. Treatment of LNAPL would be conducted prior to the implementation of each of the treatment alternatives, with the exception of Alternatives DNAPL-5 and DNAPL-6. Treatment of LNAPL would instead be conducted concurrently with Alternatives DNAPL-5 and DNAPL-6, also using MPE extraction methodology. However, under Alternatives DNAPL-5 and DNAPL-6, the LNAPL would be heated prior to extraction to reduce viscosity, thereby enhancing the anticipated removal. Costs associated with LNAPL removal are included in the cost estimates presented below.

Asphalt (or Equivalent) Cap – The 2004 OU-1 ROD required the installation of a RCRA modified cap over the Plant Area at the Site, primarily to meet the Remedial Action Objective (RAO) of eliminating direct contact with contaminated soil and groundwater as well as to minimize infiltration of precipitation during large storm events that could impact the existing SI/GWTS. Since the 2004 OU-1 ROD was issued, the current cover at the site, consisting of a combination of asphalt, concrete, and buildings, has sufficiently minimized infiltration such that the SI/GWTS has not been impacted.

Based on the performance of the current cover, EPA has determined that a cap constructed of asphalt or equivalent material would be as effective in minimizing infiltration of precipitation as the RCRA modified cap selected in the 2004 OU-1 ROD and meet the substantive requirements of the applicable hazardous waste landfill regulations. Additionally, the asphalt (or equivalent) cap would provide protection of human health in the same manner as the RCRA modified cap, by preventing direct contact with contaminated soil and groundwater. Finally, the asphalt (or equivalent) cap could be implemented more easily, in a shorter time frame, and at a similar or lower cost than the RCRA modified cap.

Based on this evaluation, EPA proposes to modify the remedy to include the installation of an asphalt (or equivalent) cap in lieu of the RCRA modified cap prescribed by the 2004 OU-1 ROD. In accordance with the 2004 OU-1 ROD, prior to installation of the asphalt (or equivalent) cap, all onsite structures will be demolished, staged debris will be placed onsite, and the Site will be graded. The condition of existing asphalt areas at the Site will be evaluated to determine what portions, if any, can be incorporated into the final cover. The asphalt (or equivalent) cap will be installed over the same area as required by the 2004 OU-1 ROD, encompassing the entire Plant Area (Figure 3).

The asphalt (or equivalent) cap will meet all Applicable or Relevant and Appropriate Requirements (ARARs) specified in the 2004 OU-1 ROD related to closure of RCRA facilities and hazardous waste landfills. However, the Code of Maryland Regulations (COMAR) requirements related to sanitary landfills, which require installation of a cap with an impermeable geosynthetic membrane and vegetated cover, are considered relevant, but not appropriate, based on the Site conditions discussed above. The Maryland Department of the Environment (MDE) has concurred with this change. Additional discussion of compliance with ARARs is included in Section J. Comparative Analysis of Alternatives.

DNAPL Treatment Area – The 2004 OU-1 ROD assumed that DNAPL was present throughout the Plant Area and required that IRD be implemented throughout that area. Data collected during the PDI refined the portion of the Site in which DNAPL was likely present in soil and overburden groundwater. This area, identified as the DNAPL Treatment Area, consists of the Confirmed/Probable DNAPL Zone and Potential DNAPL Zone, as

shown on Figure 4. Each of the Remedial Alternatives was conceptually designed to address the full extent of the DNAPL Treatment Area. During Remedial Design, if data indicates that DNAPL is not present within the Potential DNAPL Zone, the DNAPL Treatment Area will be reduced to encompass only the Confirmed/Probable DNAPL Zone. LNAPL identified during the PDI lies within the Confirmed/Probable DNAPL Zone and will be addressed regardless of the findings during Remedial Design.

Treatment of DNAPL and LNAPL will satisfy the revised RAO to treat principal threat waste to the maximum extent practicable. Dissolved phase VOC contamination in OU-1 will continue to be addressed via collection and treatment by the SI/GWTS per the existing remedy.

I.2. Remedial Alternatives

The following Remedial Alternatives that were evaluated for the remedy modification are numbered to correspond with the alternatives presented in the OU-1 FFS:

Alternative DNAPL 1: No Action

Estimated Capital Cost: $960,513
Estimated Annual Cost: $484,550
Estimated Present Worth Cost: $1,445,063
Estimated Time to Completion: 120 years

Alternative DNAPL-1 consists of continued operation of the existing Stream Isolation and Groundwater Treatment System (SI/GWTS), expanded groundwater monitoring, and potential long-term refurbishing or replacement of the system, as necessary.

Operation and maintenance of the SI/GWTS is a component of the overall remedy at the Site for both OU-1 and OU-2 and will continue in all of the Remedial Alternatives. However, under Alternative DNAPL-1, no treatment of DNAPL at the Site will occur, therefore, this alternative satisfies the requirement that a No Action alternative be evaluated. LNAPL will be removed as described above, the asphalt (or equivalent) cap will be installed in place of the RCRA modified cap, and the remaining components of the remedy will be implemented per the 2004 OU-1 ROD. Performance standards for the SI/GWTS established in the 2004 OU-1 ROD will continue to be met.

Groundwater Monitoring

Groundwater monitoring will be conducted periodically in the DNAPL Treatment Area, using select existing and/or new wells, to evaluate overburden groundwater VOC concentrations and trends, evaluate VOC mass discharge from the overburden over time, and to assess remaining DNAPL mass. Periodic groundwater monitoring of geochemical conditions will also be conducted to evaluate and quantify any degradation/transformation processes and rates throughout the DNAPL Treatment Area and overburden VOC plume. This monitoring will be conducted in addition to the groundwater and surface water monitoring requirements of the 2004 OU-1 ROD. The sufficiency of the existing overburden monitoring well network will be evaluated during Remedial Design.

SI/GWTS Repair and Replacement

Because Alternative DNAPL-1 relies entirely upon the SI/GWTS to treat contaminants at the Site, the treatment time will exceed the expected lifespan of the liner system. At the time it was installed, the liner was expected to last for a period of 20 years, and has currently been in operation for approximately 11 years. While it is

expected that the liner lifespan will exceed 20 years, it is reasonable to assume that one liner replacement will be necessary. Upgrades potentially include additional flow equalization capacity, modification of the former carbon building, and pump/blower/part replacement. Additionally, the liner system requires periodic acid flushing to maintain proper operation and may need replacement at some point in the future. Liner replacement will require temporary diversion of the creek; however, it will not be necessary to remove or replace the cutoff walls.

Alternative DNAPL-2: Enhanced Groundwater Extraction and Reinjection

Estimated Capital Cost: $3,016,225
Estimated Annual Cost: $2,091,644
Estimated Present Worth: $5,107,869
Estimated Time to Completion: 15 years

Alternative DNAPL-2 consists of focused groundwater extraction, treatment using the existing SI/GWTS, and reinjection of the treated groundwater. This methodology was chosen based on the findings of hydraulic and tracer testing conducted during the PDI that indicated groundwater extraction alone would likely not be effective. A conceptual layout of the system is included as Figure 7.

In addition to treating contaminated groundwater following extraction, reinjection of treated water will increase the groundwater flow in contact with DNAPL. The DNAPL dissolution rate will therefore be enhanced and increased dissolved VOC mass will be discharged to and treated by the SI/GWTS. It is currently assumed that only nominal upgrades will be necessary to utilize the SI/GWTS for this alternative.

Pilot Testing

During Remedial Design, a pilot test will be conducted to evaluate extraction and injection rates and the effective radius of influence in the upgradient, downgradient and cross-gradient directions. The pilot study will be designed based on hydraulic testing historically conducted at the Site during previous investigations.

Tracer Testing

Tracer testing will be performed concurrently with the pilot study, but only after the injection and extraction rates have been optimally adjusted to operate efficiently and sustainably. Two tracers will be mixed into the injection water and introduced into the pilot study cell through the injection well. One tracer will be a partitioning tracer that has the ability to partition into any potential DNAPL. The partitioning tracer will be hydrophobic, water soluble, and have a low retardation rate in the absence of DNAPL. A second, non-partitioning tracer will be used to compare the rate of travel of the partitioning tracer in the overburden groundwater. A comparison between the partitioning and non-partitioning tracer concentrations will indicate if DNAPL is present and provide an approximate estimate of the residual DNAPL mass encountered.

Groundwater Monitoring

Groundwater monitoring will be conducted to evaluate overburden groundwater VOC concentrations and trends, evaluate VOC mass removal from the overburden over time, and to assess remaining DNAPL mass. This monitoring will be conducted in addition to the OU-1 and SI/GWTS monitoring and surface water monitoring requirements of the 2004 OU-1 ROD. The sufficiency of the existing overburden monitoring well network will be evaluated during Remedial Design.

Alternative DNAPL-3: Enhanced In-Situ Reductive Dechlorination

Estimated Capital Cost: $2,504,691
Estimated Annual Cost: $2,953,978
Estimated Present Worth: $5,458,669
Estimated Time to Completion: 7 years

Alternative DNAPL-3 is similar to the remedy selected in the 2004 OU-1 ROD and both rely on in-situ reductive dechlorination (IRD) of VOCs. IRD is a bioremediation process in which the degradation of contaminants by microorganisms is stimulated by injecting electron donor material. The electron donor material helps create a favorable environment for the microorganisms to grow and use contaminants as a food and energy source. End products of the degradation are expected to be nonhazardous or less toxic compounds that are more stable, less mobile, or inert, such as ethene, ethane, and water.

The remedy in the 2004 OU-1 ROD consisted of injecting electron donor material upgradient of principal threat waste and allowing natural groundwater flow to distribute the material across the Site. Alternative DNAPL-3 consists of a closed-loop groundwater recirculation system to distribute electron donor material and pH buffer solution throughout the DNAPL Treatment Area, as detailed below. A conceptual layout of the system is included as Figure 8.

Implementation of IRD using a closed-loop system will increase DNAPL dissolution via flushing, normalize groundwater geochemistry, distribute electron donor material within the DNAPL Treatment Area, reduce contaminant mass discharge to the SI/GWTS from OU-1, and protect the SI/GWTS from damage related to IRD amendments and by-products. Groundwater will be extracted from a series of wells located toward the downgradient edge of the DNAPL Treatment Area, amended with electron donor and pH buffer, and reinjected into injection wells located toward the upgradient edge of the treatment area. A closed-loop recirculation system will be formed in which bioremediation agents and VOC daughter products will be captured at the extraction wells and recirculated back into the treatment system via the injection wells. In addition, the approach will maximize hydraulic residence time in the treatment zone via recirculation, thereby optimizing the timeframe for treatment of VOCs that biodegrade more slowly.

Treatability Study

A treatability study was completed in November 2010 in accordance with the 2004 OU-1 ROD. The treatability study indicated that IRD was effective in treating approximately 75% of the suite of chlorinated VOCs at the Site but would be unable to treat aromatic hydrocarbons and chlorobenzenes. Based on this information, assuming a 90% reduction of treatable DNAPL mass, it was estimated that IRD could achieve approximately a 67% reduction in total DNAPL mass at the Site.

Pilot Testing

A pilot test will be conducted at the Site encompassing approximately 10% to 30% of the DNAPL Treatment Area and generally consist of installation of injection and extraction wells and temporary control system, performance of a tracer test using the new wells, and performance monitoring for a period of one year. Results of the pilot test would be used to design the well layout, flow rates, electron donor and pH buffer dosing, and injection schedule for the full-scale system.

Groundwater Monitoring

Full-scale implementation of the remedy will consist of the installation of the remaining injection and extraction wells, injection of electron donor material, injection of bioaugmentation material, and performance monitoring. Performance monitoring will consist of the installation of additional monitoring wells to evaluate electron donor material concentration, migration, and longevity and genetic testing of the introduced microorganisms to assess their proliferation. Long-term groundwater monitoring will be conducted in addition to the groundwater and surface water monitoring requirements of the 2004 OU-1 ROD.

At the end of the IRD operation, it is anticipated that chlorobenzenes and aromatic hydrocarbons may remain within the target treatment zone. This contamination will be recovered and treated via continued operation of the SI/GWTS. In addition, it is anticipated that dechlorination of residual contaminants will continue in the DNAPL Treatment Area after recirculation of groundwater and injection of electron donor material has ended.

Alternative DNAPL-4: In-Situ Chemical Oxidation

Estimated Capital Cost: $6,040,942
Estimated Annual Cost: $1,585,700
Estimated Present Worth: $7,626,642
Estimated Time to Completion: 2 years

Alternative DNAPL-4 consists of In Situ Chemical Oxidation (ISCO) via recirculation of oxidant-amended water throughout the DNAPL Treatment Area. Chemical oxidation generally involves reduction/oxidation (redox) reactions that chemically convert hazardous contaminants to nonhazardous or less toxic compounds that are more stable, less mobile, or inert, such as ethene, ethane, and water. A conceptual layout of the system is included as Figure 9.

Similar to the closed-loop system in Alternative DNAPL-3, groundwater will be extracted from a series of wells located toward the downgradient edge of the DNAPL Treatment Area, amended with oxidant material, and reinjected into injection wells located toward the upgradient edge of the treatment area. ISCO recirculation will enhance the dissolution of DNAPL in the overburden via increased groundwater flow within the targeted treatment areas. The oxidant-amended water will in turn enhance the destruction of dissolved phase VOCs as it travels through the overburden material. ISCO recirculation will be implemented to ensure that the injected oxidants and downgradient groundwater are controlled to avoid DNAPL and VOC plume mobilization beyond the treatment zone and adverse impacts to the SI/GWTS.

Similar to Alternative DNAPL-3, ISCO is expected to be effective in treating approximately 75% of the suite of chlorinated VOCs at the site but will be unable to treat aromatic hydrocarbons and chlorobenzenes. Based on this information, assuming a 90% reduction of treatable DNAPL mass, it is estimated that ISCO could achieve approximately a 67% reduction of total DNAPL mass at the Site.

Design of the ISCO treatment system will consist of the following components, similar to those discussed in more detail under Alternative DNAPL-3:

- Aquifer testing – evaluate hydraulic conditions;
- Bench-scale laboratory testing – determine oxidant, activator, and dosage;
- Analytical/numerical modeling – determine injection rates, recovery rates, oxidant mass, well locations, and oxidant concentrations;

- Pilot testing – partial field implementation based on prior test results;
- Final system design.

Groundwater Monitoring

During implementation of the remedy, performance monitoring will be conducted to monitor the destruction/migration of VOCs and aquifer geochemistry. Downgradient monitoring wells will be monitored to evaluate if migration/mobilization of oxidant chemistry is occurring during the treatment. Additionally, a temporary treatment unit will likely be necessary to remove oxidents from groundwater at the end of the ISCO injections to allow the groundwater to be discharged to the GWTS directly. Groundwater may be recirculated in the subsurface after ISCO treatment to minimize the amount of oxidant-amended water that requires treatment prior to discharge. Long-term groundwater monitoring will be conducted in addition to the groundwater and surface water monitoring requirements of the 2004 OU-1 ROD.

Alternative DNAPL-5: In-Situ Thermal Treatment

Estimated Capital Cost: $6,845,500
Estimated Annual Cost: $69,524
Estimated Present Worth: $6,915,024
Estimated Time to Completion: <1 year

Alternative DNAPL-5 consists of in situ thermal treatment throughout the DNAPL Treatment Area. A conceptual layout of the system is included as Figure 10.

Thermal treatment via Electrical Resistance Heating (ERH) rapidly heats the subsurface to the boiling point of water by passing electrical current through contaminated soil and groundwater using electrodes. This heating evaporates VOCs in situ and steam strips VOCs from the subsurface. Vapors and steam are then extracted, cooled, and treated. Once subsurface heating starts, the boiling point of various VOC/water mixtures is reached in the following order: DNAPL in contact with water or moist soil, groundwater containing dissolved VOCs, and then pure groundwater. DNAPL and VOC-impacted groundwater will boil before uncontaminated water, reducing the time and energy required to complete treatment. The technology has been demonstrated as an effective method for the removal of VOCs from both unsaturated and saturated zones and is not significantly affected by soil permeability and heterogeneity. Based on currently available information, thermal treatment is expected to result in a 99% reduction in DNAPL mass within the DNAPL Treatment Area.

The primary components of the conceptual thermal treatment system include:

- Electrodes and vapor (and potentially liquid) recovery wells;
- Electrical transformer and power distribution system;
- Manifold and conveyance piping for extracted vapor and fluid;
- Cooling and phase separation equipment;
- Liquid treatment system;
- Vapor treatment system.

Bench Scale Testing

Laboratory bench scale testing will be conducted to investigate the electrical resistivity of overburden materials to identify the energy input and resulting time to reach various temperatures.

Pilot Testing

Pilot testing will be conducted to assess the radial influence of vacuum wells and vacuum pressures to collect vapors in the vadose zone. The testing will be conducted under vacuum extraction and dual extraction (vacuum and water extraction) conditions. The pilot test will also include testing for LNAPL recovery and include additional soil vapor monitoring points to define radii of influence in the overburden and additional tracer gas testing.

Thermal Cap

Installation of a thermal cap at the ground surface will be necessary to insulate the system, reduce infiltration, and assist in vapor recovery. The DNAPL Treatment Area will be covered by the cap, consisting generally of concrete or asphalt with additives to enhance insulation. The thermal cap will be tied into the asphalt (or equivalent) cap that will be installed over the remainder of the Plant Area.

Performance Monitoring

Performance of the system will be assessed through continuous monitoring of multiple parameters throughout treatment. The total mass of DNAPL/VOCs treated will be tracked during implementation to assess mass removal trends and estimate the total mass removed as vapor, liquid, and NAPL. The well field will be assessed for the presence of DNAPL and LNAPL in the DNAPL Treatment Area compared to baseline conditions. Temperature will be monitored to determine if sufficient temperatures are being maintained to result in contaminant vaporization. The technical limits of the system to remove contaminant mass will be established during operation based on evaluation of the multiple lines of evidence described above.

Alternative DNAPL-6: In-Situ Thermal Treatment, Partial DNAPL Treatment Area

Estimated Capital Cost: $4,222,568
Estimated Annual Cost: $69,524
Estimated Present Worth: $4,292,092
Estimated Time to Completion: <1 year

Alternative DNAPL-6 is identical to Alternative DNAPL-5 described above, except that only the Confirmed/Probable DNAPL Area as currently defined will be treated using thermal treatment technology (Figure 11). The Potential DNAPL Areas will be addressed by dissolution and discharge to the SI/GWTS.

The area to be treated via thermal treatment in Alternative DNAPL-6 contains the greatest saturated soil VOC mass, the highest VOC groundwater concentrations, and the portion of the Site in which DNAPL was historically directly observed. Outside of the Partial DNAPL Treatment Area, groundwater contamination will be addressed via dissolution and discharge to the SI/GWTS, as detailed in Alternative DNAPL-1. The remainder of the primary components of the remedy, including bench scale testing, pilot testing, thermal cover, and monitoring will be the same as Alternative DNAPL-5.

I.3. Expected Outcomes of the Remedy Modification

The remedy modification is expected to reduce the amount of principal threat material (DNAPL and LNAPL) in the soil and overburden groundwater to the maximum extent practicable. The Remedial Alternatives evaluated herein will be more effective in treating the principal threat material than the remedy currently selected in the 2004 OU-1 ROD. Additionally, installation of a cap is expected to eliminate direct contact with contaminated

soils and overburden groundwater while minimizing infiltration of precipitation that could potentially result in impairment of the SI/GWTS.

J. Comparative Analysis of Alternatives

The alternatives discussed above were compared with the nine criteria set forth in the NCP at 40 C.F.R § 300.430(e)(9)(iii) in order to select a remedy for the Site. These nine criteria are categorized according to three groups: threshold criteria; primary balancing criteria; and modifying criteria. These evaluation criteria relate directly to the requirements in Section 121 of CERCLA, 42 U.S.C § 9621, which determine the overall feasibility and acceptability of the remedy.

Threshold criteria must be satisfied in order for a remedy to be eligible for selection. Primary balancing criteria are used to weigh major trade-offs among remedies. State and community acceptance are modifying criteria formally taken into consideration after public comment is received on the Proposed Plan. A summary of each of the criteria is presented below, followed by a summary of the relative performance of the alternatives with respect to each of the nine criteria. These summaries provide the basis for determining which alternative provides the "best balance" of trade-offs with respect to the nine criteria. Additional comparative analysis of the alternatives can be found in the PDI/FFS.

Threshold Criteria:

1. Overall Protection of Human Health and the Environment determines whether an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, or treatment.

2. Compliance with ARARs evaluates whether the alternative meets Federal and State environmental statutes, regulations, and other requirements that pertain to the Site, or whether a waiver is justified.

Primary Balancing Criteria:

3. Long-term Effectiveness and Permanence considers the ability of an alternative to maintain protection of human health and the environment over time.

4. Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.

5. Short-term Effectiveness considers the risks that might be posed to the community during implementation of the alternative; the potential impacts on workers during the remedial action and the effectiveness and reliability of protective measures; potential environmental impacts of the remedial action; and the length of time until protection is achieved.

6. Implementability considers the technical and administrative feasibility of implementing the alternative, including factors such as the relative availability of goods and services.

7. Cost includes estimated capital and annual operations and maintenance costs, as well as present worth cost. Present worth cost is the total cost of an alternative over time in today's dollar value. Cost estimates are expected to be accurate within a range of +50 to -30 percent.

Modifying Criteria:

8. State/Support Agency Acceptance considers whether the State agrees with EPA's analyses and recommendations, as described in the Proposed Plan.

9. Community Acceptance considers whether the local community agrees with EPA's analyses and preferred alternative. Comments received on the Proposed Plan are an important indicator of community acceptance.

DETAILED ANALYSIS OF THE PROPOSED REMEDIAL ALTERNTIVES

1. Overall Protection of Human Health and the Environment

Protection of human health and the environment was provided in the 2004 OU-1 ROD by operation of the SI/GWTS, installation of a RCRA modified cap, treatment of principal threat waste using in-situ reductive dechlorination (IRD), and institutional controls restricting land and groundwater use at the Site.

The asphalt (or equivalent) cap described herein will provide protection of human health and the environment in the same manner as the RCRA modified cap, by eliminating direct contact with contaminated soil and overburden groundwater and protection of the environment, by minimizing infiltration of precipitation that could impact the SI/GWTS and result in contaminants being released to Little Elk Creek.

Each of the DNAPL treatment alternatives is also protective of human health and the environment. The alternatives would work in conjunction with the SI/GWTS to treat contaminant mass in the soil and overburden groundwater, with the exception of Alternative DNAPL-1, which consists of operation of the SI/GWTS only. Alternative DNAPL-2 would accelerate the dissolution of DNAPL for treatment by the SI/GWTS, Alternatives DNAPL-3 and DNAPL-4 would provide treatment of dissolved VOCs and Alternatives DNAPL-5 and DNAPL-6 would treat both dissolved VOCs and DNAPL mass directly.

Each of the DNAPL treatment alternatives were designed to avoid potential adverse impacts to the SI/GWTS due to its important role in maintaining the overall protectiveness of the remedy of human health and the environment.

2. Compliance with ARARs

The 2004 OU-1 ROD designated the Plant Area as a Waste Management Area (WMA) where waste would be left in place as a component of the OU-1 remedy. The waste consists of residual waste and debris piles from the former onsite lagoon, contaminated creek sediments from construction of the SI/GWTS, structural debris and historic building foundations, abandoned drainage pipes, and an abandoned mill race. Based on this designation, in accordance with the preamble of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (55 FR 8753), chemical-specific Applicable or Relevant and Appropriate Requirements (ARARs) for groundwater, such as MCLs or MCLGs, need to be met at the boundary of the WMA rather than within the WMA. MCLs and MCLGs are not currently exceeded outside the WMA in overburden groundwater. The designation of the WMA will remain in place as defined by the 2004 OU-1 ROD.

a) Asphalt (or Equivalent) Cap

Action-specific ARARs consisting of COMAR and RCRA requirements related to construction of the RCRA modified cap were determined to be both applicable and relevant and appropriate in the 2004 OU-1 ROD. All COMAR and RCRA requirements related to closure and capping of hazardous waste landfills will be retained for the modified remedy and the asphalt (or equivalent) cap will be designed to meet those requirements.

However, the COMAR sanitary landfill capping requirements determined to be both relevant and appropriate in the 2004 OU-1 ROD are considered relevant, but not appropriate to Site conditions and will be eliminated from the proposed remedy modification. Those requirements include specific design components of the cap, including use of a geosynthetic membrane to minimize infiltration. Due to the observed effectiveness of the current asphalt cover at the Site to minimize infiltration, use of a geosynthetic membrane is not necessary to meet the RAO established in the 2004 OU-1 ROD to eliminate direct contact with contaminated soil and overburden groundwater or to prevent infiltration from impacting the SI/GWTS. Therefore, the asphalt (or equivalent) cap will not be required to meet those regulations. The Maryland Department of the Environment has concurred with this ARAR modification (Appendix C). Specific ARARs to be eliminated are provided in the table below:

Landfill Cap ARARs to be Eliminated			
ARAR	**Legal Citation**	**Classification**	**Summary of Requirement**
Sanitary Landfill Closure Requirements	COMAR 26.04.07.04 C(5)	Relevant and Appropriate	Construction details for the RCRA modified cap.
	COMAR 26.04.07.10		
	COMAR 26.04.07.19 E(5),(6)		
	COMAR 26.04.07.21 B, D, E		
	COMAR 26.04.07.22 A, B, C		

b) Principal Threat Waste Treatment

No ARARs in addition to those considered in the 2004 OU-1 ROD would be required for Alternative DNAPL-1. However, two additional ARARs would be required for Alternatives DNAPL-2 through DNAPL-6, as provided below and in Table 2:

New Potential ARAR			
ARAR	**Legal Citation**	**Classification**	**Summary of Requirement**
Federal Underground Injection Control Program	40 CFR Part 144	Applicable	Federal requirements for the classification and operation of injection wells.
Maryland Underground Injection Control	COMAR 26.08.07.01-.04	Applicable	State requirements for the classification and operation of injection wells. Incorporates by reference 40 CFR 144.

One additional ARAR would also be required for Alternatives DNAPL-5 and DNAPL-6, as provided below and in Table 2:

New Potential ARAR			
ARAR	**Legal Citation**	**Classification**	**Summary of Requirement**
RCRA Requirements for Hazardous Waste Treatment, Storage, and Disposal Facilities (TSDFs)	40 CFR Part 264.600-603	Relevant and Appropriate	Federal requirements for treatment of hazardous waste in miscellaneous units.

All ARARs identified in the 2004 OU-1 ROD will continue to be met by the original components of the remedy as well as the modified components of the remedy. Those ARARs are described in detail in Table 9 of the 2004 OU-1 ROD document.

3. Long Term Effectiveness and Permanence

As noted above, each of the DNAPL treatment alternatives were designed to avoid potential adverse impacts to the SI/GWTS.

All of the DNAPL treatment alternatives provide permanent reduction of DNAPL mass. Alternatives DNAPL-1 and DNAPL-2 rely on the dissolution of DNAPL via groundwater flushing only and therefore result in the slowest reduction in contaminant mass. Additionally, because the mass reduction rate depends on the amount of DNAPL in contact with groundwater, the mass reduction will decline over time as the DNAPL mass is depleted.

Alternatives DNAPL-3 and DNAPL-4 are expected to provide a greater level of mass reduction compared to Alternatives DNAPL-1 and DNAPL-2. Similar to Alternatives DNAPL-1 and DNAPL-2, both Alternatives DNAPL-3 and DNAPL-4 rely on dissolution of DNAPL into the aqueous phase for treatment and do not treat DNAPL directly. However, the contaminant mass reduction rate for Alternatives DNAPL-3 and DNAPL-4 is increased both by the closed-loop injection methodology and in situ groundwater amendments used by both alternatives. Based on the contaminant composition at the Site and available case studies, it is assumed that the technical limits for Alternatives DNAPL-3 and DNAPL-4 would be a 67% reduction in DNAPL mass.

Long-term effectiveness and permanence is greatest for Alternatives DNAPL-5 and DNAPL-6. Case studies suggest that a mass reduction of 99% or more is typical for thermal treatment due to its ability to treat DNAPL directly and effectively treat low-permeability soils compared to other in situ technologies. Additionally, in situ thermal treatment would be effective in volatilizing the full suite of VOCs that comprise the Site DNAPL.

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

All of the DNAPL alternatives reduce the toxicity, mobility, and volume of contamination through treatment. Alternatives DNAPL-1 through DNAPL-4 rely on the dissolution of DNAPL into the aqueous phase and treatment of the aqueous phase VOCs. Alternatives DNAPL-5 and DNAPL-6 treat both DNAPL and aqueous phase VOCs directly.

Alternatives DNAPL-1 and DNAPL-2 provide for treatment of the full suite of VOCs present in DNAPL. However, the ability of Alternatives DNAPL-1 and DNAPL-2 to treat the full extent of the DNAPL mass is limited by the heterogeneity of the overburden material and the dissolution rate of DNAPL by groundwater flow.

Alternatives DNAPL-3 and DNAPL-4 are expected to treat approximately 75% of the suite of VOCs present in DNAPL. Therefore, assuming a 90% reduction of the mass of those contaminants, implementation of Alternatives DNAPL-3 and DNAPL-4 would only result in approximately a 67% reduction in overall DNAPL mass. Additionally, similar to Alternatives DNAPL-1 and DNAPL-2, the ability of Alternatives DNAPL-3 and DNAPL-4 to treat DNAPL is limited by the heterogeneity of the overburden and the DNAPL dissolution rate. Finally, some uncertainty exists related to the degree Alternative DNAPL-3 will reduce the toxicity and mobility of DNAPL in overburden groundwater, as some VOC degradation products are known to be more toxic, difficult to treat, and/or more mobile than the parent compounds.

Alternatives DNAPL-5 and DNAPL-6 can effectively treat the full suite of VOCs present in DNAPL and are expected to result in a 99% reduction in DNAPL mass within the DNAPL Treatment Area. However, the overall reduction in contaminant mass would be lower for Alternative DNAPL-6 because the DNAPL Treatment Area would be smaller than the DNAPL Treatment Area in Alternative DNAPL-5. Alternatives DNAPL-5 and DNAPL-6 would not be impacted by overburden heterogeneity or the DNAPL dissolution rate.

5. Short-term Effectiveness

Alternatives DNAPL-1 and DNAPL-2 present the least amount of risk to workers and the community due to the limited handling of potential hazardous materials during implementation. Based on the anticipated additional flow to the SI/GWTS under Alternative DNAPL-2, neither current GWTS discharge nor an increase in discharge would pose unacceptable environmental impacts for effluent discharge to surface water. However, the length of time required to implement Alternatives DNAPL-1 and DNAPL-2 is significantly longer than the other alternatives.

Alternatives DNAPL-3 and DNAPL-4 present similar short-term risks to workers and the community and would be implemented over similar time frames. The handling of in situ treatment chemicals during the implementation of both alternatives would require additional health and safety measures; however, the risks to the environment are less of a concern for Alternative DNAPL-3 due to the use of food-grade materials for IRD. Also, due to difficulties achieving complete hydraulic control downgradient of injection wells, groundwater containing high VOC concentrations and altered geochemistry may be discharged to the SI/GWTS or surface water under both Alternatives DNAPL-3 and DNAPL-4. Such discharges may negatively impact operation of the SI/GWTS or result in an impact to Little Elk Creek.

Alternatives DNAPL-5 and DNAPL-6 present the greatest concern for impacts to the environment due to the extraction of VOC vapors and treatment at the surface; however, thermal treatment requires the shortest implementation time frame, thereby minimizing these risks. Additionally, the potential for Alternatives DNAPL-5 and DNAPL-6 to impact the operation of the SI/GWTS or impact Little Elk Creek is significantly less than for Alternatives DNAPL-3 and DNAPL-4 because hydraulic control of injected materials is not necessary. Engineering controls will be in place under each of the DNAPL treatment alternatives to minimize risk to human health or the environment during implementation.

The following time frames were estimated to meet the Remedial Action Objective (RAO) of treating principal threat waste to the maximum extent practicable:

- Natural Dissolution (DNAPL-1): 120 years
- Enhanced Extraction/Reinjection (DNAPL-2): 15 years
- IRD (DNAPL-3): 7 years
- ISCO (DNAPL-4): 2 years
- Thermal (DNAPL-5 and DNAPL-6): 0.5 year

6. Implementability

Based on current information, Alternatives DNAPL-1 is the most readily implementable. Alternatives DNAPL-2 through DNAPL-6 are significantly more complex to implement.

Additional design, such as bench and/or pilot testing, hydraulic testing, and modeling will be required for Alternatives DNAPL-2 through DNAPL-6. A treatability study conducted for Alternative DNAPL-3 indicated that IRD was effective in treating dissolved phase VOCs; however, a pilot test is still necessary to confirm that the alternative could be implemented under actual field conditions.

Implementation of Alternatives DNAPL-2 through DNAPL-4 would be complicated by construction of the injection and extraction systems. Additionally, implementation of Alternatives DNAPL-3 and DNAPL-4 would be impacted by the heterogeneous nature of the overburden coupled with the need to prevent the injected materials from entering the SI/GWTS. Bio-fouling and the ability to control groundwater geochemistry would also be a concern with Alternative DNAPL-3. Handling and long-term storage of oxidation chemicals could further complicate the implementation of Alternative DNAPL-4.

Implementation of Alternatives DNAPL-5 and DNAPL-6 is complicated due to the multiple processes involved with thermal treatment. Thermal treatment also requires a more significant effort for mobilization, site preparation, and construction compared the other remedial alternatives but is subject to less uncertainty related to the overburden heterogeneity and hydraulic control of groundwater amendments.

The ability to effectively monitor and assess performance of the alternatives in achieving DNAPL reduction was also considered. Alternatives DNAPL-3 through DNAPL-6 require more complex monitoring compared to Alternatives DNAPL-1 and DNAPL-2. In particular, Alternatives DNAPL-5 and DNAPL-6 require monitoring of vapor flow, contaminant concentrations, temperature, pressure, and other parameters. However, these complications are shorter in duration compared to other alternatives due to the short operational time of thermal treatment.

7. Cost

The 30 year present worth estimates for Alternatives DNAPL-1 through DNAPL-6 are summarized as follows:

Alternative	Capital Cost	Present Worth of O&M/Periodic Costs	Total Cost
DNAPL-1	$1,000,000	$500,000	$1,500,000
DNAPL-2	$3,000,000	$2,100,000	$5,100,000
DNAPL-3	$2,800,000	$2,900,000	$5,700,000
DNAPL-4	$6,000,000	$1,600,000	$7,600,000
DNAPL-5	$6,800,000	$100,000	$6,900,000
DNAPL-6	$4,200,000	$100,000	$4,300,000

The 30 year present worth estimate was calculated using a 5 percent discount rate to remain consistent with the cost estimates provided in the 2004 OU-1 ROD. Costs for the removal of LNAPL are included in the present worth costs for each alternative.

Alternative DNAPL-1 has the lowest overall cost because it does not involve significant construction or capital costs. The total cost for Alternatives DNAPL-2 through DNAPL-6 are similar, however the capital costs for DNAPL-5 and DNAPL-6 are relatively high due to significant upfront costs to construct the thermal treatment system. Capital costs for DNAPL-4 are also relatively high due to the cost of the oxidation chemicals.

8. State Acceptance

The Maryland Department of the Environment (MDE) concurs with EPA's Selected Remedy for the Site; a concurrence letter was received by EPA on February 10, 2012 (Appendix C).

9. Community Acceptance

EPA conducted a public meeting for the Proposed Plan on November 8, 2011. EPA's Preferred Alternative was well received by those in attendance. Questions and concerns that were raised during the public meeting along with EPA's responses are provided in Section III of the ROD Amendment, the Responsiveness Summary. Additional comments that were submitted to EPA during the comment period are also addressed in the Responsiveness Summary.

K. 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 C.F.R. Section 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, for example, to groundwater. Principal threat wastes are those source materials considered to be highly toxic or highly mobile, which would present a significant risk to human health or the environment should exposure occur.

The 2004 OU-1 ROD identified DNAPL in soil and overburden groundwater as principal threat waste. Additionally, LNAPL was identified onsite during the PDI and is also considered principal threat waste. This ROD Amendment selects a remedy to address principal threat waste that is expected to me more effective than the remedy component selected to address principal threat waste in the 2004 OU-1 ROD.

L. Selected Remedy: Description and Performance Standards

Based on consideration of the CERCLA requirements and analysis of alternatives using the nine evaluation criteria, including public comments, EPA has determined that the following modifications to the remedy selected in the 2004 OU-1 ROD are appropriate:

2004 OU-1 ROD Component		Modified Remedy Component
1	Continued operation and maintenance of the existing Stream Isolation and Groundwater Treatment System (SI/GWTS).	Not modified.
2	Demolition to grade of all structures in the Plant Area.	Not modified.
3	Placement of onsite debris piles under the Resource Conservation and Recovery Act (RCRA) cap.	Not modified.
4	Grading of the Plant Area.	Not modified.
5	Installation of a RCRA modified cap, including a geosynthetic membrane.	Installation of an asphalt (or equivalent) cap.
6	In situ reductive dechlorination of principal threat waste.	In situ thermal treatment of principal threat waste.
7	Monitoring to ensure the effectiveness of the remedy.	Not modified.
8	Land and groundwater use restrictions.	Not modified.

In accordance with the 2004 OU-1 ROD, the final OU-1 remedy includes continued operation and maintenance of the existing SI/GWTS to prevent discharge of DNAPL and contaminated groundwater to Little Elk Creek and to reduce contaminant mass. Additionally, remaining onsite structures will be demolished, the Plant Area will be graded, and debris and stockpiled soils will be capped onsite to address soil direct contact risks. Institutional controls restricting land and groundwater use at the Site will also be implemented. These portions of the remedy will be subject to the performance standards established in Section 11.2 of the 2004 OU-1 ROD.

This ROD Amendment modifies the remedy selected in the 2004 OU-1 ROD such that the final OU-1 remedy includes in-situ thermal treatment of principal threat waste and installation of an asphalt (or equivalent) cap over the Plant Area in accordance with the performance standards established herein. The rationale for the remedy modification is provided below.

L.1. Summary of the Rationale for the Remedy Modification

L.1.1 Asphalt (or Equivalent) Cap

Installation of an asphalt (or equivalent) cap will meet the RAO of eliminating direct contact with contaminated soil and overburden groundwater, thereby providing protection of human health in the same manner as the RCRA modified cap selected in the 2004 OU-1 ROD. Additionally, the asphalt (or equivalent) cap will minimize infiltration of precipitation to the same degree as the RCRA modified cap, preventing the SI/GWTS from being impacted during large storm events and meeting the substantive requirements of state and federal

hazardous waste landfill closure regulations. The asphalt (or equivalent) cap also has the following advantages compared to the RCRA modified cap:

- Less complex design/implementation;
- Shorter implementation time frame;
- Lower cost.

Based on the factors presented above, EPA has determined that installing an asphalt (or equivalent) cap instead of a RCRA modified cap will be more effective in addressing OU-1 contamination.

L.1.2 Thermal Treatment

Thermal treatment will meet the RAO of treating principal threat waste in the overburden to the maximum extent practicable and has the following advantages compared to the other remedial alternatives evaluated herein:

- Treatment of approximately 99% of the contaminant mass in the DNAPL Treatment Area;
- Short implementation time-frame (less than one year);
- Low potential to impact the SI/GWTS and Little Elk Creek;
- Implementation not impacted by DNAPL dissolution rate or overburden heterogeneity.

Based on the factors presented above, EPA has determined that implementing thermal treatment instead of in-situ reductive dechlorination (IRD) will be more effective in addressing principal threat waste in OU-1.

L.2. Description of the Remedy Modification

Below is a detailed description of EPA's remedy modification; Alternative DNAPL-5, In-Situ Thermal Treatment, as presented in the OU-1 Focused Feasibility Study (FFS), and the installation of an asphalt (or equivalent) cap, as further described below. As previously indicated, the DNAPL Treatment Area will be refined during Remedial Design and will include, at a minimum, the Confirmed/Probable DNAPL Zone defined in the OU-1 FFS. Figure 10 shows a conceptual layout of the Preferred Alternative with the currently anticipated DNAPL Treatment Area.

L.2.1 Asphalt (or Equivalent) Cap

An asphalt (or equivalent) cap will be installed at the Site in lieu of the RCRA modified cap prescribed by the 2004 OU-1 ROD. Consistent with the currently selected remedy, all onsite structures will be demolished, staged debris will be placed onsite, and the Site will be graded prior to installation of the cap. The asphalt (or equivalent) cap will be installed over the same area as required by the 2004 OU-1 ROD, encompassing the entire Plant Area (Figure 3).

L.2.1.1 Performance Standards

Install a cap consisting of asphalt or equivalent material over the entirety of the Plant Area at the Site that shall:

1. Eliminate potential direct contact with contaminated soil and overburden groundwater;

2. Provide long-term minimization of migration of liquids;

3. Function with minimum maintenance;

4. Promote drainage of run-on and run-off and minimize erosion or abrasion of the cap;

5. Accommodate settling and subsidence so that the cap's integrity is maintained;

6. Have a permeability less than or equal to the permeability of the natural subsoils present.

7. Incorporate portions of existing asphalt and/or concrete areas if such materials can meet requirements 1 through 6, above.

L.2.1.2 Design Considerations

Permeability testing of the natural subsoils will be conducted during Remedial Design to determine the required permeability of the cap material.

L.2.2 In-Situ Thermal Treatment

In-situ thermal treatment will be conducted at the Site in lieu of the in-situ reductive dechlorination (IRD) remedy prescribed by the 2004 OU-1 ROD. In-situ thermal treatment consists of using Electrical Resistance Heating (ERH) to rapidly heat the subsurface by passing electrical current through contaminated soil and groundwater. Heating evaporates and steam strips volatile organic compounds (VOCs) from the subsurface where they are extracted, cooled, and treated in the existing GWTS. Treatment will occur throughout the DNAPL Treatment Area. Based on current information, it is expected that thermal treatment could achieve a maximum reduction in principal threat waste of approximately 99% within the treated area.

L.2.2.1 Performance Standards

Conduct thermal treatment throughout the DNAPL Treatment Area (Figures 4 and 10) to achieve maximum treatment of principal threat waste, consisting of the following elements:

1. Install a thermal/vapor cap over the DNAPL Treatment Area that shall insulate the treated area from ambient air, reduce direct water infiltration, and assist in vapor recovery;

2. Heat the overburden[2] to establish and maintain subsurface temperatures of 90° C in the vadose zone and 100° C in the saturated zone throughout the DNAPL Treatment Area to boil groundwater and DNAPL and to boil or reduce the viscosity of LNAPL;

3. Extract vapor, steam, groundwater, DNAPL, and LNAPL using extraction wells;

4. Establish and maintain control of vapor, steam, groundwater, DNAPL, and LNAPL within the DNAPL Treatment Area;

5. Cool and treat extracted vapor, steam, groundwater, DNAPL, and LNAPL. Extracted DNAPL and LNAPL shall be collected and disposed offsite at an approved waste disposal facility. Remaining extracted material shall be treated and discharged onsite using the existing SI/GWTS;

[2] The overburden consists of all material (including natural soils, debris, and fill material) above competent bedrock at the Site.

6. Meet the following performance standards established in Section 11.2.1 of the 2004 OU-1 ROD:
    1. Effluent discharged from the existing SI/GWTS resulting from treated vapor, steam, groundwater, DNAPL, and LNAPL shall meet the substantive requirements of the National Pollution Discharge Elimination System (NPDES) program and the Maryland discharge limitations and monitoring requirements and shall contain less than 100 µg/L of total VOCs. Surface water in Little Elk Creek shall meet the numerical performance standards established in 2004 OU-1 ROD, listed on Table 3;
    2. Air emissions from the existing SI/GWTS resulting from treated vapor steam, groundwater, DNAPL, and LNAPL shall meet the substantive requirements of Maryland general air emissions standards, Maryland regulations governing toxic air pollutants, and federal air emissions standards for process vents. In addition, emissions shall not exceed risk-based standards of 10^{-6} for carcinogenic risks or a hazard index of 1 for non-carcinogenic risks;
    3. Air emissions, if any, from the thermal treatment system during operation shall meet the substantive requirements of Maryland general air emissions standards, Maryland regulations governing toxic air pollutants, and federal air emissions standards for process vents. In addition, emissions shall not exceed risk-based standards of 10^{-6} for carcinogenic risks or a Hazard Index of 1 for non-carcinogenic risks.

7. Reinject treated groundwater within the DNAPL Treatment Area, if determined to be appropriate for thermal treatment and the overburden is determined to be sufficiently permeable;

8. Monitor and report the following parameters continuously throughout treatment:
    1. Temperature in the vadose and saturated zones;
    2. Vapor, steam, groundwater, DNAPL, and LNAPL extraction rates; and,
    3. Groundwater contaminant concentrations;
    4. Air emissions from the thermal treatment system, if any.

9. Conduct saturated soil sampling and analysis prior to, during, and following the conclusion of thermal treatment. Post-treatment sampling shall be conducted a minimum of fourteen (14) days following shutdown of the thermal treatment system.

10. Continue treatment until EPA determines that the following parameters indicate that maximum treatment of principal threat waste within the DNAPL Treatment Area has been achieved:
    1. Temperature in the vadose and saturated zones;
    2. Vapor, steam, groundwater, DNAPL, and LNAPL extraction rates; and,
    3. Groundwater contaminant concentrations;
    4. Saturated soil contaminant concentrations.

11. Monitor and report groundwater contaminant concentrations following treatment until temperatures within the vadose and saturated zones return to ambient levels;

12. Conduct additional thermal treatment within the DNAPL Treatment Area or portions thereof, based on the results of post-treatment saturated soil sampling prescribed in Item 9 above, until EPA determines that maximum treatment of principal threat waste has been achieved.

L.2.2.2 Design Considerations

The thermal treatment system shall generally consist of a power control unit to condition and control the application of power, electrodes to deliver power to the subsurface, recovery wells to collect steam and

contaminant vapors, a steam condenser, a vapor treatment system, a liquid/condensate management system, and data control systems.

During Remedial Design, laboratory bench scale testing shall be conducted to identify and refine the energy input and time requirements to meet required treatment temperatures. Pilot testing shall also be conducted to evaluate the radial influence of extraction wells and vacuum pressures to collect vapors. The pilot test may include the use of helium tracer gas to confirm vapor flow paths and soil vapor collection.

Further refinement of the DNAPL Treatment Area may also occur during Remedial Design. Currently, the DNAPL Treatment Area encompasses the area shown on Figure 4, which includes both the Confirmed/Probable DNAPL Zone and the Potential DNAPL Zone. If during Remedial Design, DNAPL is not identified in the Potential DNAPL Zone, the DNAPL Treatment Area will consist of the smaller Confirmed/Probable DNAPL Zone only. The presence of DNAPL will be determined using generally the same procedures and criteria used during the PDI and the final DNAPL Treatment Area extent will be subject to EPA approval.

Implementation of thermal treatment at similar sites has indicated that a flexible approach using multiple lines of evidence to evaluate performance of the system yields more effective results than establishing numeric performance standards prior to system operation. Therefore, the temperature in the vadose and saturated zones, vapor, steam, groundwater, DNAPL, and LNAPL extraction rates, and groundwater contaminant concentrations shall be monitored and reported in near-realtime so that the system can be operated with maximum efficiency. Shutdown of the system will be dependent primarily on a combination of mass removal rates reaching asymptotic levels and decreasing from peak rates, groundwater contaminant concentration trends, and saturated soil contaminant concentration trends. Optimization of the system may occur during operation to focus treatment on areas that continue to exhibit the presence of DNAPL and away from areas that have met performance criteria.

L.3 Cost Estimate for the Selected Remedy

Appendix E includes details of the estimated costs to construct and implement the Selected Remedy. The estimated total cost to construct and implement the remedy modification is approximately $6,915,024. The information in this cost estimate is based upon the best available information regarding the anticipated scope of the Remedial Action.

Some changes to the cost estimates are expected to occur during implementation of the remedy. Major changes may be documented in the form of a memorandum to the file, an ESD, or an additional ROD amendment, as appropriate. This cost estimate is expected to be within +50 to -30 percent of the actual project cost.

L.4 Expected Outcomes of the Selected Remedy

This section presents the expected outcomes of the remedy modification in terms of land and groundwater use and risk reduction achieved as a result of the response action.

The Plant Area at the Site was designated as a Waste Management Area (WMA) in the 2004 OU-1 ROD due to the presence of residual waste and debris piles from the former onsite lagoon, contaminated creek sediments from the construction of the SI/GWTS, structural debris and historic building foundations, abandoned drainage pipes, and an abandoned mill race. Therefore, groundwater within the Plant Area is not expected to be returned to beneficial reuse by the remedy modification described herein. However, in-situ treatment of principal threat waste (DNAPL and LNAPL) will greatly reduce the source of groundwater contamination and may reduce the time required to return bedrock groundwater outside of the Plant Area (OU-2) to beneficial reuse.

The asphalt (or equivalent) cap will eliminate direct contact with contaminated soil and overburden groundwater as well as prevent potential impacts to the SI/GWTS during large storm events and help control erosion and runoff. Institutional controls required by the 2004 OU-1 ROD will prohibit groundwater use within the extent of the OU-1 area, prevent disturbance of the SI/GWTS, and protect the integrity of the asphalt (or equivalent) cap.

Due to the limitations and restrictions imposed by the WMA and institutional controls, the former Spectron, Inc. property cannot reasonably be expected to return to residential use and any redevelopment would be subject to those restrictions described above. Potential uses could include, among others, a community park or access ramp to Little Elk Creek, development of the Site for commercial/light industrial use, or as a county utility vehicle maintenance/parking facility.

M. Statutory Determinations

Under CERCLA § 121 and the NCP § 300.430(f)(5)(ii), EPA must select remedies that are protective of human health and the environment, comply with ARARs, are cost effective, and utilize permanent solutions and alternative treatment technologies or resource recovery to the maximum extent possible. There is also a preference for remedies that use treatment that permanently and significantly reduce the volume, toxicity, or mobility of hazardous wastes as a principal element. The following sections discuss how the remedy modification meets these statutory requirements.

M.1. Protection of Human Health and the Environment

The modified remedy will be protective of human health and the environment. Protection of human health and the environment will be achieved by continued operation of the SI/GWTS and implementation of institutional controls prescribed by the 2004 OU-1 ROD. The modified remedy will also provide protection of human health and the environment through in-situ thermal treatment of principal threat waste that contributes to groundwater contamination and through installation of an asphalt (or equivalent) cap to prevent direct contact with contaminated soil and groundwater.

M.2. Compliance with Applicable or Relevant and Appropriate Requirements

The NCP § 300.430(f)(5)(ii)(B) and (C) require that a ROD describe Federal and State ARARs that the remedy modification will attain or provide a justification for any waivers. Applicable requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under Federal or State law that specifically address a hazardous substance, pollutant, or contaminant; remedial action; location; or other circumstance at a CERCLA site. Relevant and appropriate requirements, while not legally applicable to circumstances at a particular CERCLA site, address problems or situations similar to those encountered at the site such that their use is considered relevant and appropriate.

As discussed in Section J.2.a Compliance with ARARs, the following ARARs from the 2004 OU-1 ROD are considered relevant but not appropriate to the remedy modification and are eliminated:

Landfill Cap ARARs to be Eliminated			
ARAR	**Legal Citation**	**Classification**	**Summary of Requirement**
Sanitary Landfill Closure Requirements	COMAR 26.04.07.04 C(5)	Relevant and Appropriate	Construction details for the RCRA modified cap.
	COMAR 26.04.07.10		
	COMAR 26.04.07.19 E(5),(6)		
	COMAR 26.04.07.21 B, D, E		
	COMAR 26.04.07.22 A, B, C		

All remaining ARARs included in Table 9 of the 2004 OU-1 ROD and in Table 2 of this ROD Amendment will be met during implementation of the remedy.

M.3. Cost Effectiveness

Cost effectiveness is determined by evaluating the remedy's long-term effectiveness and permanence; reduction in toxicity, mobility, or volume through treatment; and short-term effectiveness. If the overall cost of the remedy is proportional to its overall effectiveness, then it is considered to be cost effective. The remedy modification satisfies the criteria listed above because it offers a permanent solution through the destruction of contaminants in groundwater, and costs less than the other protective remedies that were evaluated. Therefore, the remedy modification is cost effective.

M.4. Utilization of Permanent Solutions to the Maximum Extent Practicable

EPA has determined that the remedy modification represents the maximum extent to which permanent solutions and treatment are practicable at the Site. When compared to the other protective alternatives that were evaluated, EPA has determined that the remedy modification provides the best balance of tradeoffs in terms of the five balancing criteria, as well as the preference for treatment as a principal element. The remedy modification also has State and community acceptance.

The remedy modification will meet the statutory preference for treatment as a principal element by addressing principle threat material (DNAPL and LNAPL) at the Site through in-situ thermal treatment of soil and overburden groundwater.

M.5. Five Year Review Requirements

CERCLA § 121(c) and the NCP § 300.430(f)(4)(ii) provide the statutory and legal bases for conducting Five Year Reviews. The remedy modification, in conjunction with the existing OU-1 remedy, will result in hazardous substances remaining onsite above levels that allow for unlimited use and unrestricted exposure. Therefore, a statutory review will be conducted within five years after initiation of the Remedial Action to ensure the remedy is, or will be, protective of human health and the environment.

N. Documentation of Significant Changes from the Preferred Alternative of the Proposed Plan

The Proposed Plan was released for public comment on October 14, 2011. The public comment period for the Proposed Plan was initially held from October 14, 2011, to November 18, 2011, but was extended until December 19, 2011 due to a request from the PRP Group. EPA held a public meeting on November 8, 2011, to present the Preferred Alternative in the Proposed Plan. EPA has reviewed and responded to verbal and written comments submitted during the public comment period in Part 3 of this ROD Amendment, the Responsiveness Summary. As a result of these comments, there were no significant changes from the Preferred Alternative in the Proposed Plan, however some minor changes were made related to performance monitoring for the thermal treatment component of the remedy.

The following additional ARARs were determined to be applicable to the remedy modification following the issuance of the Proposed Plan and are included in this ROD Amendment:

- Federal Underground Injection Control Program – 40 CFR 144
- Maryland Underground Injection Control – COMAR 26.08.07.01-.04

During thermal treatment, treated groundwater may be reinjected into the overburden if such reinjection is determined to be appropriate for thermal treatment and the overburden is determined to be sufficiently permeable. The 2004 OU-1 ROD included state ARARs related to the construction of IRD injection wells (COMAR 26.04.04.07) that are also applicable to the construction of thermal treatment reinjection wells. However, the 2004 OU-1 did not include the state and federal ARARs related to the classification and operation of injection wells which would also be applicable to thermal treatment reinjection wells. Therefore, the state and federal ARARs listed above were added to the ROD Amendment.

O. State Role

Maryland Department of the Environment (MDE), on behalf of the State of Maryland, has reviewed the Remedial Alternatives presented in the ROD and has indicated its concurrence with the remedy modification. MDE has also reviewed the list of ARARs to determine if the remedy modification is in compliance with appropriate State environmental laws and regulations. Correspondence with MDE regarding the remedy modification is included as Appendix C.

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PART III- THE RESPONSIVENESS SUMMARY

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III. RESPONSIVENESS SUMMARY

This section summarizes the questions and comments received during the public comment period for the Spectron, Inc. Superfund Site. The Proposed Plan was released for public comment October 14, 2011. The public comment period was from October 14, 2011 to December 19, 2011. A public meeting was held at the Cherry Hill Middle School in Elkton, MD on the evening of November 8, 2011.

A. Questions Raised During the November 8, 2011 Public Meeting

Question 1: A citizen asked who would provide the material and labor for the asphalt (or equivalent) cap and if local contractors would be considered. The citizen also noted that using local contractors could result in cost savings.

EPA Response: The Potentially Responsible Party Group (PRP Group) would be responsible for choosing a contractor for the asphalt (or equivalent) cap and EPA can only approve or disapprove of contractors based on technical qualifications. However, EPA supports the use of local contractors, where possible. A representative of the PRP Group in attendance at the meeting expressed a willingness to use local contractors, particularly if it would reduce costs.

Question 2: A citizen asked if there would be air emissions from the in-situ thermal treatment.

EPA Response: Air emissions from the in-situ thermal treatment process, if any, will be controlled and treated to meet applicable state and federal air emissions standards.

Question 3: A citizen asked what will be happening at the Site in the long-term, such as 5, 10, and 20 years from now.

EPA Response: For OU-1, Soil and Overburden Groundwater, the onsite buildings will be demolished, the Site will be graded, the asphalt (or equivalent) cap will be installed, and in-situ thermal treatment will be conducted within the next two to five years. Additionally, the PRP Group purchased the former Spectron, Inc. property in December 2011, which will allow for easier access and potentially accelerate the cleanup process. The general appearance of the Site will also likely improve now that the PRP Group has unrestricted access to the Site.

For OU-2, Bedrock Groundwater, EPA will select the remedy in a separate Record of Decision (ROD) and begin Remedial Design for that remedy within the next one to two years. The OU-2 remedy will likely be implemented within the next five years. The Stream Isolation/Groundwater Treatment System (SI/GWTS), which is a component of both OU-1 and OU-2, will continue to operate for the next 30 to 60 years to prevent dense non-aqueous phase liquid (DNAPL) and contaminated groundwater from discharging to Little Elk Creek.

After the OU-1 and OU-2 remedies are in place, EPA will continue to provide oversight of the Site and conduct Five Year Reviews to ensure that the remedies remain protective of human health and the environment. Institutional controls will be in place to restrict land and groundwater use that could potentially negatively impact the remedies. EPA and the PRP Group will also look at ways in which the Site could be reused, potentially as a storage facility for municipal vehicles or as a recreation area.

Question 4: A citizen asked if the asphalt (or equivalent) cap would be installed before or after the in-situ thermal treatment is conducted.

EPA Response: In-situ thermal treatment will likely be conducted prior to installation of the asphalt (or equivalent) cap. As a component of the treatment, an insulating cap, consisting of a specially designed insulating material, will be installed over the DNAPL Treatment Area to prevent excess heat loss and help contain generated vapors/steam. The asphalt (or equivalent) cap will be installed following thermal treatment and will likely be incorporated into the insulating cap. The details of cap construction are still in the conceptual phase and will be refined during Remedial Design following the issuance of the Record of Decision (ROD) Amendment.

Question 5: A citizen recommended that EPA install a monument or memorial to document the history of contamination at the Site, the impact it had to the surrounding community, and the efforts of EPA and the PRP Group to clean up the Site.

EPA Response: EPA appreciates the community's recognition of the significant progress that has been made in addressing contamination at the Site.

Question 6: A citizen asked if Little Elk Creek is contaminated.

EPA Response: No. Water quality in Little Elk Creek is sampled on a quarterly basis and currently meets all state and federal water quality criteria. The SI/GWTS is preventing the discharge of contaminants to the creek.

Question 7: A citizen asked why EPA was proposing in-situ thermal treatment if contaminants are no longer discharging to Little Elk Creek.

EPA Response: Although the SI/GWTS prevents contamination from discharging to the creek, cleaning up the Site by relying solely on natural flushing of contaminants to the SI/GWTS would take a very long time, potentially hundreds of years. In-situ thermal treatment will remove DNAPL that acts as a continuous groundwater contaminant source, thereby greatly reducing the amount of time it will take to clean up the Site. Natural flushing of the remaining contaminated groundwater to the SI/GWTS will continue after in-situ thermal treatment is conducted.

Question 8: A citizen asked if both light non-aqueous phase liquid (LNAPL) and DNAPL were being collected by the SI/GWTS.

EPA Response: No. Both DNAPL and contaminated groundwater are discharging to the SI/GWTS, however, LNAPL is currently identified in a very small portion of the Site and is not discharging to the SI/GWTS.

Question 9: A citizen asked if groundwater at the Site was flowing up or down.

EPA Response: Some groundwater in the overburden flows downward into the bedrock, however, overburden groundwater flows primarily east, along the bedrock surface toward Little Elk Creek. Groundwater in the bedrock flows primarily upward as recharge from precipitation on both sides of the creek valley discharges to the creek. This mechanism has also caused some contamination in the bedrock to migrate under the creek in the vicinity of the former Office Area. Bedrock groundwater will be addressed under OU-2 and the remedy will be selected in a separate Record of Decision (ROD), currently projected for late 2012.

Question 10: A citizen asked if the increased precipitation the past two years has affected groundwater flow at the Site.

EPA Response: No. Based on available monitoring data, it does not appear that increased precipitation has impacted groundwater conditions at the Site. Groundwater elevations have remained relatively consistent and no change in groundwater flow directions has been observed. Increased groundwater has discharged to the SI/GWTS, however, a corresponding increase in contaminant mass has not been observed.

Question 11: A citizen asked how deep the bedrock is at the Site.

EPA Response: The depth to the bedrock at the Site varies from approximately 4 to 20 feet below ground surface and is thickest in the central portion of the Site, in the vicinity of the GTWS building and former Powerhouse building. Within Little Elk Creek, bedrock is very close to the surface and the bottom of the stream liner.

Question 12: A citizen asked if thermal treatment would also be conducted in the northwestern portion of the Site in the vicinity of the former lagoon.

EPA Response: No. Principal threat material such as DNAPL or LNAPL was not identified in the vicinity of the former lagoon during the Pre-Design Investigation (PDI). Because the goal of thermal treatment is to treat principal threat material, no thermal treatment will be conducted in that portion of the Site. The contamination present in the vicinity of the former lagoon will be addressed by natural flushing and discharge to the SI/GWTS.

Question 13: A citizen asked who will own the Site in the future.

EPA Response: The PRP Group purchased the Site in December 2011. The PRP Group is comprised of companies that sent waste to Spectron, Inc. for disposal when the facility was in operation from 1964 through 1988. PRP Group ownership of the Site will eliminate Site access issues that have occurred in the past and may help accelerate the cleanup.

Question 14: A citizen asked when the buildings onsite would be demolished.

EPA Response: The former Office Area building was demolished in September 2010. Demolition of the former Powerhouse building is anticipated in early 2012. Asbestos abatement in the former Powerhouse building was completed in the Fall of 2011. Because contaminated material is currently stored under the former Drum Storage building, that structure will be demolished at a later time when the contaminated material can be used for grading purposes beneath the asphalt (or equivalent) cap. When the buildings are demolished, contaminated scrap metal and other material that cannot be used as fill will be decontaminated in accordance with state and federal requirements before it is recycled or disposed offsite. EPA will provide oversight during building demolition.

B. Stakeholder Comments

The following comments were submitted by the PRP Group in a letter dated December 19, 2011. No other comments were received from stakeholders.

Comment 1: Section VII, 7. Cost (p.34): In the paragraph following the cost summary table, it is stated that costs for long-term monitoring and Five Year Reviews are included in the annual Operations and Maintenance (O&M) costs presented in the table. This is incorrect. The costs presented in the table only include capital and O&M costs specific to the in-situ treatment alternatives.

EPA Response: The comment was noted and the text in the ROD Amendment was revised to omit the following sentence: "Costs for long-term monitoring and Five Year Reviews are included in the annual Operations and Maintenance costs above."

Comment 2: Section VIII, Thermal Treatment (pp. 36-37): 3) The Group requests changing the text to "Extract vapor, steam, groundwater, DNAPL, and LNAPL using thermal treatment and/or multi-phase extraction (MPE) wells;" MPE wells will be used to remove LNAPL prior to and/or during thermal treatment. However, as described in the OU-1 FFS Report, the final methodology for thermal treatment may not use MPE wells to remove the media listed.

EPA Response: The comment was noted and the text in the ROD Amendment was revised as follows: "Extract vapor, steam, groundwater, DNAPL, and LNAPL using extraction wells;"

Comment 3: Section VIII, Thermal Treatment (pp. 36-37): 5) The Group requests changing text to: "Cool, treat and/or collect extracted vapor, steam, groundwater, DNAPL, and LNAPL." This change is requested because LNAPL will be collected by the MPE wells but will not be treated on-Site; similarly, DNAPL collected or condensed during thermal treatment will also be disposed off-Site.

EPA Response: The comment was noted and the text in the ROD Amendment was revised as follows: "Cool and treat extracted vapor, steam, groundwater, DNAPL, and LNAPL. Extracted DNAPL and LNAPL shall be collected and disposed offsite at an approved waste disposal facility. Remaining extracted material shall be treated and discharged onsite using the existing SI/GWTS."

Comment 4: Section VIII, Thermal Treatment (pp. 36-37): 7) The Group requests changing text to: "Reinject treated groundwater within the DNAPL Treatment Area, if necessary for thermal treatment and the overburden is determined to be sufficiently permeable." Reinjection of groundwater may be beneficial to the thermal treatment process, depending on the final design of the thermal treatment method and, among other factors, the amount of moisture in the overburden retained during treatment.

EPA Response: The comment was noted and the text in the ROD Amendment was revised as follows: "Reinject treated groundwater within the DNAPL Treatment Area, if determined to be appropriate for thermal treatment and the overburden is determined to be sufficiently permeable."

Comment 5: Section VIII, Thermal Treatment (pp. 36-37): 9) The group requests changing text to: "Continue thermal treatment until EPA determines that treatment of principal threat waste within the DNAPL Treatment Area has been achieved to the maximum extent practicable based on the evaluation of treatment parameters including:

a) Temperature in the saturated zones; {vadose omitted}
b) Vapor, steam, groundwater, DNAPL, and LNAPL extraction rates;
c) Groundwater contaminant concentrations; and,
d) Saturated soil contaminant concentrations.

In-situ thermal operations will be continued until the mass removal rate reaches asymptotic levels, defined by a leveling off of the vapor phase mass removal rate over time and at least an order of magnitude reduction in the peak mass removal rate. Along with achieving asymptotic levels for mass removal, the reductions in saturated soil and/or groundwater VOC concentrations and comparison to soil saturation or aqueous solubility limits will be evaluated to assess if DNAPL zones have been treated to the maximum extent practicable within the treatment area. In saturated soil, VOC concentrations will be compared to the USEPA Region 3 (May 2010) default soil saturation concentration ("Csat") values for a single VOC contaminant and NAPL (USEPA, 2009a). In groundwater, VOC concentrations will be compared to aqueous effective solubility limits.

Temperatures within the vadose zone are anticipated to increase to some degree due to the groundwater zone heating and steam generation. Vadose zone temperatures should not be cited as a performance parameter. Attempting to elevate and maintain a target vadose zone temperature greater than temperatures normally achieved may increase the difficulty of controlling/capturing vapors by requiring limitations on the amount of outside, cooler air flow into the vapor control points. Within the vadose zone, the ratio of steam to air is the largest factor in determining the temperature. During a thermal remediation, a vacuum is applied to the vadose zone in order to ensure capture of contaminant vapor. The applied vacuum also causes outside air to be pulled into the treatment zone and reduces the percentage of steam in the vadose zone gas mixture. In order to meet the vadose zone temperature specification proposed by EPA, vapor extraction rates may need to be reduced to increase the steam to air ratio and temperature. The effect of a temperature specification will be counter to good design.

The Group believes that the PRAP should not eliminate saturated soil concentrations from the parameter list at this conceptual stage. This is particularly important given the effects of thermal treatment, such as the VOC soil adsorption-aqueous concentration equilibrium (due to change in organic carbon content of soil); groundwater concentrations alone could provide an underestimation of the DNAPL mass removed due to these effects.

It is expected that thermal treatment can treat the full suite of VOCs present in DNAPL to achieve a maximum reduction in DNAPL mass of 99% within 0.5 years, after which additional treatment and containment of principal threat waste will continue through the operation of the Stream Isolation/Ground Water Treatment System ("SI/GWTS"). However, since it is difficult to estimate the actual DNAPL mass in-situ with any certainty, the evaluation of mass reduction can be based on 1) pre and post-treatment and/or groundwater concentrations; 2) achieving an asymptotic condition in the mass removal rates during thermal treatment; or 3) a combination of these two factors. The mass removal rate will be accurately quantified based on the frequent, real-time analysis and measurements of concentrations and flow/volumes. The Group and their selected thermal expert(s) intend to more fully develop and detail the asymptotic criterion for in-situ thermal treatment/removal of DNAPL during the Remedial Design phase for review and approval by USEPA. However, given the significant daily cost for thermal operation of approximately $10,000 per day, it is imperative that the shutdown criteria be based on real-time measurements of mass removal and support active treatment termination once the practical limits of the technology – fractional mass removal rates at the disproportionate application of energy and costs – have been quantitatively demonstrated.

EPA Response: EPA appreciates the PRP Group's concerns regarding temperatures in the vadose zone. However, multiple lines of evidence will be utilized to determine when treatment of principal threat waste has been achieved to the maximum extent practicable and monitoring temperature in the vadose zone, as indicated in the PRAP, will be beneficial to the decision making process. Therefore, monitoring temperature in the vadose zone during in-situ thermal treatment has been retained as a performance standard in the ROD Amendment.

Conducting saturated soil sampling prior to, during, or after in-situ thermal treatment was not discussed in the FFS and was therefore not included in the performance standards in the PRAP. The text in the ROD was revised to add an additional performance standard, as follows: "9. Conduct saturated soil sampling and analysis prior to, during, and following the conclusion of thermal treatment. Post-treatment sampling shall be conducted a minimum of fourteen (14) days following shutdown of the thermal treatment system."

The following additional text was also added to the ROD Amendment under Section L.2.2.2 Design Considerations: "Shutdown of the system will be dependent primarily on a combination of mass removal rates reaching asymptotic levels and decreasing from peak rates, groundwater contaminant concentration trends, and saturated soil contaminant concentration trends. Optimization of the system may occur during operation to

focus treatment on areas that continue to exhibit the presence of DNAPL and away from areas that have met performance criteria."

Comment 6: Section VIII, Thermal Treatment (pp. 36-37): 11) The Group requests that item 11 be removed from the PRAP for the reasons explained below.

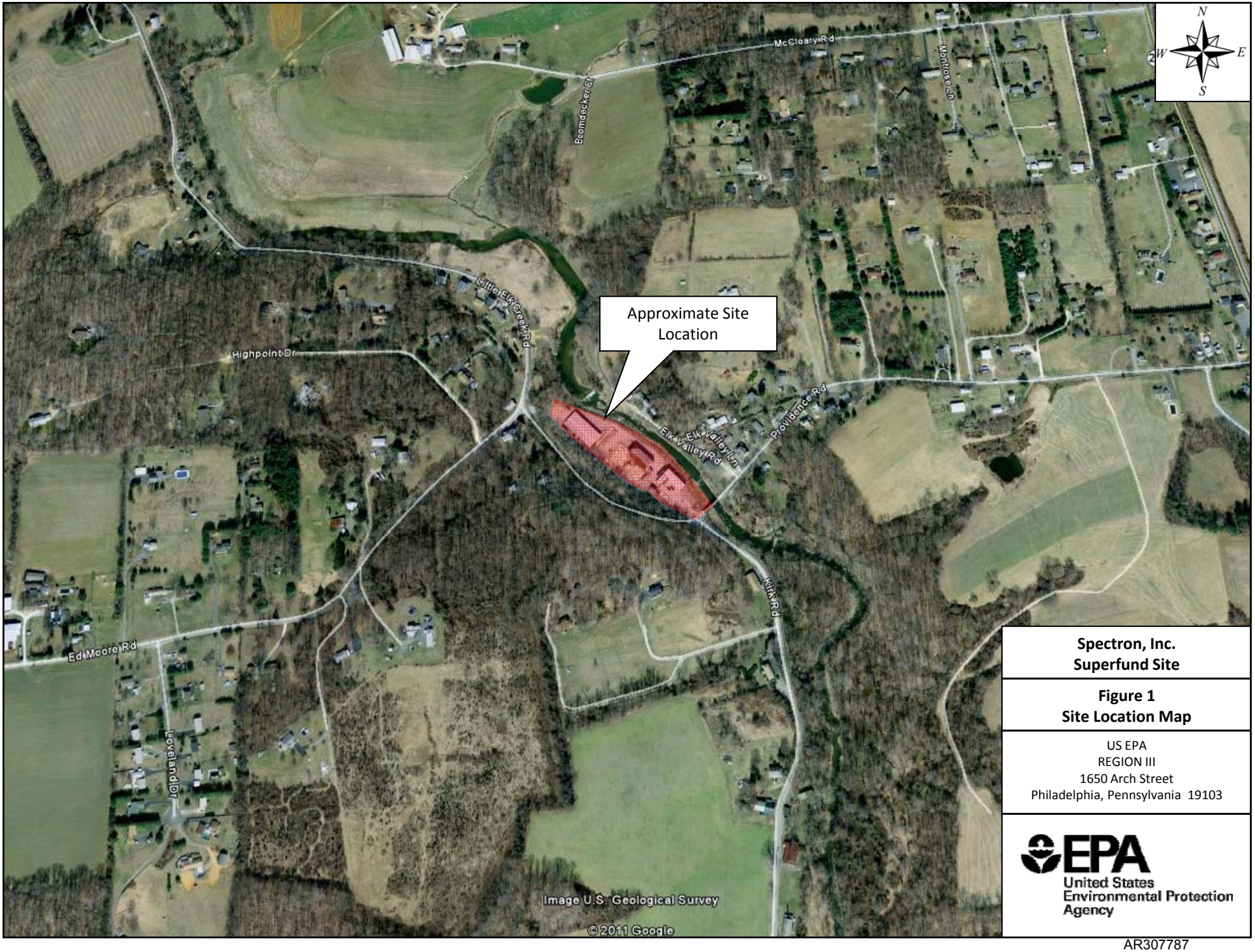
Item 11 would require additional thermal treatment based on groundwater monitoring results prescribed in Item 10, which requires groundwater monitoring until temperatures return to ambient levels. It is estimated that temperatures will reach ambient temperatures after a period of (6) or more months after the application of thermal energy. This item would therefore require the remobilization of thermal treatment equipment, renewal of permit equivalents, extended time to reheat the subsurface and other activities that essentially result in a second full-scale mobilization and implementation of the heating treatment. Given the expectation of 99% reduction in mass and the performance parameter analyses conducted by EPA prior to shutdown, it is unreasonable to require additional thermal treatment in this manner, which would nearly double the alternative costs. It would not be reasonable or practical to perform this second thermal treatment implementation to address 1% or less of the DNAPL mass.

Further, additional treatment of DNAPL/principal threat waste after thermal treatment will be provided by natural groundwater flushing and subsequent capture and treatment by the Stream Isolation/Groundwater Treatment System (SI/GWTS). As detailed in the FFS Report, the empirical data from the operation of the SI/GWTS proves that natural dissolution is an effective mass removal technique at the Site. As noted above, SI/GWTS monitoring data indicate that the system has removed more than 27,000 pounds (12,227 kg) of VOCs over its operational history. The application of thermal treatment will also reduce the fraction of organic carbon in soils, thereby reducing the VOC mass that may adsorb onto the soil matrix and increasing the mass flux of groundwater VOCs to the SI/GWTS. The natural dissolution and capture and treatment of VOCs by the SI/GWTS already provides for an effective post-thermal treatment "polishing" of Site groundwater.

EPA Response: In response to Comments 5 and 6, Performance Standard 11 of the PRAP (Performance Standard 12 in the ROD Amendment) was retained, but was modified as described below. Based on the data that will be collected and evaluated during treatment and the collaborative decision making process that will occur between EPA and the PRP Group to determine when to end thermal treatment, there is a very low likelihood that additional thermal treatment will be necessary following initial shutdown of the system. However, the possibility exists that significant rebound in groundwater and saturated soil contaminant concentrations occurs following initial thermal treatment indicating that large quantities of DNAPL are still present within the DNAPL Treatment Area. Including the performance standard described in Item 11 provides the option to treat that remaining DNAPL to meet the RAO of treating principal threat waste to the maximum extent practicable. EPA recognizes the significant costs potentially involved in restarting thermal treatment, particularly if equipment has been demobilized from the Site. In order to limit those potential costs, the decision to require additional thermal treatment will be based on the results of post-treatment saturated soil contaminant concentrations, rather than on post-treatment groundwater contaminant concentrations. This change will limit the decision making window to the short period of time following treatment that is required to collect and analyze saturated soil samples, rather than the time required for the DNAPL Treatment Area to return to ambient temperatures. Limiting the decision making window in this manner will allow the decision to require additional treatment to be made prior to the demobilization of equipment from the site, thereby significantly reducing costs associated with the additional treatment.

The text for Item 11 in the PRAP (Item 12 in the ROD Amendment) was modified as follows: "Conduct additional thermal treatment within the DNAPL Treatment Area or portions thereof, based on the results of post-treatment saturated soil sampling prescribed in Item 9 above, until EPA determines that maximum treatment of principal threat waste has been achieved."

Figures



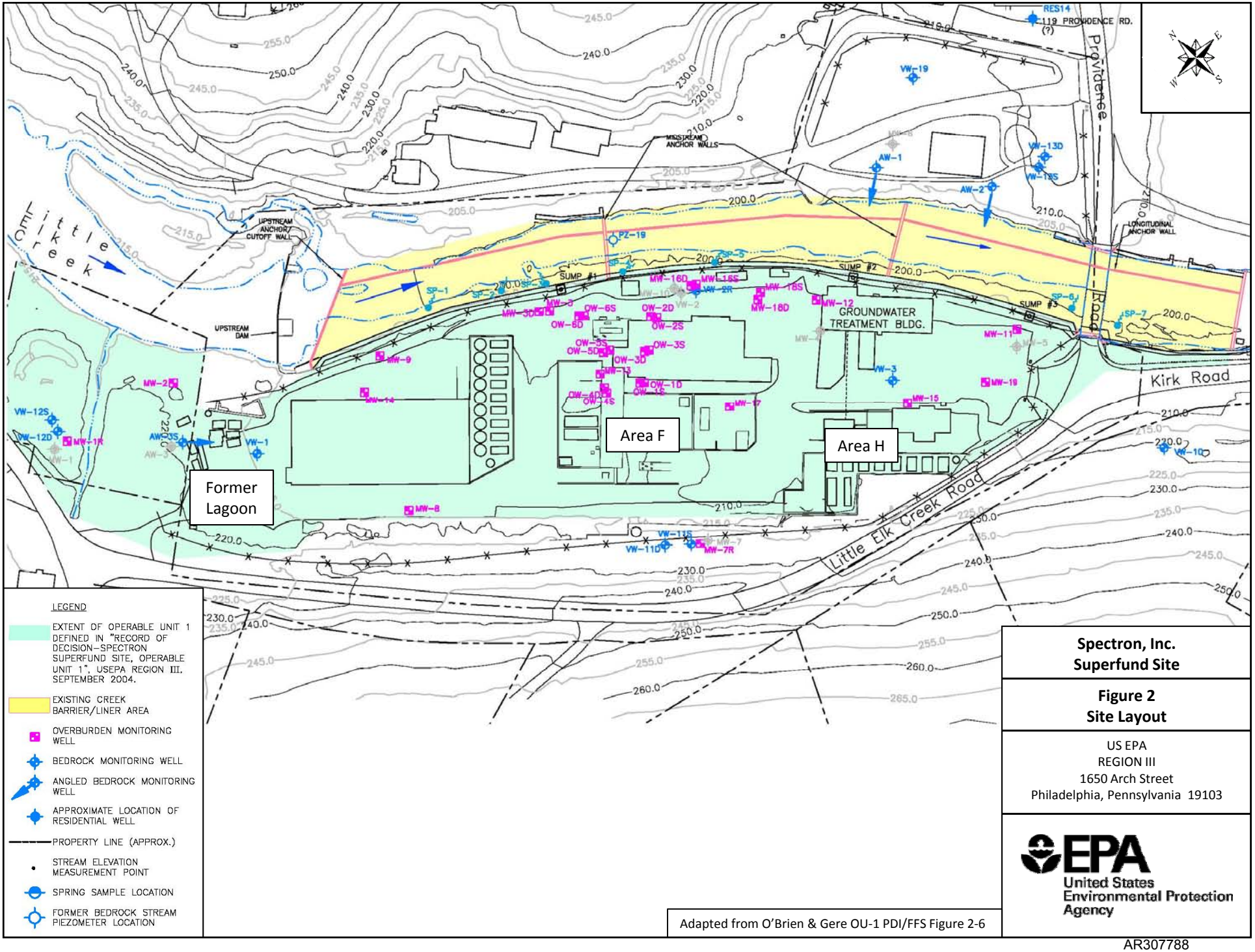
Spectron, Inc.
Superfund Site

Figure 1
Site Location Map

US EPA
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103

EPA
United States
Environmental Protection
Agency

AR307787



Adapted from O'Brien & Gere OU-1 PDI/FFS Figure 2-6

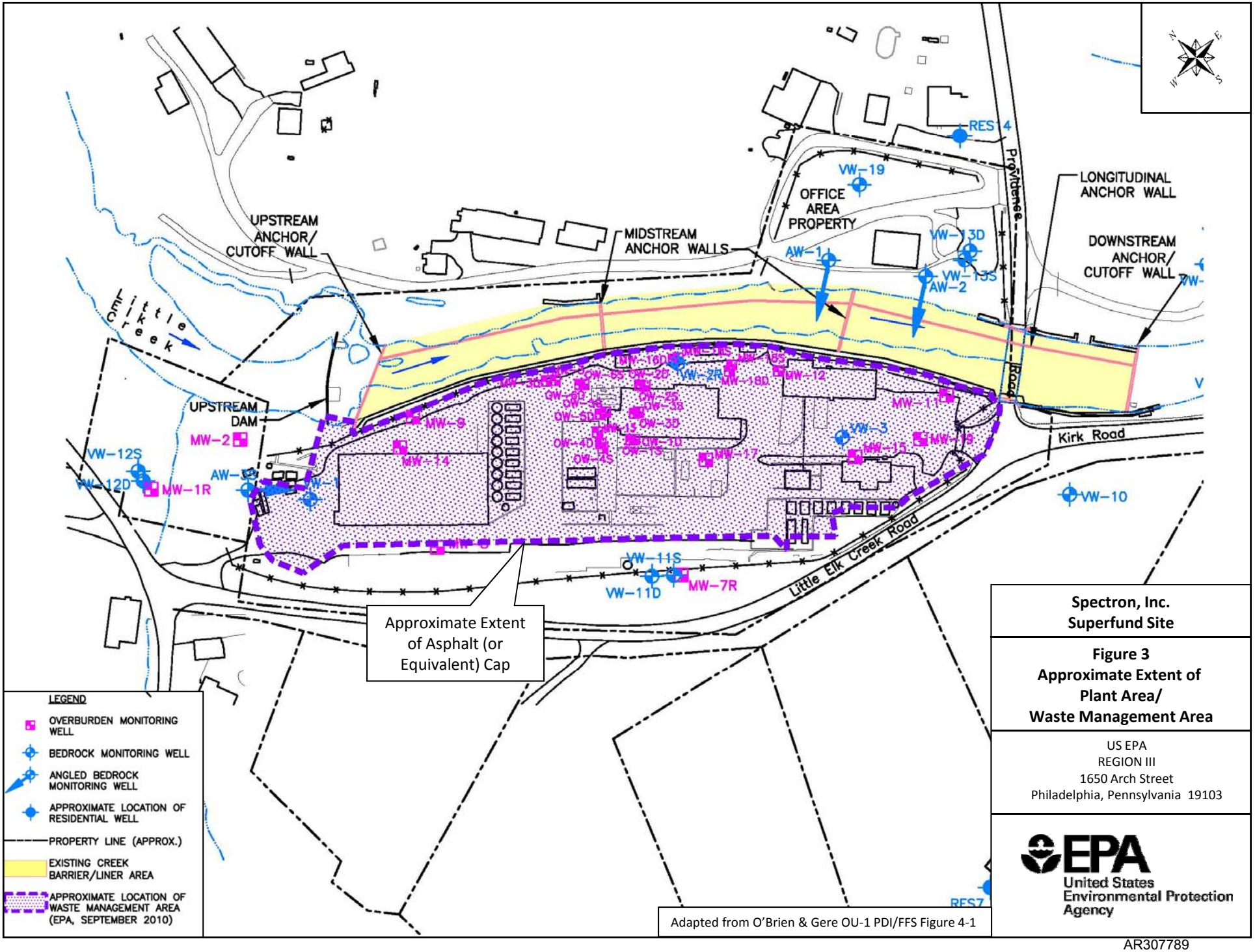
Spectron, Inc.
Superfund Site

Figure 2
Site Layout

US EPA
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103

EPA United States Environmental Protection Agency

AR307788



Spectron, Inc.
Superfund Site

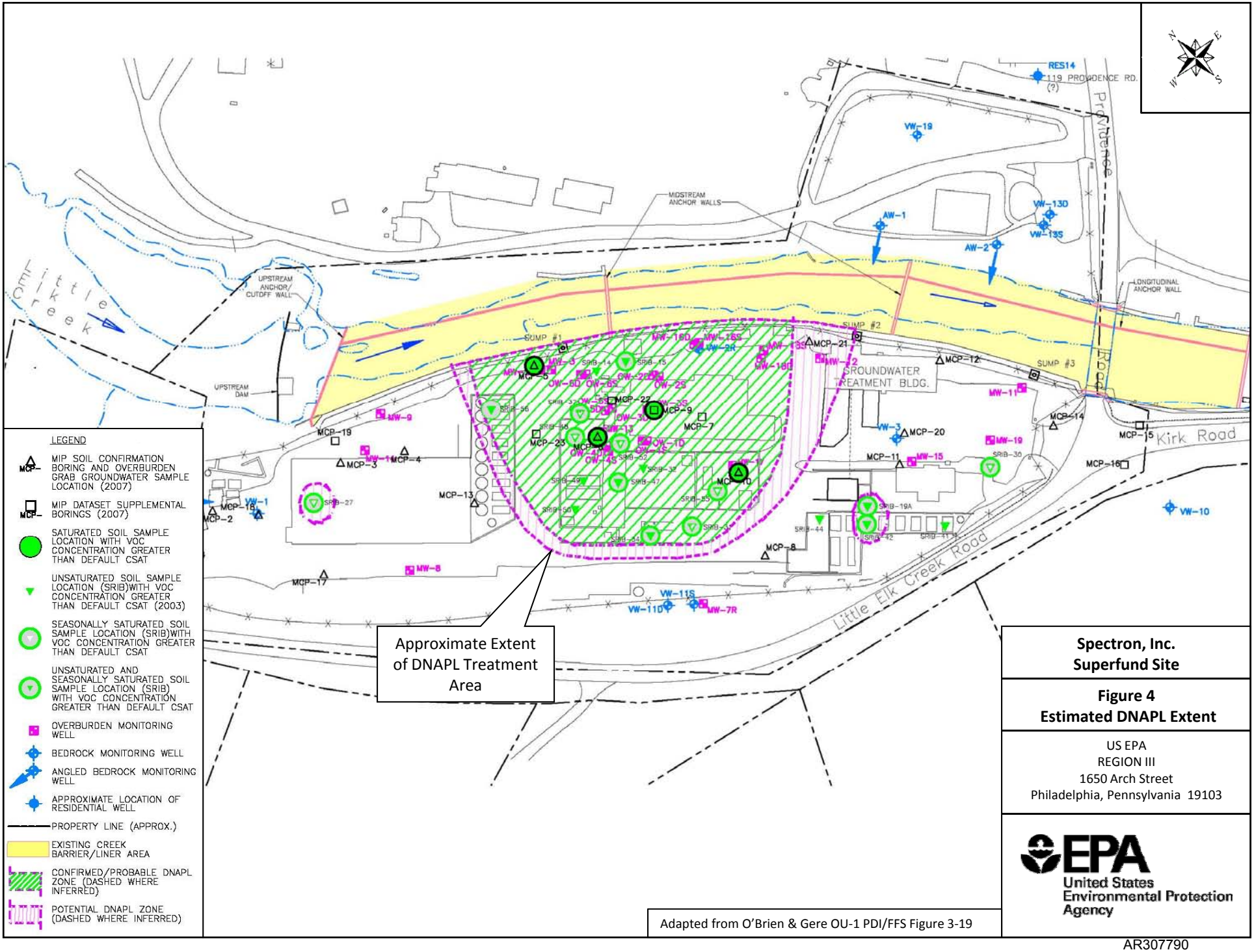
Figure 3
Approximate Extent of Plant Area/ Waste Management Area

US EPA
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103

EPA United States Environmental Protection Agency

Adapted from O'Brien & Gere OU-1 PDI/FFS Figure 4-1

AR307789



Adapted from O'Brien & Gere OU-1 PDI/FFS Figure 3-19

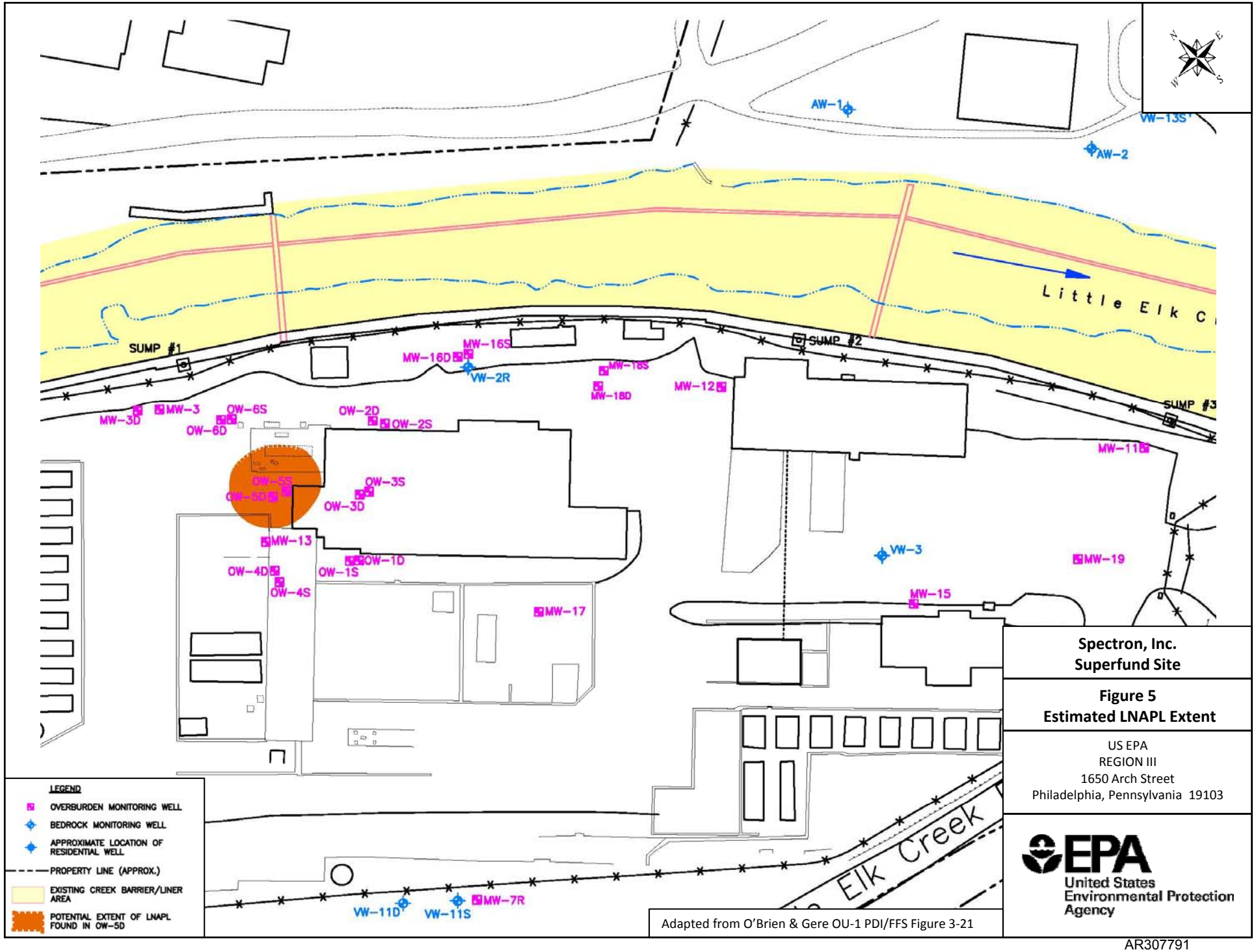
Spectron, Inc.
Superfund Site

Figure 4
Estimated DNAPL Extent

US EPA
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103

EPA United States Environmental Protection Agency

AR307790



Adapted from O'Brien & Gere OU-1 PDI/FFS Figure 3-21

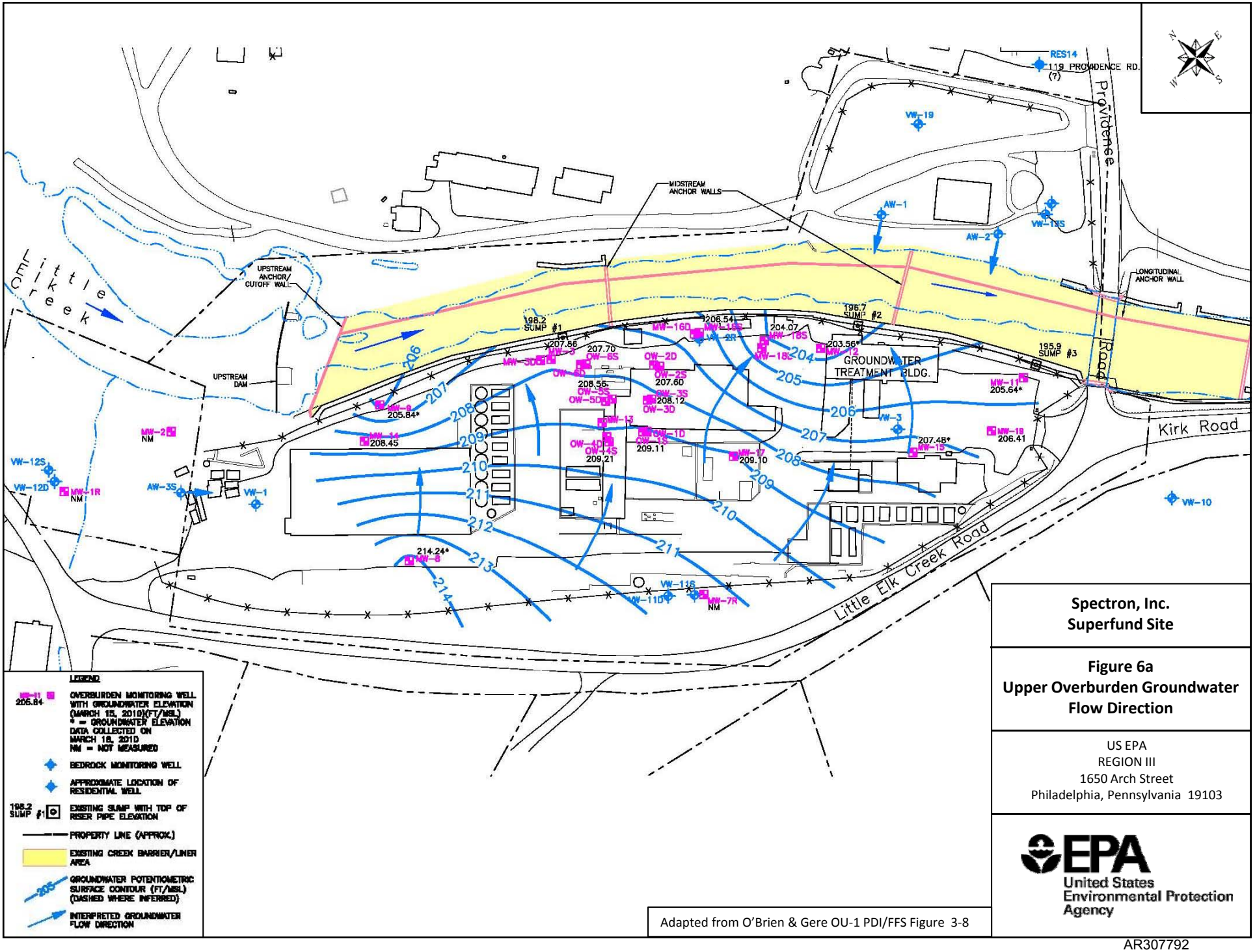
Spectron, Inc.
Superfund Site

Figure 5
Estimated LNAPL Extent

US EPA
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103

EPA
United States
Environmental Protection
Agency

AR307791



Adapted from O'Brien & Gere OU-1 PDI/FFS Figure 3-8

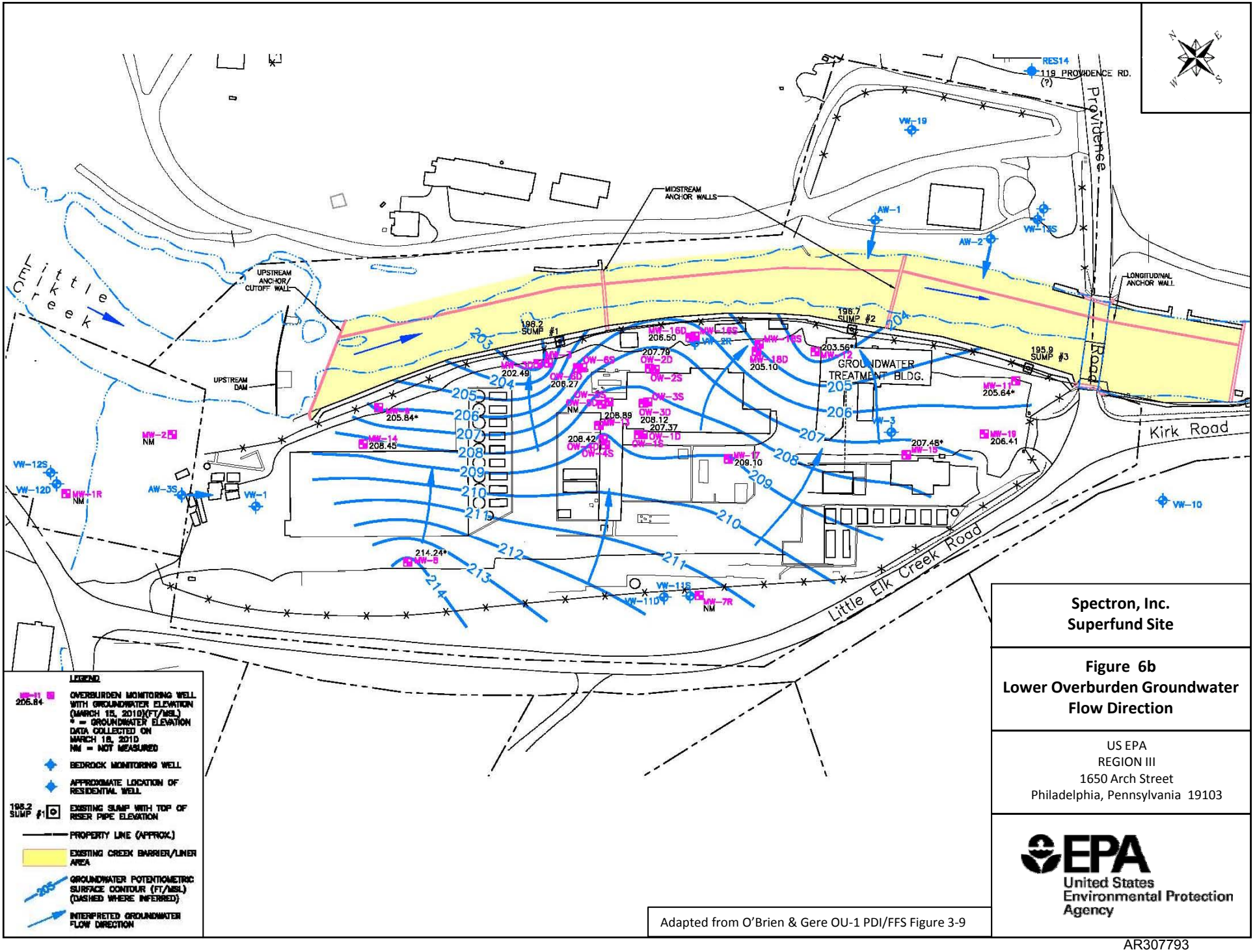
Spectron, Inc.
Superfund Site

Figure 6a
Upper Overburden Groundwater Flow Direction

US EPA
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103

EPA United States Environmental Protection Agency

AR307792



Adapted from O'Brien & Gere OU-1 PDI/FFS Figure 3-9

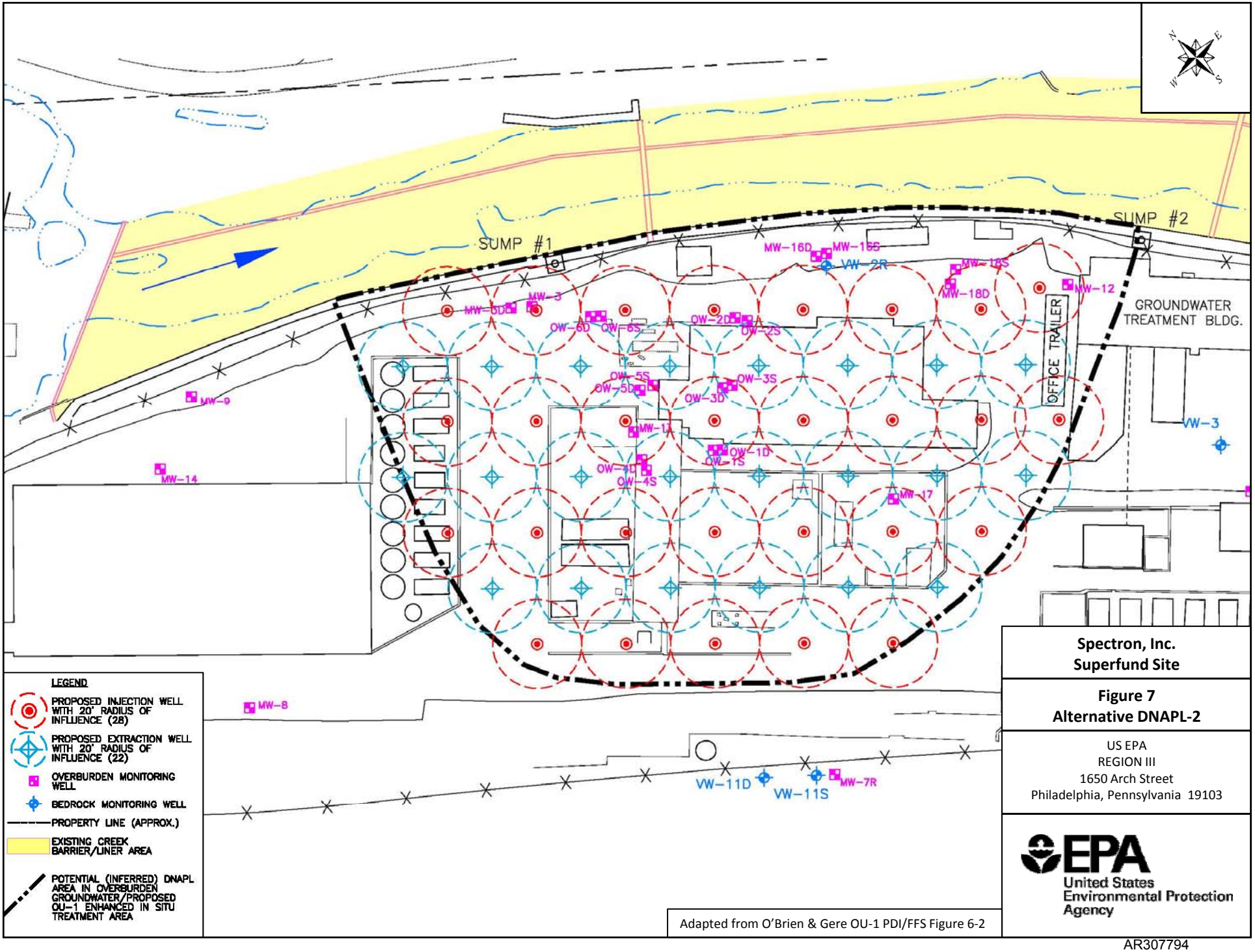
Spectron, Inc.
Superfund Site

Figure 6b
Lower Overburden Groundwater Flow Direction

US EPA
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103

EPA
United States
Environmental Protection
Agency

AR307793



Adapted from O'Brien & Gere OU-1 PDI/FFS Figure 6-2

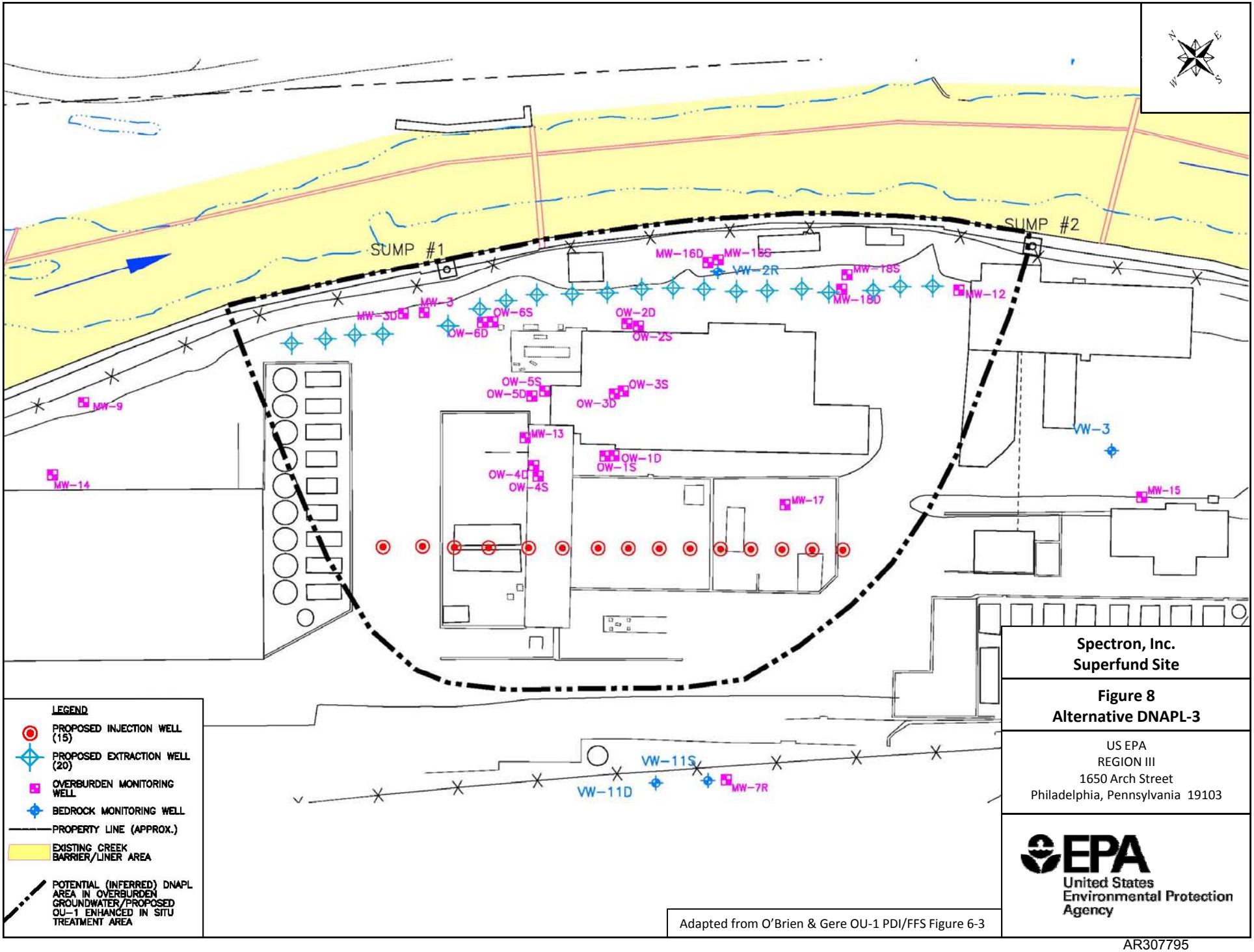
Spectron, Inc.
Superfund Site

Figure 7
Alternative DNAPL-2

US EPA
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103

EPA United States Environmental Protection Agency

AR307794



Adapted from O'Brien & Gere OU-1 PDI/FFS Figure 6-3

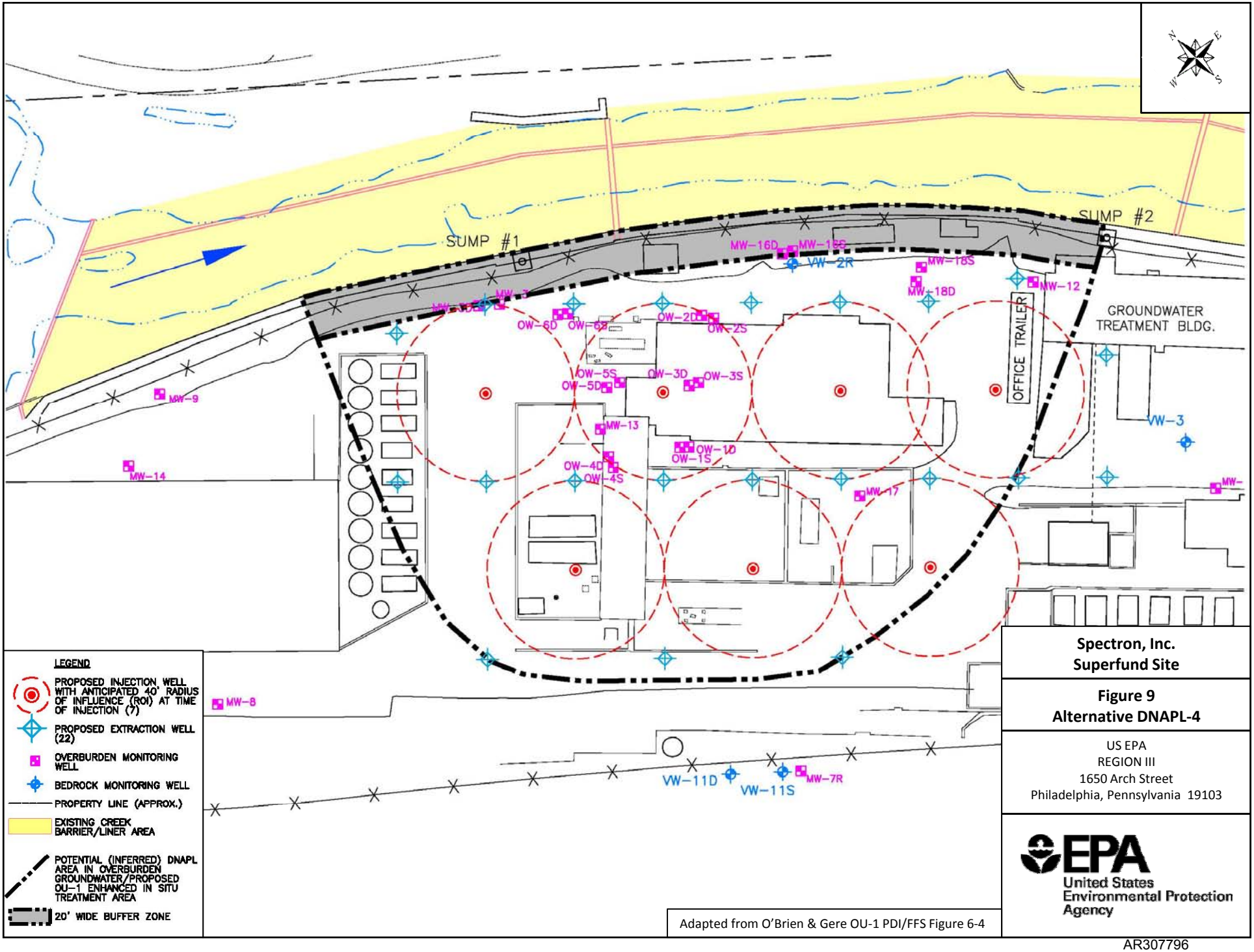
Spectron, Inc.
Superfund Site

Figure 8
Alternative DNAPL-3

US EPA
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103

EPA United States Environmental Protection Agency

AR307795



Adapted from O'Brien & Gere OU-1 PDI/FFS Figure 6-4

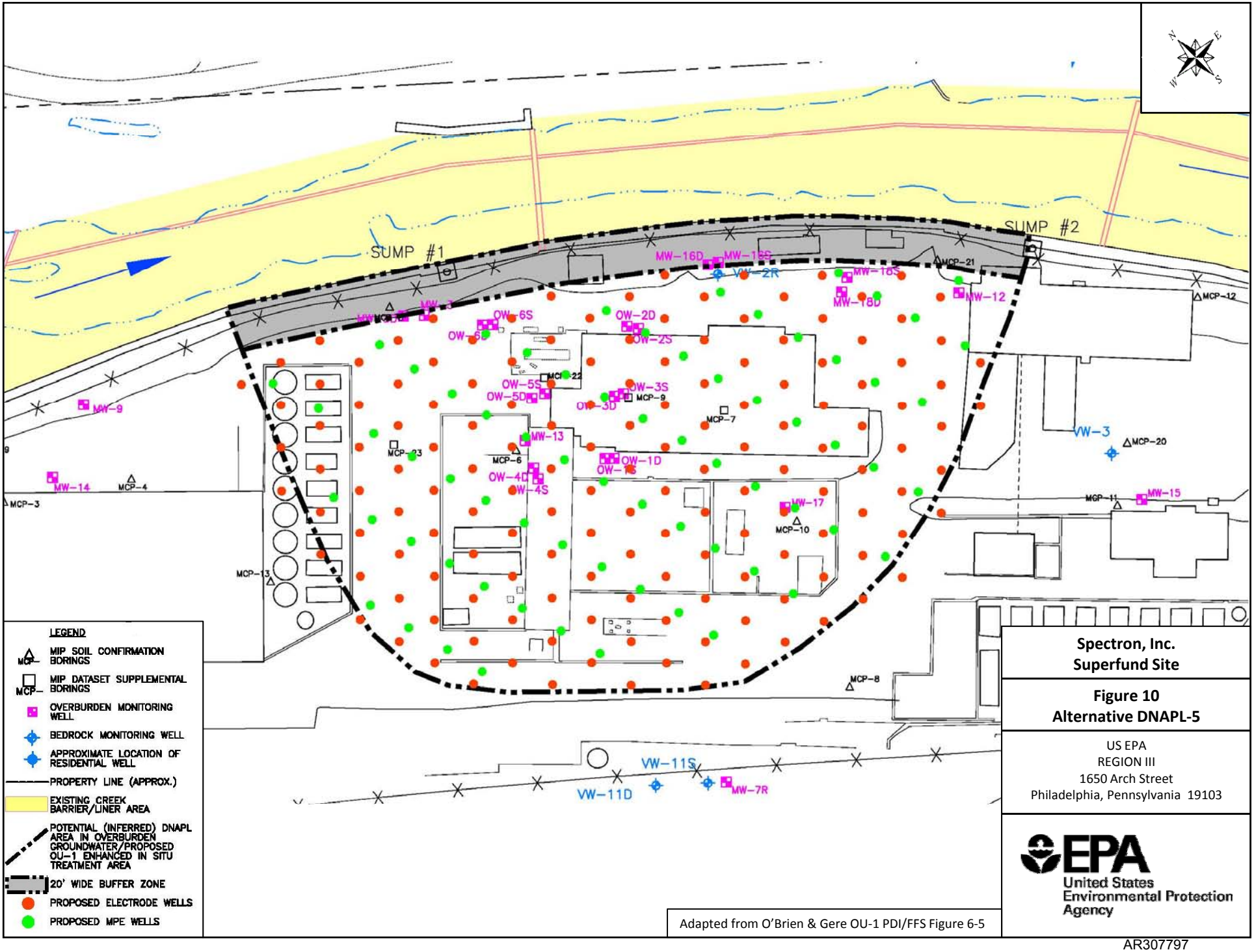
Spectron, Inc.
Superfund Site

Figure 9
Alternative DNAPL-4

US EPA
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103

EPA
United States
Environmental Protection
Agency

AR307796



Adapted from O'Brien & Gere OU-1 PDI/FFS Figure 6-5

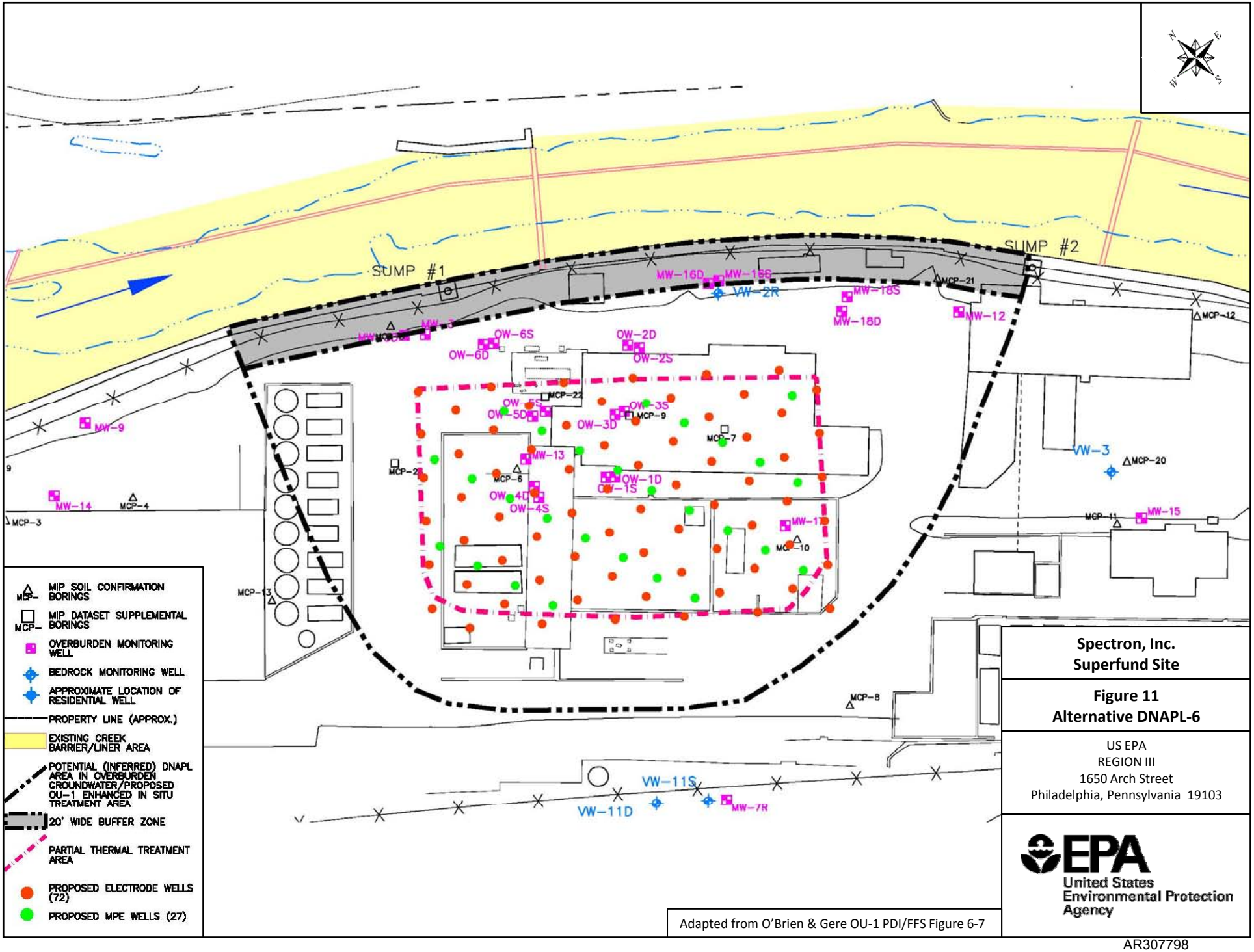
Spectron, Inc.
Superfund Site

Figure 10
Alternative DNAPL-5

US EPA
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103

EPA
United States
Environmental Protection
Agency

AR307797



Adapted from O'Brien & Gere OU-1 PDI/FFS Figure 6-7

Spectron, Inc.
Superfund Site

Figure 11
Alternative DNAPL-6

US EPA
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103

EPA
United States
Environmental Protection
Agency

AR307798

Tables

Table 1
Contaminants of Concern (COCs)
Spectron, Inc. Superfund Site
Operable Unit 1 Record of Decision Amendment

Soil COPCs	
Contaminant	**Maximum Concentration**
Volatile Organic Compounds (VOCs)	**µg/kg**
1,1,2,2-Tetrachloroethane	14000
Tetrachloroethene	26000
Trichloroethene	5300
Vinyl Chloride	1000
Semi-Volatile Organic Compounds (SVOCs)	**µg/kg**
Benzo(a)anthracene	1100
Benzo(a)pyrene	860
Benzo(b)fluoranthene	1500
Dibenz(a,h)anthracene	280
1,4-Dichlorobenzene	44000
1,2,4-Trichlorobenzene	160000
Pesticides/PCBs	**µg/kg**
Arochlor-1242	1600
Inorganics	**mg/kg**
Aluminium	18800
Antimony	17.8
Arsenic	85.6
Barium	744
Cadmium	80.2
Chromium	342
Iron	47900
Lead	4310
Manganese	374
Mercury	2.8
Nickel	249

Table 1
Contaminants of Concern (COCs)
Spectron, Inc. Superfund Site
Operable Unit 1 Record of Decision Amendment

Groundwater COPCs	
Contaminant	**Maximum Concentration**
Volatile Organic Compounds (VOCs)	**µg/L**
Acetone	120000
Benzene	140000
Benzyl Chloride	7.6
2-Butanone	19000
Chlorobenzene	21000
Chloroethane	4200
Chloroform	2400
1,1-Dichloroethane	38000
1,2-Dichloroethane	36000
1,1-Dichloroethene	8600
1,2-Dichloroethene	52000
Ethylbenzene	4300
Methylene Chloride	740000
4-Methyl-2-Pentanone	18000
1,1,2,2-Tetrachloroethane	1650
Tetrachloroethene	26500
Toluene	36000
1,1,1-Trichloroethene	83000
1,1,2-Trichloroethene	180
Trichloroethene	8000
1,1,2-Trichloro-1,2,2-Trifluoroethane	11000
Vinyl Chloride	14000
Xylene	18200
Semi-Volatile Organic Compounds (SVOCs)	**µg/L**
bis(2-Chloroethyl Ether	290
4-Chloroaniline	9900
2-Chlorophenol	34
1,2-Dichlorobenzene	25000
1,3-Dichlorobenzene	27
1,4-Dichlorobenzene	3300
2-Methylnaphthalene	36
4-Methylphenol	870
Naphthalene	28
1,2,4-Trichlorobenzene	87.5

Table 1
Contaminants of Concern (COCs)
Spectron, Inc. Superfund Site
Operable Unit 1 Record of Decision Amendment

Groundwater COPCs (continued)	
Contaminant	**Maximum Concentration**
Pesticides/PCBs	**µg/L**
alpha-BHC	0.057
beta-BHC	0.27
delta-BHC	4.4
Dieldrin	0.099
Heptachlor epoxide	0.026
Inorganics	**µg/L**
Aluminium	178000
Antimony	142
Arsenic	5.8
Barium	1480
Beryllium	12.3
Cadmium	42.7
Chromium	390
Cobalt	418
Copper	1280
Iron	491000
Lead	1320
Manganese	18800
Nickel	1030
Vanadium	438
Zinc	2880

Table 2
Applicable or Relevant and Appropriate Requirements
Spectron, Inc. Superfund Site
Operable Unit 1 Record of Decision Amendment

ARAR or TBC	Legal Citation	Classification	Summary of Requirement	Further Details Regarding ARARs in the Context of the Selected Remedy
Federal Underground Injection Control Program	40 CFR Part 144	Applicable	Federal Underground Injection Control Program	Applicable to injection of fluids such as extracted and/or treated groundwater.
Maryland Underground Injection Control	COMAR 26.08.07.01-.04	Applicable	State requirements for the classification and operation of injection wells. Incorporates by reference 40 CFR 144.	Applicable to injection of fluids such as extracted and/or treated groundwater.
Federal Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities (TSDFs)	40 CFR Part 264.600-603	Relevant and Appropriate	Federal requirements for treatment of hazardous waste in miscellaneous units.	Relevant and appropriate to the in situ thermal treatment of principal threat waste.

Table 3
Performance Standards for Little Elk Creek
Spectron, Inc. Superfund Site
Operable Unit 1 Record of Decision Amendment

Contaminant	Performance Standard
Volatile Organic Compounds (VOCs)	**µg/L**
Acetone	5500
Benzene	2.2
2-Butanone	7000
Chlorobenzene	680
Chloroethane	3.6
Chloroform	5.7
1,1-Dichloroethane	800
1,2-Dichloroethane	0.38
1,1-Dichloroethene	0.057
trans-1,2-Dichloroethene	700
Ethylbenzene	3100
Methylene Chloride	4.6
4-Methyl-2-Pentanone	6300
Naphthalene	6.5
1,1,2,2-Tetrachloroethane	0.17
Tetrachloroethene	0.69
Toluene	6800
1,1,1-Trichloroethane	200
1,1,2-Trichloroethane	0.59
Trichloroethene	2.5
Vinyl Chloride	2
Semi-Volatile Organic Compounds (SVOCs)	**µg/L**
bis(2-Chloroethyl) Ether	0.03
4-Chloroaniline	150
1,2-Dichlorobenzene	2700
1,4-Dichlorobenzene	400
4-Methylphenol	180
1,2,4-Trichlorobenzene	70

Appendix A

SPECTRON, INC. SITE
OU1 ADMINISTRATIVE RECORD FILE *
INDEX OF DOCUMENTS

I. SITE IDENTIFICATION

1. Letter to Mr. Paul Mraz, Spectron, Inc., from Mr. Ronald Nelson, Maryland Office of Environmental Programs, re: Notification that Maryland Office of Environmental Programs has determined that certain structural deficiencies exist that require corrective measures, 11/29/82. P. 100001-100004. A September 29, 1982, Complaint and Order regarding structural deficiencies, is attached.

* Administrative Record File Available 6/20/03, updated 8/18/04, 9/28/04, 10/13/11 and 3/20/12.

II. REMEDIAL ENFORCEMENT PLANNING

1. Letter to Mr. Anthony Conte, U.S. EPA, and Mr. Mike Chesik, U.S. EPA, from Mr. Robert Sanchez, U.S. EPA, re: 122(j) notification of negotiations concerning actions to be taken in response to release of hazardous substances, 8/14/03. P. 200001-200008. Certified mail receipts are attached.

2. Letter to Ms. Sharon Shutler, U.S. EPA, and Mr. Simeon Hahn, U.S. EPA, from Mr. Robert Sanchez, U.S. EPA, re: 122(j) notification of negotiations concerning actions to be taken in response to release of hazardous substances, 8/14/03. P. 200009-200013. A Certified mail receipt is attached.

3. Letter to Mr. Robert Sanchez, U.S. EPA, from Mr. W. David Fennimore, Earth Data, Inc., re: Comments on Proposed Remedial Action Plan (PRAP) for Operable Unit #1, 8/20/03. P. 200014-200041. The comments are attached.

III. REMEDIAL RESPONSE PLANNING

1. Letter to Mr. Jerry Hoover, U.S. EPA, from Mr. Michael Parr, E.I. Dupont Nemours Company, re: Follow up letter to discussion on December 13, 1994, regarding potential need for additional air quality characterization at the Galaxy/Spectron Site, 1/18/95. P. 300001-300002.

2. Letter to Ms. Jane Schaefer, Cecil County Health Department, from Ms. Sarah Casper, U.S. EPA, re: Update on site activities and indication that report entitled, "Residential Well and Creek Water Sampling Results, Galaxy/Spectron," is being sent, 12/20/95. P. 300003-300004.

3. Document entitled, "Effluent Biotoxicity Testing Protocol for Industrial and Municipal Effluents," prepared by Maryland Department of the Environment (MDE), 1/22/96. P. 300005-300024.

4. Report: Removal Action Conceptional Design Report, prepared by Advanced GeoServices Corp., 3/1/96. P. 300025-300094.

5. Letter to Mr. Christopher Rogers, Cecil County Government, from Ms. Sarah Casper, U.S. EPA, re: Addressing concern regarding proposed subdivision of the Spectron property, 6/14/96. P. 300097-300097. A June 4, 1996, memorandum to Ms. Marcia Preston, U.S. EPA, from Mr. Chip Hosford, U.S. EPA, regarding additional address for Mr. Paul Mraz, is attached.

6. Transmittal letter to Ms. Sarah Casper, U.S. EPA, from Mr. Paul Mraz, Cecil County Government, re: Attached letter requesting information on the feasibility of subdividing the Spectron property, 6/3/96. P. 300098-300101. The letter is attached.

7. Letter to Mr. Randy Sturgeon, U.S. EPA, from Mr. Edward Sullivan and Mr. Stephen Fulton, ERM, re: Summary of technical issues and other concerns relating to the potential application of low

temperature thermal desorption (LTTD) and soil vapor extraction (SVE) remedies for the soil and fill material in the Galaxy/Spectron Site, 7/2/96. P. 300102-300116. An August 31, 1966, newspaper article, a site drawing and four site diagrams, are attached.

8. Letter to Mr. Randy Sturgeon, U.S. EPA, from Mr. Rick Grills, MDE, re: MDE evaluation of two potential remedial technologies- Low Temperature Thermal Desorption (LTTD) and Soil Vapor Extraction (SVE), 8/27/96. P. 30017-300123. An undated comments document on the preliminary evaluation of Low Temperature Thermal Desorption (LTTD) and Soil Vapor Extraction (SVE), prepared by MDE, is attached.

9. Preliminary Public Health Assessment, prepared by Agency for Toxic Substances and Disease Registry (ATSDR), 9/30/96. P. 300124-300173.

10. Transmittal letter to Mr. Randy Sturgeon, U.S. EPA, from Mr. Rick Grills, U.S. EPA, re: Recently published article from the Groundwater Monitoring and Remediation Journal, 10/10/96. P. An October 3, 1996, telephone memorandum to Mr. Randy Sturgeon, U.S. EPA, from Mr. Rick Grills, MDE, regarding a Summer 1996, article and comments, are attached.

11. Memorandum to Mr. Randy Sturgeon, U.S. EPA, from Ms. Jennifer Hubbard, U.S. EPA, re: Minor comments on the review of the Spectron Creek Risk Assessment, 5/5/97. P. 300184-300193. An April 18, 1997, Risk Assessment (RA), is attached.

12. Letter to Mr. Randy Sturgeon, U.S. EPA, from Mr. Derek Evans and Mr. Edward Sullivan, Environmental Resources Management (ERM), re: Notification of ERM completion of subtask of Task 2G of the Remedial Investigation/Feasibility Study (RI/FS) Work Plan for the Galaxy/Spectron Site, 7/16/97. P. 300194-300206. An undated MDE comments on the July 16, 1997, ERM letter, the July 16, 1997, Roy F. Weston comments on the July 16, 1997, ERM letter, and a August 29, 1997, facsimile transmittal memorandum, to Mr. Randy Sturgeon, U.S. EPA, from Mr. Tom Cornuet, Roy F. Weston, Inc., are attached.

13. Letter to Ms. Deirde Murphey, MDE, from Mr. Randy Sturgeon, U.S. EPA, re: Comments on the calculated

risk caused by the contaminants from the Spectron Superfund Site, 8/14/97. P. 300207-300208.

14. Response to ERM comments on RI/FS Literature Review, prepared by MDE, 8/27/97. P. 300209-300217. An August 27, 1997, transmittal letter to Mr. Randy Sturgeon, U.S. EPA, from Mr. Rick Grills, MDE, is attached.

15. Electronic memorandum to Mr. Randy Sturgeon, U.S. EPA, from Mr. Michael Parr, E.I. Du Pont de Numours & Company, 11/1/97. P. 300218-300251. An undated packet of presentation materials concerning the Galaxy/Spectron Site Human Health Risk Assessment Scoping meeting, prepared by ERM, is attached.

16. Report: Scoping Document, Human Health Risk Assessment for the Galaxy/Spectron Site, prepared by ERM, 11/3/97. P. 300252-300320. A November 5, 1997, transmittal memorandum to Mr. Randy Sturgeon, U.S. EPA, from Ms. Jennifer Hubbard, U.S. EPA, is attached.

17. Data Package, Galaxy/Spectron Site, 1/12/98. P. 300321-300397. Undated, data results from groundwater sampling and residential well sampling, are attached.

18. Letter to Mr. Randy Sturgeon, U.S. EPA, from Ms. Connie Rodgers, ERM, re: Response, on behalf of Group II, to EPA's November 20, 1997, comments on the Human Health Risk Assessment Scoping Document, 3/13/98. P. 300398-300415.

19. Electronic memorandum to 'Research Brief List', from Ms. Christina Inhof, National Institute of Health (NIH), re: Use of Photoremediation to remediate chlorinated organic contaminant, 3/18/98. P. 300416-300467. An October, 1997, document entitled, "Photoremediation", prepared by Mr. Jerald Schnoor, University of Iowa Department of Civil and Environmental Engineering and Center for Global and Regional Environmental Research, is attached.

20. Letter to Ms. Sarah Caspar, U.S. EPA, from Mr. Rick Grills, MDE, re: Transmittal of comments regarding a report entitled, "Final Removal Action Design Report,

Galaxy/Spectron Site, Elkton, Maryland," 4/17/98. P. 300468-300475. The comments are attached.

21. Letter to Ms. Karen Melvin, U.S. EPA, from Mr. Michael Parr, E.I. Dupont Nemours Company, re: Request by Galaxy/Spectron Group for permission from EPA to implement work described in EPA's April 15, 1998, Action Memorandum, in accordance with the remedial design and in accordance with the Applicable Relevant Requirements(ARARs), 4/27/98. P. 300476-300476.

22. Letter to Mr. Michael Parr, E.I. Dupont Nemours Company, from Mr. Randy Sturgeon, U.S. EPA, re: Notification that Mr. Sturgeon is assuming Remedial Project Manager duties from Ms. Sarah Caspar, 05/06/98. P. 300477-300477.

23. Letter to Mr. Randy Sturgeon, U.S. EPA, from Mr. William Richardson, Advanced GeoServices Corporation, re: Baseline Benthic Monitoring Program, 5/29/98. P. 300478-300479.

24. Facsimile Memorandum to Mr. Randy Sturgeon, U.S. EPA, Mr. Rick Grills, MDE, and Mr. Ramon Benitez, U.S. Army Corp of Engineers (U.S. ACE), from Mr. John Fiore, Maverick Construction Management Services, Inc., re: Notification of Work Plans that were scheduled for submission the past Friday will be sent out by the following Tuesday morning, 7/26/98. P. 300480-300483. A July 26, 1998, memorandum to the Galaxy/Spectron Group, from Mr. John Fiore, Maverick Construction Management Services, Inc., regarding material required to bring to the July 29, 1998, meeting, directions to Singerly Fire Company (Station 14) and a meeting agenda, are attached.

25. Report: Galaxy/Spectron Superfund Site, Removal Action, Draft Execution Plan, prepared by Conti Environmental, Inc., 7/27/98. P. 300484-300516.

26. Letter to Mr. Randy Sturgeon, U.S. EPA, from Mr. John Fiore, Maverick Construction Management Services, Inc., re: Maverick Construction Management Services, Inc.'s resubmittal of Conti Environmental's Health and

Safety, Erosion and Sediment Control, and Removal Action Executable Work Plan, 8/10/98. P. 300517-300517.

27. Bar Graph entitled, "Galaxy/Spectron Removal Action Construction", 8/10/98. P. 300518-300522. An August 1, 1987, Base Grading Plan, an August 24, 1998, Drawing entitled, "Air Monitoring Stations, Galaxy/Spectron Superfund Site, Elkton, Maryland" and a March 11, 1998, Diagram entitled, "Habitat Restoration Block Diagrams," are attached.

28. Letter to Mr. Randy Sturgeon, U.S. EPA, from Mr. John Fiore, Maverick Construction Management Services, Inc., re: Summary of Removal action measures that will be protective to the public, as discussed during the August 12, 1998, public meeting, 8/10/98. P. 300523-300524.

29. Report: Proposed Water Treatment System, prepared by Conti Environmental, Inc., 9/29/98. P. 300525-300563.

30. Report: Baseline Environmental Monitoring Event Pre-Construction Findings Report, prepared by Advanced GeoServices Corporation, 12/98. P. 300564-300776. A December 12, 1998, transmittal letter from Mr. Brian Carling, and Mr. William Richardson, Advanced GeoServices Corp., is attached.

31. Report: Removal Action Groundwater Treatment Work Plan, prepared by O'Brien & Gere Engineers, Inc., 1/99. P. 300777-300849. An January 27, 1999, transmittal letter to Mr. Timothy Joness, Maverick Construction Management Services, Inc., from Mr. Randy Sturgeon, U.S. EPA, is attached.

32. Report: Health and Safety Plan, prepared by O'Brien & Gere Laboratories, Inc., 1/99. P. 300850-300925. An January 27, 1999, transmittal letter to Mr. Timothy Joness, Maverick Construction Management Services, Inc., from Mr. Randy Sturgeon, U.S. EPA, is attached.

33. Letter to Mr. Richard Grills, MDE, from Mr. Thomas Komar, O'Brien & Gere Engineers, Inc., re: Indication that enclosed data was generated as a result of the influent characterization and flow testing program, 4/2/99. P. 300926-300972. A packet of 42 data tables and an undated, field investigation summary, are attached.

34. Electronic memorandum to Mr. Randy Sturgeon, U.S. EPA, from Mr. Michael Parr, E.I. Dupont Nemours Company, re: Notification that site cleanup work has begun including additional work on fish passage, 07/22/99. P. 300973-300973.

35. Report: Bench-Scale Treatability Study, prepared by O'Brien & Gere Laboratories, Inc., 6/10/99. P. 300974-301077. A June 10, 1999, letter to Ms. Margaret Chauncey, MDE, from Mr. Thomas Komer, O'Brien & Gere Laboratories, Inc., regarding the results of the Treatability Study, is attached.

36. Facsimile transmittal memorandum to Mr. Randy Sturgeon, U.S. EPA, from Mr. Ed Sullivan, ERM, re: Notification that ERM data sent as per earlier discussion, 12/10/99. P. 301078-301084. December 18, 1991, and December 19, 1991, analytical results, are attached.

37. Report: Project Start Up Plan, prepared by O'Brien & Gere Laboratories, Inc., 1/20/00. P. 301085-301395. A February 23, 2000, transmittal letter to Mr. Randy Surgeon, U.S. EPA, and Mr. Rick Grills, MDE, from Mr. Tim Joness, Maverick Construction Management Sevices, Inc. regarding the Project Start Up Plan, is attached.

38. Report: Removal Action Construction Certification Report, prepared by Advanced Geoservices Corp., 1/24/00. P. 301396-301673.

39. Document entitled, "Spectron Scoping Meeting, January 18, 2000, Summary of Meeting Notes," prepared by Roy F. Weston, Inc., for EPA, (undated). P. 301674-301678.

40. Electronic memorandum to Mr. Randy Sturgeon, U.S. EPA, re: Testing on the PACT reactor and observation on liner float, 3/29/00. P. 301679-301679.

41. Electronic memorandum, to Mr. Anthony Iacobone, U.S. EPA, from Mr. Randy Sturgeon, U.S. EPA, re: Comments on Spectron treatment performance relating to concern that system was under designed, 04/25/00. P. 301680-301680.

42. Electronic memorandum to Mr. Anthony Iacobone, U.S. EPA, from Mr. Randy Sturgeon, U.S. EPA, re: Listing of key issues involved with ensuring that the Spectron plant works, 05/03/00. P. 301681-301681.

43. Electronic memorandum to Mr. Anthony Iacobone, U.S. EPA, from Mr. Randy Sturgeon, U.S. EPA, re: Comments on the preparation of a field report regarding the May 3, 2000, Spectron treatment plant visit, 5/03/00. P. 301682-301682.

44. Electronic memorandum, to Mr. Anthony Iacobone, U.S. EPA, from Mr. Randy Sturgeon, U.S. EPA, re: Comments on outstanding issues at the site, including black “plume” from the discharge pipe, growth of grass around discharge pipe and carbon dust inside the building, 05/04/00. P. 301683-301683.

45. Electronic memorandum to Mr. Randy Sturgeon, U.S. EPA, from Mr. Christopher Guy, U.S. EPA, re: Suggestions on the cause for the appearance of the black plume, 5/5/00. P. 301684-301684.

46. Electronic memorandum, to Mr. Randy Sturgeon, U.S. EPA, from Mr. Anthony Iacobone, U.S. EPA, re: Comments on VOC effluent level and the possible cause of the black plume, 5/08/00. P. 301685-301685.

47. Electronic memorandum to Mr. Randy Sturgeon, U.S. EPA, from Ms. Margaret Chauncey, MDE, re: Comments on by-pass pipe location and closing of the by-pass valve, 05/12/00. P. 301686-301686.

48. Memorandum to file, from Ms. Margaret Chauncey, MDE, re: Possible PRP investigation for the possibility of diverting clean water from recharging the creek, 5/16/00. P. 301687-301691.

49. Electronic memorandum to Mr. Randy Sturgeon, U.S. EPA, from Ms. Margaret Chauncey, MDE, re: Comments on various issues including: Reception of fax with latest data for Little Elk Creek, question as to whether bypass pipe was charging influent water while samples were being collected, VOC levels in surface water samples and request to keep the "no swimming, no fishing" signs up, 06/09/00. P. 301692-301692.

50. Report: Updated Evaluation Report, prepared by Advanced GeoServices Corporation, Inc., 6/29/00. P. 301693-301756. A June 29, 2000, transmittal letter to Mr. Randy Sturgeon, U.S. EPA, and Mr. Rick Grills, MDE, from Timothy Joness, Maverick Construction Management Services, Inc., regarding background information relating to the Stream Linear Float Evaluation Report, is attached.

51. Memorandum to Mr. Randy Sturgeon, U.S. EPA, from Ms. Jennifer Hubbard, U.S. EPA, re: Risk estimates from exposure to VOCs, 7/12/00. P. 301757-301758.

52. Letter to Mr. Randy Sturgeon, U.S. EPA, and Ms. Margaret Chauncey, MDE, from Mr. Timothy Joness, Maverick Construction Management Services, Inc., re: Comments on measures to address the liner float issue and note that first sludge generated by the groundwater was uncharacteristically hazardous, 8/31/00. P. 301759-301759.

53. Electronic memorandum to Mr. Timothy Joness, Maverick Construction Management Services, Inc., from Mr. Randy Sturgeon, U.S. EPA, re: Request to begin the air stripper and note to check the amount of air emissions that would cause a health problem, 09/28/00. P. 301760-301760.

54. Analytical Data Package, prepared by O'Brien & Gere Laboratories, Inc., 10/16/00. P. 301761-301800. An

October 25, 2000, transmittal letter to Mr. Tim Jones, Maverick Construction Management Services, Inc., from Mr. Thomas Komar, O'Brien and Gere, Laboratories, Inc., is attached.

55. Memorandum to Mr. Randy Sturgeon, U.S. EPA, Mr. Karl Kalbacher, MDE, Mr. Rick Grills, MDE, Mr. Robert Summers, MDE and Mr. Edward Gertler, MDE, from Ms. Margaret Chauncey, MDE, re: Galaxy/Spectron Superfund Site groundwater treatment system off-line, 10/20/00. P. 301801-301802.

56. Electronic memorandum to Mr. Robert Sanchez, U.S. EPA, from Mr. Randy Sturgeon, U.S. EPA, re: Forwarded message addressing the DNAPL problem and web site listing providing more information on the subject, 10/25/00. P. 301803-301804.

57. Letter to Mr. Craig Branchfield, Solutia, Inc., from, Mr. Randy Sturgeon, U.S. EPA, re: Update on October 23, 2000, site visit to address maintenance problems relating to a plant shutdown that occurred the prior week, 10/26/00. P. 301805-301805.

58. Electronic memorandum to Mr. Craig Branchfield, Solutia, Inc., from Mr. Randy Sturgeon, U.S. EPA, re: Accuracies in the data on the Spectron Groundwater Report, 10/27/00. P. 301806-301806.

59. Electronic memorandum to Mr. Robert Sanchez, U.S. EPA, from Mr. Randy Sturgeon, U.S. EPA, re: Further addressing of inaccuracies in the data on Spectron Groundwater Report, 10/27/00. P. 301807-301807.

60. Electronic memorandum to Mr. Craig Branchfield, Solutia, Inc., from Mr. Randy Sturgeon, U.S. EPA, re: Question regarding Turbidity-Decant reporting on the Spectron Groundwater Report, 10/27/00. P. 301808-301808.

61. Memorandum to Mr. Randy Sturgeon, U.S. EPA, and Ms. Margaret Chauncey, MDE, from Mr. Tim Joness, Maverick Construction Management Services, Inc., re: Update of several issues at the site including, removal of

carbon from creek, removal of topsoil from creek bank, installation of bag filters prior to the air stripper, testing of sludge in roll off container, and finalization of temporary treatment system, 11/00. P. 301809-301810.

62. Letter to Mr. Randy Sturgeon, U.S. EPA, from Mr. Timothy Joness, Maverick Construction Management Services, Inc., re: Temporary groundwater treatment system implemented to treat groundwater passing through the downstream cutoff wall, 11/3/00. P. 301811-301811.

63. Electronic memorandum to Mr. Craig Branchfield, Solutia, Inc., and Timothy Joness, Maverick Construction Management Services, Inc., from Mr. Randy Sturgeon, U.S. EPA, re: Instrumentation relating to effluent flows, 11/8/00. P. 301812-301812.

64. Letter to Mr. Randy Sturgeon, U.S. EPA, from Mr. Timothy Joness, Maverick Construction Management Services, Inc., re: Proposed Plan for addressing liner float and groundwater, 11/13/00. P. 301813-301815.

65. Electronic memorandum to Mr. Craig Branchfield, Solutia, Inc., from Mr. Randy Sturgeon, U.S. EPA, re: Suggestion that streams are analyzed at a range in the next round of GWTS tests, 11/15/00. P. 301816-301816.

66. Letter to Mr. Craig Branchfield, Solutia, Inc., from Mr. Randy Sturgeon, U.S. EPA, re: U.S. EPA review of air model development to predict residence's exposure to air releases, 11/15/00. P. 301817-301839. An October 19, 2000, memorandum to Ms. Patricia Flores-Brown, U.S. EPA, from Ms. Randy Sturgeon, U.S. EPA, regarding the comments on the air modeling analysis and statistical data, is attached.

67. Document entitled; "Analytical results method 624," prepared by O'Brien and Gere, Laboratories, Inc. Laboratories, Inc., 11/15/00. P. 301840-301849.

68. Certificate of Analysis-Volatiles, Galaxy/Spectron Superfund Site, 11/16/00. P. 301850-301852. A November 22, 2000, facsimile transmittal memorandum to Mr. Randy Sturgeon, U.S. EPA, from Ms. Margaret Chauncey, MDE, regarding transmittal of sample results, is attached.

69. Letter to Mr. Craig Branchfield, Solutia, Inc., from Mr. Randy Sturgeon, U.S. EPA, re: EPA's "Off-Site Policy" regarding sludge disposal, 11/21/00. P. 301853-301853.

70. Transmittal letter to Mr. Randy Sturgeon, U.S. EPA, from Mr. Edward Sullivan, ERM, re: The October and November 2000, Progress Report in accordance with the RI/FS ACO, 12/5/00. P. 301854–301856. The reports are attached.

71. Letter to Mr. Timothy Joness, Maverick Construction Management Services, Inc., from Mr. Thomas Komar, U.S. EPA, re: Summary of events that led to the addressing of accumulation of carbon in the treatment process, 12/6/00. P. 301857-301860.

72. Electronic memorandum to Mr. Robert Sanchez, U.S. EPA, from Mr. Randy Sturgeon, U.S. EPA, re: Spectron Site visit to sample the effluent discharge inside the treatment building, 12/08/00. P. 301861-301861.

73. Electronic memorandum to Mr. Robert Sanchez, U.S. EPA, from Mr. Randy Sturgeon, U.S. EPA, re: Approval of ERM proposal regarding DNAPL monitoring approval, 12/08/00. P. 301862-301862.

74. Transmittal letter to Mr. Randy Sturgeon, U.S. EPA, and Ms. Margaret Chauncey, MDE, from Mr. Timothy Joness, Maverick Construction Management Services, Inc., re: Transmittal of an October 2000, O & M Report/Temporary Treatment System Work Plan, a December 6, 2000, letter regarding the treatment shutdown that occurred between October 19-21, 2000, November 2000, analytical results and a December 11, 2000, Work Plan, are attached, 12/11/00. P. 301863-301864.

75. Electronic memorandum to Mr. Randy Sturgeon, U.S. EPA, from Mr. Robert Sanchez, U.S. EPA, re: Decision regarding Spectron's groundwater temporary treatment system, 12/18/00. P. 301865-301867. A December 18, 2000, letter to Mr. Randy Sturgeon, U.S. EPA, from Mr. Craig Branchfield, Solutia, Inc., regarding approval of groundwater temporary treatment system, is attached.

76. Letter to Mr. Craig Branchfield, Solutia, Inc., from Mr. Robert Sanchez, U.S. EPA, re: Approval of temporary groundwater treatment facility, 1/4/01. P. 301868-301872. A handwritten map is attached.

77. Letter to Mr. Craig Branchfield, Solutia, Inc., from Mr. Robert Sanchez, U.S. EPA, re: Agenda for January 18, 2001, meeting, 1/5/01. P. 301873-301874. The January 18, 2001, agenda is attached.

78. Transmittal letter to Mr. Robert Sanchez, U.S. EPA, and Ms. Margaret Chauncey, MDE, from Mr. Timothy Joness, Maverick Construction Management Services, Inc., re: Forwarded December 15, 2000, and December 16, 2000, Groundwater Treatment System analytical results, 1/8/01. P. 301875-301922. The results are attached.

79. Transmittal letter to Mr. Robert Sanchez, U.S. EPA, and Ms. Margaret Chauncey, MDE, from Mr. Timothy Joness, Maverick Construction Management Services, Inc., re: Forwarded December 28, 2000, and December 29, 2000, Groundwater Treatment System analytical results, 1/14/01. P. 301923-301977. The results are attached.

80. Electronic memorandum to Mr. W. David Fennimore, Earth Data, Inc., from Mr. Robert Sanchez, U.S. EPA, re: Questions and changes concerning the Feasibility Study, 1/23/01. P. 301973-301974.

81. Letter to Mr. Craig Branchfield, Solutia, Inc., from Mr. Robert Sanchez, U.S. EPA, re: Summary of Feasibility Study Scoping meeting minutes, 1/23/01.

P. 301975-301996. A January 5, 2001, letter to Mr. Craig Branchfield, Solutia, Inc., from Mr. Robert Sanchez, U.S. EPA, regarding the January 23, 2001, meeting agenda and purpose, a summary of the January 23, 2001, meeting notes, the January 23, 2001, meeting sign-in sheet and a packet of presentation materials, are attached.

82. Letter to Mr. Robert Sanchez, U.S. EPA, from Mr. W. David Fennimore, Earth Data, Inc., re: Schedule for site soil and shallow fill groundwater RI/FS in accordance with the January 18, 2001, meeting, 1/26/01. P. 301997-301999. An undated chart is attached.

83. Transmittal letter to Mr. Robert Sanchez, U.S. EPA, and Ms. Margaret Chauncey, MDE, from Mr. Timothy Joness, Maverick Construction Management Services, Inc., re: Enclosure of O'Brien & Gere's Laboratories, Inc., analytical results from the forth sampling event, 1/26/01. P. 302000-302032. The sampling results are attached.

84. Electronic memorandum to Mr. Robert Sanchez, U.S. EPA, from Ms. Paula Kovacs, DecisonQuest, re: Approval of Spectron citizen sampling letters for distribution to citizens regarding the monitoring program, 1/31/01. P. 302033-302033.

85. Letter to Mr. Thomas Morris, IBM Corporation, from Mr. Robert Sanchez, U.S. EPA, re: Approval of project manager for Galaxy/Spectron Site, 2/1/01. P. 302034-302040. A January 23, 2001, letter to Mr. Robert Sanchez, U.S. EPA, from Mr. Thomas Morris, IBM Corporation, regarding Intent to hire Mr. W. David Fennimore, Earth Data, Inc., as a new project coordinator for the Spectron Site and a professional profile on Mr. Fennimore, are attached.

86. Electronic memorandum to Mr. Robert Sanchez, U.S. EPA, from Mr. Thomas Morris, IBM Corporation, re: Attached Site Soil and Groundwater RI/FS schedule, 2/1/01. P. 302041-302042.

87. Letter to residents, from Mr. Robert Sanchez, U.S. EPA, re: Notification that Mr. Sanchez is taking over for Mr. Sturgeon as Remedial Project Manager for the U.S. EPA at the Spectron Site, 2/5/01. P. 302043-302043.

88. Electronic memorandum to Mr. Robert Sanchez, U.S. EPA, from Mr. Randy Sturgeon, U.S. EPA, re: Site visit to Spectron groundwater treatment plant and comments on the black plume, 2/10/01. P. 302044-302044.

89. Electronic memorandum to Mr. Robert Sanchez, U.S. EPA, from Mr. Randy Sturgeon, U.S. EPA, re: Spectron groundwater treatment plant data, 2/10/01. P. 302045-302045.

90. Electronic memorandum to Mr. Robert Sanchez, U.S. EPA, from Mr. Randy Sturgeon, U.S. EPA, re: Swimming advisory fact sheet distribution to residents, 2/10/01. P. 302046-302046.

91. Electronic Memorandum to Mr. Robert Sanchez, U.S. EPA, from Mr. Randy Sturgeon, U.S. EPA, re: Observation that attached numbers for the treatment plant indicate that the bioreactor is performing poorly, 2/10/01. P. 302047-302047.

92. Electronic memorandum to Mr. Robert Sanchez, U.S. EPA, from Ms. Margaret Chauncey, MDE, re: Waste disposal practices at Spectron, 2/12/01. P. 302048-302048.

93. Transmittal letter to Mr. Robert Sanchez, U.S. EPA, from Mr. W. David Fennimore, Earth Data, Inc., re: Transmission of the January 2002, progress report (PRP Group) for the Galaxy/Spectron Superfund Site, 2/14/01. P. 302049-302051. The progress report is attached.

94. Letter to Mr. W. David Fennimore, Earth Data, Inc., from Mr. Robert Sanchez, U.S. EPA, re: Confirmation of receipt of Maverick Construction’s February 12, 2001, disposal letter concerning non-hazardous waste, 2/21/01. P. 302052-302061. A February 12, 2001, letter to Mr. Robert Sanchez, U.S. EPA, from Mr.

Timothy Joness, Maverick Construction Management Services, Inc., regarding determination that sludge and carbon discharge into Little Elk Creek is non-hazardous, a January 3, 2001, letter to Mr. Timothy Joness, from Mr. Kenneth Jones, O'Brien and Gere, Laboratories, Inc., regarding request for permission for O'Brien and Gere, Laboratories, Inc., to dispose of filter cakes, and a July 5, 2000, analytical result packet, are attached.

95. Electronic memorandum to Mr. Robert Sanchez, U.S. EPA, from Ms. Margaret Chauncey, U.S. EPA, re: Approval of soil storage on site and necessity of issuance of a permanent EPA ID number for continuance of generating hazardous waste, 2/23/01. P. 302062-302062.

96. Electronic memorandum to Ms. Bernice Pasquini, U.S. EPA, from Ms. Jennifer Hubbard, U.S. EPA, re: Questions relating to the categorization of soils for use in the creation of the Human Health Risk Assessment, 2/27/01. P. 302063-302065.

97. Facsimile transmittal memorandum, to Mr. Rick Grills, and Ms. Margaret Chauncey, U.S. EPA, from Mr. Robert Sanchez, U.S. EPA, re: The attendance list for the February 20, 2001, Spectron meeting, 2/28/01. P. 302066-302067. The attendance list is attached.

98. Report: Remedial Investigation and Risk Assessment Report for Site Soils and Overburden Groundwater, prepared by ERM, 3/01. P. 302068-302465. A March 23, 2001, transmittal letter to Mr. Robert Sanchez, U.S. EPA, from Mr. W. David Fennimore, Earth Data, Inc., is attached.

99. Electronic memorandum to Mr. Robert Sanchez, U.S. EPA, from Mr. W. David Fennimore, Earth Data, Inc., re: Confirmation that Mr. W. David Fennimore can attend the March 15, 2001, scheduled meeting regarding Well Plan and Feasibility Study, 3/6/01. P. 302466-302466.

100. Electronic memorandum to Mr. Randy Shuler, ERM, from Ms. Jennifer Hubbard, U.S. EPA, re: Writing bridge from the risk assessment to the Feasibility Study portion of the report, 3/7/01. P. 302467-302467.

101. Electronic Memorandum to Mr. Robert Sanchez, U.S. EPA, from Mr. Randy Sturgeon, U.S. EPA, re: Copy of document entitled, "Research Brief 75: An Advanced Characterization Study of a Chlorinated Solvent Contaminated Aquifer", 3/8/01. P. 302468-302471.

102. Letter to Mr. Thomas Morris, IBM Corporation, from Mr. Randy Sturgeon, U.S. EPA, re: Notification that all electronic data submittals must be submitted as per the format specified in the EPA Region III, "Electron Data Deliverable Specification Manual," 3/15/01. P. 302472-302472.

103. Electronic memorandum to Mr. Robert Sanchez, U.S. EPA, from Mr. W. David Fennimore, Earth Data, Inc., re: Changes made to notice letters and answer to question regarding soils generated as part of removal action, 3/26/01. P. 302473-302474.

104. Letter to Mr. W. David Fennimore, Earth Data, Inc., from Mr. Robert Sanchez, U.S. EPA, re: General guidance as to the handling and disposal of waste on site, 3/26/01. P. 302475-302475.

105. Electronic memorandum to Mr. Robert Sanchez, U.S. EPA, from Mr. Randy Sturgeon, U.S. EPA, re: Approval of ERM's October 5, 2000, proposal regarding monitoring and recovering DNAPL in AW-1 for the two following months, 3/30/01. P. 302476-302476.

106. Letter to Mr. Robert Sanchez, U.S. EPA, from Mr. Edward Sullivan, ERM, re: Attachment of February 2001, progress report in accordance with the RI/FS Administrative Order on Consent (AOC), 4/2/01. P. 302477-302478. A February 2001, progress report, is attached.

107. Facsimile memorandum to Mr. Jim Gravette, MDE, from Mr. Robert Sanchez, U.S. EPA, re: Rough calculation

of the discharge rate of the liner when it is floating, 4/10/01. P. 302479-302480. An undated diagram is attached.

108. Electronic memorandum to Mr. Robert Sanchez, U.S. EPA, from Mr. W. David Fennimore, Earth Data, Inc., re: Treatment shut-down the prior night due to a high level in the equalization tank, 4/11/01. P. 302481-302481.

109. Electronic memorandum to Mr. Robert Sanchez, U.S. EPA, from Ms. Carrie Deitzel, U.S. EPA, re: Letter to be written by contractor regarding drilling, fact sheet that is needed for RI/FS report and residences requiring notification prior to drilling, 4/11/01. P. 302482-302482.

110. Electronic memorandum to Mr. Robert Sanchez, U.S. EPA, from Mr. Randy Sturgeon, U.S. EPA, re: Conversation with Mr. Tom Komar, O'Brien and Gere, Laboratories, Inc., regarding the Spectron treatment performance, 4/13/01. P. 302483-302483.

111. Electronic memorandum to Mr. Robert Sanchez, U.S. EPA, from Mr. Randy Sturgeon, U.S. EPA, re: Question to Mr. Tim Joness, Maverick Construction Management Services, Inc., regarding how the PACT system would meet NPDES compliance, 4/13/01. P. 302484-302484.

112. Electronic memorandum to Mr. Robert Sanchez, U.S. EPA, from Mr. Randy Sturgeon, U.S. EPA, re: April 11, 2000, site visit for oversight on the borehole geophysical logging effort at Spectron, 4/13/01. P. 302485-302485.

113. Electronic memorandum to Mr. Robert Sanchez, U.S. EPA, from Mr. Randy Sturgeon, U.S. EPA, re: Attached summary report for the requested sediment sampling results, 4/13/01. P. 302486-302487.

114. Electronic memorandum to Mr. Robert Sanchez, U.S. EPA, from Mr. Randy Sturgeon, U.S. EPA, re: Summary of discussion with Mr. Rick Grills, MDE, regarding future site work, 4/13/01. P. 302488-302488.

115. Electronic memorandum to Mr. Robert Sanchez, U.S. EPA, from Mr. Randy Sturgeon, U.S. EPA, re: August 1, 2001, reschedule date for re-sampling of four wells (VW-1, VW-3, VW-4 and AW-3S), 4/13/01. P. 302489-302489.

116. Electronic memorandum to Mr. Robert Sanchez, U.S. EPA, from Mr. Randy Sturgeon, U.S. EPA, re: Review of the PRP's request to turn on the air stripper and questions regarding EPA's plan for the removal action, 4/13/01. P. 302490-302490.

117. Electronic memorandum to Mr. Robert Sanchez, U.S. EPA, from Mr. Randy Sturgeon, U.S. EPA, re: Attached letter regarding temporary groundwater treatment system, 4/13/01. P. 302491-302491.

118. Electronic memorandum to Mr. Robert Sanchez, U.S. EPA, from Mr. Randy Sturgeon, U.S. EPA, re: Site visit to Spectron for the purpose of administering electroshock for anadromous fish, 4/13/01. P. 302492-302492.

119. Electronic memorandum to Mr. Robert Sanchez, U.S. EPA, from Mr. Randy Sturgeon, U.S. EPA, re: Request for Mr. Sturgeon to add citizen's name and address to mailing list, 4/13/01. P. 302493-302495.

120. Electronic memorandum to Mr. Robert Sanchez, U.S. EPA, from Mr. Randy Sturgeon, U.S. EPA, re: Approval granted to Mr. Tim Joness, Maverick Construction Management Services, Inc., to start the air stripper and indication that Mr. Sturgeon will respond with U.S. EPA comments regarding the site sampling, 4/13/01. P. 302496-302496.

121. Electronic memorandum to Mr. Robert Sanchez, U.S. EPA, from Mr. Randy Sturgeon, U.S. EPA, re: Request to update well depth for domestic well samples, 4/13/01. P. 302497-302497.

122. Electronic Memorandum to Mr. Robert Sanchez, U.S. EPA, from Mr. Randy Sturgeon, U.S. EPA, re: Update on preparation of field report, 4/13/01. P. 302498-302498.

123. Electronic Memorandum to Mr. Robert Sanchez, U.S. EPA, from Mr. Randy Sturgeon, U.S. EPA, re: Request to look into the bag filter issue and the black discharge, 4/13/01. P. 302499-302499.

124. Electronic memorandum to Ms. Jennifer Hubbard, U.S. EPA, from Mr. Robert Sanchez, U.S. EPA, re: Notification that Mr. W. David Fennimore, Earth Data, Inc., was asked to locate the data validation package, 4/16/01. P. 302500-302500.

125. Electronic memorandum to Mr. Robert Sanchez, U.S. EPA, from Ms. Jennifer Hubbard, U.S. EPA, re: Intent to locate the well results that were reflected in the Remedial Investigation Report, 4/16/01. P. 302501-302502.

126. Electronic memorandum to Ms. Kathy Davies, U.S. EPA, from Mr. Robert Sanchez, U.S. EPA, re: Reminder that the following will be discussed on the scheduled April 24, 2001, meeting: The cost oversight, the scheduled April 25, 2001, meeting with reporters on site, the RI/FS Work Plan for Additional Bedrock Investigation, locations, monitoring well design, schedule, adequacy of well placement and Electronic Data Deliverable format, 4/23/01. P. 302503-302503.

127. Electronic memorandum to Mr. W. Dave Fennimore, Earth Data, Inc., from Mr. Robert Sanchez, U.S. EPA, re: Memorandum signed by acting director of the Office of Emergency Removal Response (OERR), Mr. Larry Reed, transmitting a report entitled, “Reusing Cleaned up Superfund Sites: Recreational Reuse of Land Above Hazardous Waste Containment Areas OSWE 9230.0.93),” 5/1/01. P. 302504-302506.

128. Electronic memorandum to Mr. Robert Sanchez, U.S. EPA, from Ms. Jennifer Hubbard, U.S. EPA, re: List of missing well data sampling items from various dates in 1991, 5/09/01. P. 302507-302507.

129. Electronic memorandum to Mr. Robert Sanchez, U.S. EPA, from Ms. Jennifer Hubbard, U.S. EPA, re: Comments on change in wording on Spectron Work Plan Review, 5/14/01. P. 302508-302509.

130. Letter to Mr. W. Dave Fennimore, Earth Data, Inc., from Mr. Robert Sanchez, U.S. EPA, re: Notification that U.S. EPA has reviewed the RI/FS Work Plan Addendum No. 2 for Additional Bedrock Investigation, 5/16/01. P. 302510-302511.

131. Electronic memorandum to Mr. Edward Sullivan, ERM, from Ms. Jennifer Hubbard, U.S. EPA, re: Question regarding background soil samples that were collected for the Spectron Site, 5/17/01. P. 302512-302512.

132. Electronic memorandum to Mr. Robert Sanchez, U.S. EPA, Ms. Jennifer Hubbard, U.S. EPA, re: Notification that soil assessment is finished, 5/17/01. P. 302513-302513.

133. Electronic memorandum to Mr. Robert Sanchez, U.S. EPA, from Mr. W. David Fennimore, Earth Data, Inc., re: Acknowledgment of review of February 2001, residential well samples, 5/21/01. P. 302514-302514.

134. Electronic memorandum to Ms. Jennifer Hubbard, U.S. EPA, from Mr. Edward Sullivan, ERM, re: ERM lab correctly analyzed December, 1991, lab results for MW-11 data, 5/21/01. P. 302515-302515.

135. Report: Draft Feasibility Study Report for Site Soils and Overburden Groundwater, prepared by ERM, 6/01. P.302516-302739. An April 9, 2002, letter to Mr. Robert Sanchez, U.S. EPA, from Mr. W. David Fennimore, Earth Data, Inc., regarding an attached addendum to the Draft Feasibility Study Report for Site Soils and Overburden Groundwater, and the undated addendum, are attached.

136. Electronic memorandum to Mr. Randy Sturgeon, U.S. EPA, from Ms. Margaret Chauncey, MDE, re: Review of O'Brien and Gere's mass balance estimates of maximum potential air stripper emissions, 6/2/01. P. 302740-302740.

137. Electronic memorandum to Mr. Robert Sanchez, U.S. EPA, from Ms. Jennifer Hubbard, U.S. EPA, re: U.S. EPA response to ERM comments on Spectron Work Plan, 6/14/01. P. 302741-302741.

138. Electronic memorandum to Ms. Jennifer Hubbard, U.S. EPA, from Mr. Robert Sanchez, U.S. EPA, re: Indication that Roy F. Weston, Inc. is going to perform overall QA review of RI/RA Report, 6/15/01. P. 302742-302742.

139. Letter to Mr. John Brzezenski, U.S. Army Corp of Engineers (U.S. ACE), from Mr. Robert Sanchez, U.S. EPA, re: Notification that the U.S. EPA will be forwarding a copy of the RI/RA Report to Mr. David Pohl, Roy F. Weston, Inc., for review, 6/18/01. P. 302743-302743.

140. Electronic memorandum to Mr. Robert Sanchez, U.S. EPA, from Mr. Bruce Pluta, U.S. EPA, re: Request for Mr. Pluta to review RI/RA Report from an ecological perspective and indication that he will pick up document on Thursday, 6/20/01. P. 302744-302744.

141. Electronic memorandum to Mr. Christopher Rogers, from Mr. Robert Sanchez, U.S. EPA, re: Response to citizen inquiry regarding the status of the groundwater treatment facility, RI/FS Report, and the outfall from the Water Treatment Plant (WTP), 6/20/01. P. 302745-302746.

142. Electronic memorandum to Mr. Robert Sanchez, U.S. EPA, from Mr. Jim Gravette, MDE, re: Determination that the 100% removal design drawing is incomplete and

related comments to the design drawing, 7/02/01. P. 302747-302748.

143. Electronic memorandum to Mr. Robert Sanchez, U.S. EPA, from Mr. Randy Sturgeon, U.S. EPA, re: Request for Mr. Sanchez to review at listing of July 10, 2001, internet seminar regarding Natural Attenuation of Chlorinated Solvents in Groundwater, 7/02/01. P. 302749-302752.

144. Electronic memorandum to Mr. Robert Sanchez, U.S. EPA, from Mr. Jim Gravette, MDE, re: Comments on Certification Report, 7/2/01. P. 302753-302754.

145. Transmittal letter to Mr. Robert Sanchez, U.S. EPA, from Mr. Edward Sullivan, ERM, re: A June 2001, Progress Report for Galaxy/Spectron Site, 7/16/01. P. 302755-302756. The progress report is attached.

146. Memorandum to file, from Mr. Robert Sanchez, U.S. EPA, re: Spectron PRP Removal Cost Evaluation, 7/19/01. P. 302757-302757.

147. Electronic memorandum to Mr. W. David Fennimore, Earth Data, Inc., from Mr. Robert Sanchez, ERM, re: Request for EPA and MDE to better understand the stream liner design and the willingness of EPA and MDE contacts to travel to ERM's office, if necessary, to facilitate this objective, 8/06/01. P. 302758-302758.

148. Electronic memorandum to Mr. W. David Fennimore, Earth Data, Inc., from Mr. Robert Sanchez, U.S. EPA, re: Approval of residential well sampling results conducted in May 2001, and the approval of well sampling results for the respective residents, 8/08/01. P. 302759-302759.

149. Electronic memorandum to Mr. Robert Sanchez, U.S. EPA, from Mr. W. David Fennimore, Earth Data, Inc., re: Notification that Mr. W. David Fennimore has a scheduled meeting with O'Brien and Gere, Laboratories, Inc., concerning the hydraulics of the stream liner system, 8/15/01. P. 302760-302761.

150. Letter to Mr. Robert Sanchez, U.S. EPA, from Mr. Edward Sullivan, ERM, re: July 2001, Progress Report for Galaxy/Spectron Site, 8/21/01. P. 302762-302763. The progress report is attached.

151. Memorandum to Mr. Robert Sanchez, U.S. EPA, from Ms. Bernice Pasquini, U.S. EPA, re: Comments on RI, RA and FS Reports for Site Soils and Overburden Groundwater, 10/11/01. P. 302764-302765.

152. Electronic memorandum to Mr. Jim Gravette, MDE, from Mr. Robert Sanchez, U.S. EPA, re: Indication that technical comments that the EPA has on the RI/FS report, are attached, 10/26/01. P. 302766-302766.

153. Comments on the Feasability Study for Site Soils and Overburden Ground Water, Galaxy/Spectron Site, Elkton, Maryland, prepared by U.S. EPA, 11/01. P. 302767-302812. A November 10, 2001, letter to Mr. W. David Fennimore, Earth Data, Inc., from Mr. Robert Sanchez, U.S. EPA, transmitting the comments, is attached.

154. Letter to Mr. W. David Fennimore, Earth Data, Inc., from Mr. Robert Sanchez, U.S. EPA, re: U.S. EPA general comments on the March 2001, draft RI and the June 2001, draft FS reports, 11/10/01. P. 302813-302858. The comments are attached.

155. Presentation materials from a meeting concerning the Galaxy/Spectron Superfund Site Project Meeting, prepared by O'Brien and Gere, Laboratories, Inc., 11/15/01. P. 302859-302906.

156. Letter to Mr. Robert Sanchez, U.S. EPA, from Mr. W. David Fennimore, Earth Data, Inc., re: Acknowledgment of receipt of the U.S. EPA and MDE comments on the Soil and Overburden Groundwater RI/FS/RA, 11/19/01. P. 302907-302908.

157. Electronic memorandum to Mr. Robert Sanchez, U.S. EPA, from Mr. Mark Kluger, Dajak, LLC., re: The use of pressure pulse technology as a potential means to assist in removing free contaminants from the site, 11/20/01. P. 302909-302909.

158. Electronic memorandum to Ms. Bernice Pasquini, U.S. EPA, from Mr. Robert Sanchez, U.S. EPA, re: Response to question regarding horizontal drilling on site versus use of trenching or a French drain, 11/21/01. P. 302910-302912.

159. Electronic memorandum to Mr. Robert Sanchez, U.S. EPA, from Mr. W. David Fennimore, Earth Data, Inc., re: Request for a U.S. EPA response regarding request for extension on the RI/FS/RA comments, 12/03/01. P. 302913-302913.

160. Electronic memorandum to Mr. David Pohl, Roy F. Weston, Inc., from Mr. Robert Sanchez, U.S. EPA, re: Request for December 14, 2001, meeting to discuss relations between the PRP group and the U.S. EPA concerning possible remediation, 12/07/01. P. 302914-302915.

161. Letter to Mr. Robert Sanchez, U.S. EPA, from Mr. William Butler, ERM, re: Submission of September 2001, and November 2001, Progress Reports, 12/11/01. P. 302916-302918. The September 2001, and November 2001, Progress Reports are attached.

162. Electronic memorandum to Mr. David Pohl, Roy F. Weston, Inc., from Mr. Robert Sanchez, U.S. EPA, re: Attached RI/FS comments noting the possibility of insufficient evidence as to the causes for contamination at the center of the site, 12/18/01. P. 302919-302919.

163. Electronic memorandum to Mr. Robert Sanchez, U.S. EPA, from Mr. Rick Grills, MDE, re: Indication that Mr. Grills does not have any comments regarding the December 19, 2001, meeting agenda, 11/18/01. P. 302920-302923. The agenda is attached.

164. Letter to Mr. Robert Sanchez, U.S. EPA, from Mr. W. David Fennimore, Earth Data, Inc., re: Transmittal of attached copy of December 26, 2001, letter regarding the removal of surface soils, 1/02/02. P. 302924-302925. The letter is attached.

165. Letter to Mr. Robert Sanchez, U.S. EPA, from Mr. W. David Fennimore, Earth Data, Inc., re: Confirmation of receipt of January 3, 2002, letter granting an extension to the January 14, 2002, request for response to the EPA's comments on the Soil and Shallow Overburden Groundwater Remedial Investigation, 1/04/02. P. 302924-302925. The letter is attached.

166. Letter to Mr. Robert Sanchez, U.S. EPA, from Mr. W. David Fennimore, Earth Data, Inc., re: Confirmation of extension for PRP group's review of U.S. EPA and MDE comments on the RI/FS/RA for the soil and overburden groundwater, 1/10/02. P. 302926-302927. A December 26, 2001, letter to Mr. Carl Everett, Saul Ewing LLP, from Mr. Paul Mraz, regarding a change of address for Mr. Paul Mraz, is attached.

167. Letter to Mr. Robert Sanchez, U.S. EPA, from Mr. William Butler, ERM, re: Submission of December 2001, Progress Report, 1/11/02. P. 302928-302930. A December 2001, Progress Report, is attached.

168. Report: Response to comments document regarding RI/RA and FS Reports, prepared by ERM, 1/11/02. P. 302933-303066.

169. Handwritten sign-in sheet for meeting regarding horizontal drilling, 1/24/02. P. 303067-303071. A February 18, 2002, letter to Mr. Robert Sanchez, U.S. EPA, from Mr. Louis Fournier, Star Environmental, Inc., regarding the submission of a proposal for performance monitoring of three wells at the Spectron Site, a February 18, 2002, proposal and an undated chart, are attached.

170. Electronic Memorandum to Ms. Bernice Pasquini, U.S. EPA, from Mr. Robert Sanchez, U.S. EPA, re: Notification that on January 30, 2002, Earth Data, Inc., team will visit the Spectron Site to remove accumulated DNAPL from AW-1 and set the packer as per the approved work plan, 1/28/02. P. 303072-303072.

171. Electronic memorandum to Mr. Robert Sanchez, U.S. EPA, from Mr. Jim Gravette, MDE, re: Transmittal of attached document regarding the air sparging remedial techniques, 02/11/02. P. 303073-303073.

172. Electronic memorandum to Mr. Louis Founier, Star Company, from Mr. Robert Sanchez, U.S. EPA, re: Response to the notification that Star Company is working on two proposals for contamination removal, 02/11/02. P. 303074-303076.

173. Meeting notes, Galaxy/Spectron Site, prepared by Roy F. Weston, Inc., 2/13/02. P. 303077-303081.

174. Electronic memorandum to Mr. W. David Fennimore, Earth Data, Inc., from Mr. Robert Sanchez, U.S. EPA, re: The need to set up a meeting with risk assessor to develop an Eco Risk Assessment (ERA), 2/20/02. P. 303082-303082.

175. Electronic memorandum to Mr. Louis Fournier, Star Environmental, Inc., from Mr. Robert Sanchez, U.S. EPA, re: Ineffectiveness of horizontal wells in eliminating contamination, 2/22/02. P. 303083-303084.

176. Electronic memorandum to Mr. Louis Fournier, Star Environmental, Inc., from Mr. Robert Sanchez, U.S. EPA, re: Advice on the potential use of horizontal biosparge wells at the site, 2/25/02. P. 303085-303086.

177. Letter to Mr. John Brezenski, USACE, from Mr. Robert Sanchez, U.S. EPA, re: Request for Roy F. Weston, Inc. to assist with the development of the Proposed Remedial Action Plan (PRAP), 2/27/02. P. 303087-303113. Draft Spectron notes in response to the letter, and a June 6, 2000, and June 7, 2000, Remedial Technologies Development Forum training course workbook, are attached.

178. Document entitled, “Spectron Meeting notes between Mr. Robert Sanchez, U.S. EPA, and Roy F. Weston, Inc.,” prepared by U.S. EPA, 3/6/02. P. 303114-303116.

179. Electronic memorandum to Mr. Robert Sanchez, U.S. EPA, from Mr. Thomas Cornuet, Roy F. Weston, Inc., re: Attached draft notes from March 2002, meeting and conceptional costing for HRC groundwater remediation, 3/14/02. P. 303117-303139. March 6, 2002, meeting notes and an October 1996, Technology Overview Report, are attached.

180. Electronic memorandum to Mr. W. David Fennimore, Earth Data, Inc., from Mr. Robert Sanchez, U.S. EPA, re: Risk Assessment Review, 3/15/02. P. 303140-303140.

181. Electronic memorandum to Mr. Jim Gravette, MDE, from Mr. Robert Sanchez, U.S. EPA, re: Soil investigation, 3/19/02. P. 303141-303141.

182. Electronic memorandum to Mr. Robert Sanchez, U.S. EPA, from Mr. Rick Grills, MDE, re: Possible solution to shallow drilling problems, 3/21/02. P. 303142-303142.

183. Letter to Mr. John Brzezenski, USACE, from Mr. Robert Sanchez, U.S. EPA, re: Amendment to Scope of Work, 3/21/02. P. 303143-303143.

184. Memorandum to file, from Mr. Robert Sanchez, U.S. EPA, re: Record of telephone conversation with Mr. Scott Huling, U.S. EPA, regarding lactic acid substrate, 3/22/02. P. 303144-303147. A March 20, 2002, internet article regarding lactic acid substrate, is attached.

185. Memorandum to file, from Mr. Robert Sanchez, U.S. EPA, re: Comments on discussion between Mr. Sanchez and Mr. Randy Sturgeon, U.S. EPA, on Roy F. Weston, Inc.’s meeting notes dated March 19, 2002, 3/22/02. P. 303148-303149.

186. Electronic memorandum to Mr. W. David Fennimore, Earth Data, Inc., from Mr. Robert Sanchez, U.S. EPA, re: Treatment of Vadose zone to prevent exposure to the public and site workers, 3/22/02. P. 303150-303150.

187. Memorandum to file, from Mr. Robert Sanchez, U.S. EPA, re: Record of telephone conversation with Mr. Rick Grills, MDE, concerning drilling on site, 3/25/02. P. 303151-303151.

188. Electronic memorandum to Mr. Robert Sanchez, U.S. EPA, from Ms. Debra Rossi, U.S. EPA, re: Notification that MDE clean up level standards for non-residential soil are more stringent then the residential cleanup standards for soil, 3/26/02. P. 303152-303152.

189. Electronic memorandum to Mr. Robert Sanchez, U.S. EPA, from Mr. Christopher Guy, U.S. EPA, re: Concern regarding soil cover and flood plains, 3/26/02. P. 303153-303153.

190. Electronic memorandum to Mr. Robert Sanchez, U.S. EPA, from Mr. Jim Gravette, MDE, re: Reply to electronic memorandum regarding the installation of soil cover on site flood plains, 3/27/02. P. 303154-303154.

191. Memorandum to file, from Mr. Robert Sanchez, U.S. EPA, re: Record of telephone conversation with Mr. Larry Kimmel, U.S. EPA, regarding use of lactic acid substrates, 4/4/02. P. 303155-303156. A March 20, 2002, memorandum to file from Mr. Sanchez, regarding a telephone conversation with Mr. Kimmel regarding use of lactic acid substrates, is attached.

192. Memorandum to Mr. Robert Sanchez, U.S. EPA, from Ms. Jennifer Hubbard, U.S. EPA, re: Review of RI/RA response to comments, 4/15/02. P. 303157-303183.

193. Electronic memorandum to Mr. W. David Fennimore, Earth Data, Inc., from Mr. Robert Sanchez, U.S. EPA, re: Transmittal of attached ERA outline, 04/16/02. P. 303184-303184.

194. Electronic memorandum to Mr. W. David Fennimore, Earth Data, Inc., from Mr. Robert Sanchez, U.S. EPA, re: Transcript of telephone conversation between MDE and Mr. Sanchez, 4/22/02. P. 303185-303186.

195. Letter to Mr. W. David Fennimore, Earth Data Inc., from Mr. Robert Sanchez, U.S. EPA, re: Request for a schedule for completion of a Groundwater Isolation and Collection System Status Report, 4/22/02. P. 303187-303187.

196. Memorandum to file from Mr. Robert Sanchez, U.S. EPA, re: Record of telephone conversation between Mr. Jim Gravette and Mr. Sanchez concerning the review of the FS Alternative #10, 4/22/02. P. 303188-303188. An April 9, 2002, letter to Mr. Robert Sanchez, U.S. EPA, from Mr. W. David Fennimore, Earth Data, Inc., regarding the transmittal of the draft FS Report, and the undated FS Report Addendum, are attached.

197. Memorandum to file from Mr. Robert Sanchez, U.S. EPA, re: Record of telephone conversation between Mr. Tom Kavookjian, Peat Humic Substances (PHS) Company, and Mr. Sanchez concerning the potential use of the PHS product to improve the efficiency of bacteria, 4/22/02. P. 303189-303189.

198. Memorandum to file from Mr. Robert Sanchez, U.S. EPA, re: Record of telephone conversation concerning comments to Alternative #10, 4/22/02. P. 303190-303231. An April 9, 2002, letter to Mr. Robert Sanchez, U.S. EPA from Mr. W. David Fennimore, Earth Data, Inc., and a FS addendum, is attached.

199. Memorandum to Mr. Robert Sanchez, U.S. EPA, from Ms. Jennifer Hubbard, U.S. EPA, re: Risk Assessment summary of fundamental errors, 5/1/02. P. 303232-303232.

200. Letter to Mr. Robert Sanchez, U.S. EPA, from Mr. Aamer Raza, O'Brien and Gere, Laboratories, Inc., re: Schedule for Ecological Risk Assessment based on the conceptional site model, 5/9/02. P. 303233-303237.

201. Memorandum to file, from Mr. Robert Sanchez, U.S. EPA, re: Record of telephone conversation with Mr. Doug Shattuck, Regenisis Corp., regarding use of lactic acid esters in treating volatile organic compounds (VOCs), 5/16/02. P. 303238-303238.

202. Memorandum to file from Mr. Robert Sanchez, U.S. EPA, re: Record of telephone conversation between Mr. Larry Kimmel, U.S. EPA, and Mr. Sanchez concerning performance specifics of lactic acid substrate, 5/20/02. P. 303239-303239.

203. Letter to Mr. Robert Sanchez, U.S. EPA, from Mr. W. David Fennimore, Earth Data, Inc., re: Submission of the April 2002, Progress Report, 05/22/02. P. 303240-303242.

204. Letter to Mr. Robert Sanchez, U.S. EPA, from Mr. James Gravette, MDE, re: Transmittal of April 9, 2002, Addendum to the Draft FS Report, 5/28/02. P. 303243-303246.

205. Facsimile transmittal memorandum to Mr. W. David Fennimore, Earth Data, Inc., from Mr. Robert Sanchez, U.S. EPA, re: MDE's comments on Alternative 10, 5/29/02. P. 303247-303247.

206. Electronic memorandum to Dr. Ann Keeley, U.S. EPA, from Mr. Robert Sanchez, U.S. EPA, re: Electron donors in the Vadose as a treatment remedy for VOCs, 5/30/02. P. 303248-303248.

207. Letter to Mr. Dave Fennimore, Earth Data, Inc., From Mr. Robert Sanchez, U.S. EPA, re: Advice regarding Vadose Zone treatment, 5/30/02. P. 303249-303250.

208. Memorandum to Mr. W. David Fennimore, Earth Data, Inc., from Mr. Robert Sanchez, U.S. EPA, re: Lactic Acid Substrates for in-sutu treatment, 5/30/02. P. 303251-303252.

209. Memorandum to file, from Mr. Robert Sanchez, U.S. EPA, re: Record of telephone conversation with Mr. Jim Gravette, MDE, regarding Draft Proposed Plan, 6/11/02. P. 303253-303254.

210. Memorandum to file, from Mr. Robert Sanchez, U.S. EPA, re: Record of telephone conversation with Dr. Ann Keeley, U.S. EPA, regarding Lactic acid substrate,

6/24/02. P. 303255-303257. A May 30, 2002, electronic memorandum regarding the Vadose zone treatment issue, is attached.

211. Handwritten meeting sign-in sheet, re: Proposed Remedial Action Plan (PRAP) progress discussion, 6/27/02. P. 303258-303258.

212. Electronic memorandum to Mr. Robert Sanchez, U.S. EPA, from Mr. Jim Gravette, MDE, re: Comments on July 3, 2003, site visit to observe well sampling, 7/8/02. P. 303259-303259.

213. Memorandum to Mr. Robert Sanchez, U.S. EPA, from Ms. Jennifer Hubbard, U.S. EPA, re: Summary of chemicals with potentially unacceptable risks, 07/08/02. P. 303260-303267.

214. Memorandum to Mr. W. David Fennimore, Earth Data, Inc., Mr. Dave Pohl, Roy F. Weston, Inc., and Mr. Aamer Raza, O'Brien and Gere, Laboratories, Inc.., re: Principle threat ID (tentative) to cover principle threat areas 07/09/02. P. 303268-303270. A July 9, 2002, handwritten sign-in sheet, is attached.

215. Memorandum to Mr. Robert Sanchez, U.S. EPA, from Ms. Jennifer Hubbard, U.S. EPA, re: Principal-Threat Preliminary Remediation Goals (PRGs), 7/17/02. P. 303271-303276.

216. Memorandum to file, from Mr. Robert Sanchez, U.S. EPA, re: Meeting notes regarding defining principal threats, 7/18/02. P. 303277-303281. A July 19, 2002, meeting summary to Mr. Robert Sanchez, U.S. EPA, from Mr. Kenneth Cowan, Roy F. Weston Inc., regarding Roy F. Weston Inc., comments, is attached.

217. Memorandum to Mr. Robert Sanchez, U.S. EPA, from Ms. Jennifer Hubbard, U.S. EPA, re: Soil Direct-Contact Preliminary Remediation Goals (PRGs), 7/19/02. P. 303282-303285.

218. Letter to Mr. Robert Sanchez, U.S. EPA, from Mr. James Gravette, MDE, re: Response to written request

regarding the effectiveness of the Little Elk Creek Removal Action Containment/Groundwater Collection System, 8/26/02. P. 303286-303288. A September 24, 2002, facsimile transmission memorandum to Mr. W. David Fennimore, Earth Data, Inc., from Mr Robert Sanchez, U.S. EPA, regarding An August 26, 2002, letter from MDE, is attached.

219. Memorandum to file, from Mr. Robert Sanchez, U.S. EPA, re: Technical meeting notes on Modeling GW containment system capacity, 10/21/02. P. 303289-303292. An October 22, 2002, memorandum to file from Mr. Rick Grills, MDE, regarding the OU-1 conference call, is attached.

220. Facsimile transmittal memorandum to Mr. Robert Sanchez, U.S. EPA, and Ms. Bernice Pasquini, U.S. EPA, from Mr. Jim Gravette, MDE, re: Revised RI Figures, 10/28/02. P. 303293-303300. Three handwritten diagrams and notes and an October 28,2002, facsimile transmittal memorandum, are attached.

221. Sign in sheet, 10/31/02. P. 303301-303310. The following are attached:

a) an October 31, 2002, memorandum to Security Desk, from Mr. Robert Sanchez, U.S. EPA, regarding the visitor list for meeting;

b) a November 6, 2002, letter to Mr. W. David Fennimore, Earth Data, Inc., from Mr. Robert Sanchez, U.S. EPA, regarding stop Vadose zone sampling work;

c) a November 8, 2002, memorandum to file, from Mr. Robert Sanchez, U.S. EPA, regarding technical meeting notes regarding Draft RI/FS Comments;

d) a November 4, 2002, memorandum to file, from Mr. Jim Gravette, MDE, regarding OU-1 meeting summary;

e) a November 8, 2002, electronic memorandum to Mr. W. David Fennimore, Earth Data, Inc., from Mr. Robert Sanchez, U.S. EPA, regarding response to reply to stop vadose sampling work.

222. Electronic memorandum to Mr. W. David Fennimore, Earth Data, Inc., from Mr. Robert Sanchez, U.S. EPA, re: Response to reply to stop vadose sampling work, 11/8/02. P. 303311-303312.

223. Letter to Mr. Robert Sanchez, U.S. EPA, from Mr. W. David Fennimore, Earth Data, Inc., re: October 2002, Progress Report, 12/19/02. P. 303313-303316. The report is attached.

224. Report: Progress Report for the Stream Isolation/Groundwater Collection and Treatment System, prepared by O'Brien and Gere, Laboratories, Inc. Engineers, Inc., 1/03. P. 303317-303408. A January 9, 2003, transmittal letter to Mr. Robert Sanchez, U.S. EPA, from Mr. Michael Kozar, O'Brien and Gere, Laboratories, Inc. Engineers, Inc., is attached.

225. Letter to Mr. Robert Sanchez, U.S. EPA, from Mr. W. David Fennimore, Earth Data, Inc., re: November 2002, Progress Report, 01/06/03. P. 303409-303412. The report is attached.

226. Memorandum to Mr. Eric Johnson, U.S. EPA, and Ms. Jennifer Hubbard, U.S. EPA, from Mr. Robert Sanchez, U.S. EPA, re: Little Elk Creek as a Public Water Supply Risk Assessment Request, 01/31/03. P. 303143-303432. The following are attached:

a) a document entitled "Appendix D.9, MD Stream Use Designations;"

b) a September 3, 1998, letter to Mr. Andy Weber, Conti Environmental, Inc., from Mr.

Edward Gertler, MDE, regarding Discharge Criteria;

c) a Code of Maryland Regulations (COMAR)Subsection 26.08.02.02;

d) a July 15, 1998, letter to Ms. Sarah Caspar, U.S. EPA, from Mr. Edward Sullivan, ERM, regarding Creek Surface Water Sample results and Stream Sampling Analytical results.

227. Report: Supplemental Remedial Investigation for Principal Threat Soil, Operable Unit 1 (Soil and Overburden Groundwater), prepared by O'Brien and Gere, Laboratories, Inc., 2/03. P. 303433-303928. A February 19, 2003, transmittal letter to Mr. Robert Sanchez, U.S. EPA, from Mr. W. David Fennimore, Earth Data, Inc., is attached.

228. Letter to Mr. Robert Sanchez, U.S. EPA, from Mr. W. David Fennimore, Earth Data, Inc., re: December 2002, Progress Report, 02/04/03. P. 303929-303930.

229. Memorandum to file, from Mr. Robert Sanchez, U.S. EPA, re: Technical meeting regarding Electronic Data Deliverable (EDD), 02/11/03. P. 303931-303931.

230. Facsimile transmittal memorandum to Mr. Robert Sanchez, U.S. EPA, from Mr. Jim Gravette, MDE, re: Revised RI Figures, 02/14/03. P. 303932-303938. A cross-section location map, and five handwritten diagrams are attached.

231. Memorandum to Mr. Eric Johnson, U.S. EPA, and Ms. Bernice Pasquini, U.S. EPA, from Mr. Robert Sanchez, U.S. EPA, re: Transmission of attachment of replacement figures in RI/FS report, 2/21/03. P. 303939-303940. A March 3, 2003, electronic memorandum to Ms. Bernice Pasquini, U.S. EPA, from Mr. Robert Sanchez, U.S. EPA, regarding the indication

that Mr. Sanchez intends to review MDE prepared cross sections when submitted, is attached.

232. Letter to Mr. Jim Gravette, MDE, from Mr. W. David Fennimore, Earth Data, Inc., re: Response to comments concerning FS Report, 2/24/03. P. 303941-303944.

233. Memorandum to file from Mr. Robert Sanchez, U.S. EPA, re: Record of conservation between Mr. John Warrington, Citizen, and Mr. Sanchez concerning historical information that Mr. Warrington provided regarding Spectron, 2/26/03. P. 303945-303945.

234. Memorandum to Mr. W. David Fennimore, Earth Data, Inc., from Mr. Robert Sanchez, U.S. EPA, re: Former above ground storage tanks demolition, 02/27/03. P. 303946-303946.

235. Electronic memorandum to Mr. Jim Gravette, MDE, from Mr. Robert Sanchez, U.S. EPA, re: Comments on December, 2002, monthly report, 3/03/03. P. 303947-303947.

236. Letter to Mr. Robert Sanchez, U.S. EPA, from Mr. W. David Fennimore, Earth Data, Inc., re: A January 2003, Progress Report, 03/04/03. P. 303948-303950.

237. Electronic memorandum to Ms. Jennifer Hubbard, U.S. EPA, from Mr. Robert Sanchez, U.S. EPA re: Transmittal of attached data that had prior format errors due to transfer into an Electronic Data Deliverable (EDD), 3/12/03. P. 303951-303960. The undated data is attached.

238. Letter to Mr. W. David Fennimore, Earth Data, Inc.,from Mr. Robert Sanchez, U.S. EPA, re: Feasibility Study approval for site soils and overburdened groundwater, 03/17/03. P. 303961-303961.

239. Memorandum to file, from Mr. Robert Sanchez, U.S. EPA, re: Indication that the office area is within the boundaries of the site, 03/22/03. P. 303962-303962.

240. Letter to Ms. Elizabeth Cole, Division of Historical and Cultural Programs, from Mr. Robert Sanchez, U.S. EPA, re: Transmittal of NHPA Site Evaluation Report, 3/24/03. P. 303963-303977. A March 17, 2003, letter to Mr. Robert Sanchez, U.S. EPA, from Mr. W. David Fennimore, Earth Data, Inc., regarding enclosed information to assist in the determination of whether or not the former powerhouse building meets the criteria of an historical property, a December, 2002, location map and undated photographs, are attached.

241. Memorandum to file from Mr. Robert Sanchez, U.S. EPA, re: Record of telephone conversation between Mr. Larry Kimmel, U.S. EPA, and Mr. Sanchez concerning Mr. Kimmel's first-hand experience with the use of lactic acid substrates, 3/27/03. P. 303978-303978.

242. Memorandum to file from Mr. Robert Sanchez, U.S. EPA, re: Record of telephone conversation between Mr. John Vetter, U.S. EPA, and Mr. Sanchez concerning advice on the National Historic Preservation Act (NHPA), 3/31/03. P. 303979-303981. A March 14, 2003, memorandum to Mr. John Vetter, U.S. EPA, from Mr. Robert Sanchez, U.S. EPA, regarding confirmation from Mr. Vetter that Mr. Sanchez is correctly preparing the NHPA evaluation report, is attached.

243. Electronic Memorandum to Mr. W. David Fennimore, Earth Data, Inc., from Mr. Robert Sanchez, U.S. EPA, re: Request for confirmation of current O & M costs for the Spectron Site, 4/2/03. P. 303982-303982.

244. Memorandum to file from Mr. Robert Sanchez, U.S. EPA, re: Transmittal of the cost estimate worksheet for each of the Spectron Proposed Remedial Action Plan (PRAP), 4/4/03. P. 303983-304015. The following are attached:

    a) a March 18, 2003, cost estimate worksheet;

    b) an undated Chemical Engineers Handbook;

    c) a June 2001, FS Report;

d) an April 9, 2002, addendum to the Draft FS Report;

e) a November 15, 2000, cost estimate.

245. Letter to Ms. Jennifer Hubbard, U.S. EPA, from Mr. Robert Sanchez, U.S. EPA, re: Transmittal of attached email that contains the data required for the baseline risk assessment (BLRA), 4/10/03. P. 304016-304028. A February 21, 2003, electronic memorandum to Mr. W. David Fennimore, Earth Data, Inc., from Mr. Robert Sanchez, U.S. EPA, regarding the transmittal of attached spreadsheet concerning Spectron Screen data and the undated data, are attached.

246. Letter to Ms. Elizabeth Cole, Division of Historical and Cultural Programs, from Mr. Robert Sanchez, U.S. EPA, re: Transmittal of submission of maps for the Spectron Site evaluation, 4/10/03. P. 304029-304030. An undated map is attached.

247. Memorandum to file from Mr. Robert Sanchez, re: Transmittal of attached evaluation to determine a Remedial Action Objective (RAO) for removal principal threat waste, 4/24/03. P. 304031-304035. The undated evaluation is attached.

248. Letter to Mr. W. David Fennimore, Earth Data, Inc., from Mr. Robert Sanchez, U.S. EPA re: EPA approval of RA with the incorporation of EPA memorandums, 4/30/03. P. 304036-304493. The following are attached:

a) an April 15, 2002, memorandum to Mr. Sanchez from Ms. Jennifer Hubbard, U.S. EPA, regarding the response to comments on the draft Spectron RI/RA;

b) an April 30, 2002, memorandum to Mr. Sanchez from Ms. Jennifer Hubbard, U.S. EPA, regarding the review of the RA;

c) a May 1, 2002, memorandum to Mr. Sanchez from Ms. Jennifer Hubbard, U.S. EPA, regarding the summary of the RA;

d) a July 8, 2002, memorandum to Mr. Sanchez from Ms. Jennifer Hubbard, U.S. EPA, regarding the PRGs for Spectron;

e) a July 17, 2002, memorandum to Mr. Sanchez from Ms. Jennifer Hubbard, U.S. EPA, regarding the soil direct-contact PRGs for Spectron;

f) an April 2002, memorandum to Mr. Sanchez from Ms. Jennifer Hubbard, U.S. EPA, regarding the Spectron Focused Baseline RA;

g) a January 2002, RA Report.

249. Electronic Memorandum to Mr. Jim Gravette, MDE, and Mr. Rick Grills, MDE, from Mr. Robert Sanchez, U.S. EPA, re: Historical information concerning designated stream usage, 6/17/03. P. 304494-304494.

250. Proposed Plan, Galaxy/Spectron Superfund Site, Operable Unit 1, 6/20/03. P. 304495-304566.

251. Report: Supplemental Remedial Investigation for Principal Threat Soil, Operable Unit 1 (Soil and Overburden Ground Water), prepared by O'Brien & Gere Engineers, Inc., 2/03. P. 304567-304681. A February 14, 2003, transmittal letter, is attached.

252. Letter to Mr. Robert Sanchez, U.S. EPA, from Mr. James Gravette, (MDE), re: Transmittal of Proposed Plan for Operable Unit 1, Contaminated Site Soils and Overburden Groundwater, 6/19/03. P. 304682-304682.

253. Memorandum to File, from Mr. Robert Sanchez, U.S. EPA, re: Meeting notes from June 25, 2003, meeting with PRP

group, 7/11/03. P. 304683-304701. The following are attached:

a) a June 25, 2003, meeting attendance list;

b) a June 25, 2003, Supplemental Remedial Investigation Summary of Risks;

c) a February 2003, packet of Supplemental Remedial Investigation Data;

d) a June 24, 2003, packet of VOC Analytical Results;

e) an undated summary statistics table for chemicals of potential concern.

254. Memorandum to Mr. Robert Sanchez, U.S. EPA, from Ms. Jennifer Hubbard, U.S. EPA, re: Evaluation of swimming risks from Spectron stream data, 7/31/03. P. 304702-304704.

255. Letter to Mr. David Fennimore, Earth Data, Inc., from Mr. Robert Sanchez, U.S. EPA, re: Discovery of chemical stabilizer and request for sampling of Ground Water Treatment System influent and effluent, 7/31/03. P. 304705-304706. A February 19, 2003, memorandum from Ms. Jennifer Hubbard, U.S. EPA, to Mr. Robert Sanchez, U.S. EPA, regarding consideration of 1,4-Dioxane, is attached.

256. Letter to Mr. David Fennimore, Earth Data, Inc., from Mr. Robert Sanchez, U.S. EPA, re: Removal of Swimming Advisory on Little Elk Creek, 7/31/03. P. 304707-304710. A July 31, 2003, memorandum to Mr. Robert Sanchez, U.S. EPA, from Ms. Jennifer Hubbard, U.S. EPA, regarding comments on swimming risks at Little Elk Creek, is attached.

257. Memorandum to Mr. Robert Sanchez, U.S. EPA, from Mr. Scott Huling, U.S. EPA, re: Technical review comments on the Proposed Plan, 9/30/03. P. 304711-304720. Technical review comments and recommendations are attached.

258. Document entitled, "EPA Region III RBC Table," 10/15/03. P. 304721-304728.

259. Memorandum to File, from Mr. Robert Sanchez, U.S. EPA, re: Comments on phone conversation record with Scott Huling, U.S. EPA, regarding PRAP, 2/24/04. P. 304729-304731.

260. Report: Volatization from a Stream with Resulting Annual Average Air Concentrations, Galaxy/Spectron Superfund Site, U.S. EPA, (undated). P. 304732-304741. A July 17, 2000, transmittal memorandum to Mr. Randy Sturgeon, U.S. EPA, from Ms. Patricia Flores-Brown, U.S. EPA, is attached.

261. Letter to Mr. Robert Sanchez, U.S. EPA, from Mr. Kim LeMaster, Maryland Department of the Environment (MDE), re: State Concurrence of Record of Decision for Operable Unit 1, 9/1/04. P. 304742-304742.

262. Record of Decision (ROD), Spectron Inc. Site, Operable Unit 1 (OU1) Contaminated Shallow Soils, 9/16/04. P. 304743-304871.

263. Letter to Mr. John Epps, U.S. EPA, from Mr. W. David Fennimore, Earth Data, Inc., re: Comments on RCRA modified cap, 6/14/11. P. 304872-304875.

264. Report: Pre-Design Investigation/Focused Feasibility Study Report for DNAPL in Groundwater, Operable Unit 1, Spectron Superfund Site, Elkton, Maryland, prepared by O'Brien & Gere Engineers, Inc., 9/11. P. 304876-305108.

265. Report: Pre-Design Investigation/Focused Feasibility ** Study Report for DNAPL in Groundwater, Appendices A, C-D, F-O, Operable Unit 1, Spectron Superfund Site, Elkton, Maryland, prepared by O'Brien & Gere Engineers, Inc., 9/11. P. 305109-307656.

266. Letter to Mr. John Epps, U.S. EPA, from Ms. Irena Rybak, MDE, re: Comments on Draft Proposed Plan for the Record of Decision (ROD)Amendment, 10/4/11. P. 307657-307658.

267. Proposed Plan for Record of Decision Amendment, Spectron, Inc. Superfund Site, Operable Unit 1, Elkton, Maryland, 10/11. P. 307659-307716.

268. Letter to Mr. John Epps, U.S. EPA, from Mr. W. David Fennimore, Earth Data Northeast, Inc., re: Comments on the Proposed Plan for Record of Decision Amendment, Operable Unit # 1, 12/19/11. P. 307717-307720.

269. Letter to Mr. John Epps, U.S. EPA, from Mr. James Carroll, MDE, re: State concurrence on the Record of Decision Amendment for Operable Unit 1 (OU 1), 2/10/12. P. 307721-307722.

** The raw analytical data of Appendices B & E were tabulated and included elsewhere in the report. These appendices were not relied on for this Administrative Record File.

V. COMMUNITY INVOLVEMENT

1. Memorandum to Providence Valley Community Advisory Group Members, from Mr. Chris Barclay, Cecil County Health Department, re: Invitation to attend a meeting of the Community Advisory Group on Tuesday, March 12, 1996, 7/6/96. P. 500001-500003. The meeting agenda is attached.

2. Newsletter from Cecil County Health Department, entitled "Newsletter, Galaxy/Spectron Superfund Site," 11/96. P. 500004-500009.

3. Newsletter from Cecil County Health Department, entitled "Newsletter No. 3, Galaxy/Spectron Superfund Site," 12/96. P. 500010-500015.

4. Newsletter from Cecil County Health Department, entitled "Newsletter No. 4, Galaxy/Spectron Superfund Site," 2/97. P. 500016-500021.

5. Newsletter from Cecil County Health Department, entitled "Newsletter No. 6, Galaxy/Spectron Superfund Site," 7/97. P. 500022-500027.

6. Newsletter from Cecil County Health Department, entitled "Newsletter No. 10, Galaxy/Spectron Superfund Site," 6/98. P. 500028-500031.

7. Electronic memorandum to Mr. Robert Sanchez, U.S. EPA, from Mr. Walter Leis, Tetrahedron Consultants, Inc., re: Comments on July 26, 2003, public meeting and request to consider alternative clean-up methods, 6/27/03. P. 500032-500033.

8. Public Meeting Minutes, Galaxy/Spectron Superfund Site, Proposed Plan, 6/26/03. P. 500034-500104.

9. U.S. EPA Fact Sheet: Spectron Inc. Superfund Site, Town of Elkton, Cecil County, Maryland, entitled, "EPA Announces Proposed Plan," 11/11. P. 500105-500106.

10. Transcript of Public Meeting Minutes, Public Meeting for Proposed Remedial Action Plan, Operable Unit 1, Soil and Overburden Groundwater, Spectron, Inc. Superfund Site, 11/8/11. P. 500107-500163.

11. Letter to Mr. John Epps, U.S. EPA, from Mr. W. David Fennimore, Earth Data Northeast, Inc., re: Request for a thirty-day extension to the public comment period, 11/11/11. P. 500164-500164.

12. U.S. EPA Public Notice, Spectron, Inc. Superfund Site, re: Proposed Plan for Record of Decision, undated. P. 500165-500165.

13. U.S. EPA Public Notice, Spectron, Inc. Superfund Site, re: Proposed Plan Public Comment Period Extended Until December 19, undated. P. 500166-500166.

GUIDANCE DOCUMENTS

1. Office of Solid Waste and Emergency Response (OSWER) Directive 9283.1-2, re: Guidance on Remedial Actions for Contaminated Ground Water at Superfund Sites, 12/88.

2. Office of Solid Waste and Emergency Response (OSWER) Directive 9283.1-12, re: Presumptive response strategy and ex-situ treatment technologies for contaminated ground water at CERCLA sites, 10/96.

3. Report: National Recommended Water Quality Criteria: 2002, prepared by Office of Water, Office of Science and Technology, 11/02.

4. Office of Emergency and Remedial Response Superfund Publication: 9380.3-06FS, re: A Guide to Principal Threat and Low Level Threat Wastes, 11/91.

Appendix B

Alternative DNAPL 5 - In Situ Thermal Treatment

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
CAPITAL COSTS:				
Pre-Design Costs				
Treatability Testing (incl. sample collection)	1	l.s.	$ 15,200	$ 15,200
Full Scale Thermal Treatment Implementation				
Installation				
Mobilization	1	l.s.	$ 170,000	$ 170,000
Power Drop & Transformer/Setup	1	l.s.	$ 102,000	$ 102,000
Well / Probe Materials	1	l.s.	$ 786,000	$ 786,000
Electrodes / Tubing / Cables	1	l.s.	$ 770,000	$ 770,000
Drilling	1	l.s.	$ 537,000	$ 537,000
Downhole Pumps	1	l.s.	$ 577,000	$ 577,000
Thermal Cover Installed	0	l.s.	$ 434,000	$ -
Electrical Construction	1	l.s.	$ 247,000	$ 247,000
Mechanical Construction	1	l.s.	$ 112,000	$ 112,000
Vapor Effluent treament system construction	1	l.s.	$ 241,000	$ 241,000
Commissioning /Startup	1	l.s.	$ 126,000	$ 126,000
Maintenance Hardware	1	l.s.	$ 302,000	$ 302,000
Operation				
Power System Rental	1	l.s.	$ 152,000	$ 152,000
Vapor Effluent treament system rental	1	l.s.	$ 211,000	$ 211,000
Labor/Per Diem/ Rentals / Fees	6	mon.	$ 60,000	$ 360,000
Monitoring, sampling, analysis	1	l.s.	$ 25,000	$ 25,000
Liquid Phase GAC	1	l.s.	$ 56,000	$ 56,000
Waste Disposal	1	l.s.	$ 10,000	$ 10,000
Power	1	l.s.	$ 731,000	$ 731,000
Gas	1	l.s.	$ 76,000	$ 76,000
Caustic	1	l.s.	$ 15,000	$ 15,000
Demobilization				
Equipment	1	l.s.	$ 120,000	$ 120,000
Reporting	1	l.s.	$ 75,000	$ 75,000
SUBTOTAL				$ 5,801,000
SUBTOTAL				$ 5,816,200
Project Management / Misc. Correspondence (1%)				$ 58,162
Remedial Design (5%)				$ 290,810
Construction Management (1%)				$ 58,010
SUBTOTAL				$ 6,223,182
Contingency	10%			$ 622,318
TOTAL CAPITAL COST				**$ 6,845,500**

Alternative DNAPL 5 - In Situ Thermal Treatment

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL
ANNUAL O&M COSTS:				
Performance Monitoring				
Groundwater Sampling & Analysis	1	year	$ 48,000	$ 48,000
Performance Assessment Report	1	each	$ 25,000	$ 25,000
SUBTOTAL				$ 73,000
SUBTOTAL				$ 73,000
Project Management / Misc. Correspondence (5%)				$ 3,650
Technical/Engineering Support (5%)				$ 3,650
SUBTOTAL				$ 80,300
Contingency	15%			$ 12,045
TOTAL ANNUAL O&M COST				**$ 92,345**
PERIODIC COSTS:				
				$ -
				$ -
				$ -
SUBTOTAL				$ -
Project Management (5%)				$ -
SUBTOTAL				$ -
Contingency	15%			$ -
TOTAL PERIODIC COST				**$ -**
SUMMARY:				
Total Capital Cost				$ 6,845,500
Total Annual O&M Cost				$ 92,345
Total Periodic Cost				$ -
TOTAL				**$ 6,937,845**
PRESENT VALUE ANALYSIS:				
Capital Cost				$ 6,845,500
Present Worth of O&M and Periodic Costs				$ 69,524
Estimated Net Present Value (I = 5%)				**$ 6,915,024**

NOTES:

Alternative DNAPL 5 - In Situ Thermal Treatment

Year	Capital Cost	Annual O&M Cost	Periodic Costs	Periodic Costs (with Project Management and Contingency)	P/F @5% (1+i)^-n	Total Present Worth Dollars @ 5%
1	$6,845,500	$0	$0	$0	1.0000	$6,845,500
2	$ -	$73,000	$0	$0	0.9524	$69,524
3	$ -	$0	$0	$0	0.9070	$0
4	$ -	$0	$0	$0	0.8638	$0
5	$ -	$0	$0	$0	0.8227	$0
6	$ -	$0	$0	$0	0.7835	$0
7	$ -	$0	$0	$0	0.7462	$0
8	$ -	$0	$0	$0	0.7107	$0
9	$ -	$0	$0	$0	0.6768	$0
10	$ -	$0	$0	$0	0.6446	$0
11	$ -	$0	$0	$0	0.6139	$0
12	$ -	$0	$0	$0	0.5847	$0
13	$ -	$0	$0	$0	0.5568	$0
14	$ -	$0	$0	$0	0.5303	$0
15	$ -	$0	$0	$0	0.5051	$0
16	$ -	$0	$0	$0	0.4810	$0
17	$ -	$0	$0	$0	0.4581	$0
18	$ -	$0	$0	$0	0.4363	$0
19	$ -	$0	$0	$0	0.4155	$0
20	$ -	$0	$0	$0	0.3957	$0
21	$ -	$0	$0	$0	0.3769	$0
22	$ -	$0	$0	$0	0.3589	$0
23	$ -	$0	$0	$0	0.3418	$0
24	$ -	$0	$0	$0	0.3256	$0
25	$ -	$0	$0	$0	0.3101	$0
26	$ -	$0	$0	$0	0.2953	$0
27	$ -	$0	$0	$0	0.2812	$0
28	$ -	$0	$0	$0	0.2678	$0
29	$ -	$0	$0	$0	0.2551	$0
30	$ -	$0	$0	$0	0.2429	$0
31	$ -	$0	$0	$0	0.2314	$0
32	$ -	$0	$0	$0	0.2204	$0
33	$ -	$0	$0	$0	0.2099	$0
34	$ -	$0	$0	$0	0.1999	$0
35	$ -	$0	$0	$0	0.1904	$0
36	$ -	$0	$0	$0	0.1813	$0
37	$ -	$0	$0	$0	0.1727	$0
38	$ -	$0	$0	$0	0.1644	$0
39	$ -	$0	$0	$0	0.1566	$0
40	$ -	$0	$0	$0	0.1491	$0
41	$ -	$0	$0	$0	0.1420	$0
42	$ -	$0	$0	$0	0.1353	$0
43	$ -	$0	$0	$0	0.1288	$0

Alternative DNAPL 5 - In Situ Thermal Treatment

Year	Capital Cost	Annual O&M Cost	Periodic Costs	Periodic Costs (with Project Management and Contingency)	P/F @5% (1+i)^-n	Total Present Worth Dollars @ 5%
44	$ -	$0	$0	$0	0.1227	$0
45	$ -	$0	$0	$0	0.1169	$0
46	$ -	$0	$0	$0	0.1113	$0
47	$ -	$0	$0	$0	0.1060	$0
48	$ -	$0	$0	$0	0.1009	$0
49	$ -	$0	$0	$0	0.0961	$0
50	$ -	$0	$0	$0	0.0916	$0
51	$ -	$0	$0	$0	0.0872	$0
52	$ -	$0	$0	$0	0.0831	$0
53	$ -	$0	$0	$0	0.0791	$0
54	$ -	$0	$0	$0	0.0753	$0
55	$ -	$0	$0	$0	0.0717	$0
56	$ -	$0	$0	$0	0.0683	$0
57	$ -	$0	$0	$0	0.0651	$0
58	$ -	$0	$0	$0	0.0620	$0
59	$ -	$0	$0	$0	0.0590	$0
60	$ -	$0	$0	$0	0.0562	$0
Total	$ 6,845,500	$ 73,000	$ -	$ -		**$ 6,915,024**

Present Worth Discounting Factor	5.0%

Note: Capital Costs are not discounted; therefore, they are shown in Year 1

Appendix C

MDE
MARYLAND DEPARTMENT OF THE ENVIRONMENT
1800 Washington Boulevard • Baltimore MD 21230
410-537-3000 • 1-800-633-6101 • www.mde.state.md.us

Martin O'Malley
Governor

Anthony G. Brown
Lieutenant Governor

Robert M. Summers, Ph.D.
Secretary

October 4, 2011

Mr. John Epps, Remedial Project Manager
U.S. Environmental Protection Agency
Region III
Hazardous Site Cleanup Division
Western PA/MD Branch (3HS22)
1650 Arch Street
Philadelphia, PA 19103-2029

Re: Draft Proposed Plan for Record of Decision (ROD) Amendment,
Spectron, Inc. Superfund Site, Operable Unit 1 (OU-1), Elkton, Maryland, September 28, 2011

Dear Mr. Epps:

The Maryland Department of the Environment, Land Restoration Program (MDE/LRP) has reviewed the above referenced document. MDE/LRP concurs with Applicable or Relevant and Appropriate Requirements (ARARs) modification for new remedy selected in the ROD Amendment, in particular with elimination of the sanitary landfill closure requirements cited in the Code of Maryland Regulations (COMAR) 26.04.07.04 C(5), 26.04.07.10, 26.04.07.19 E(5), 26.04.07.21 B, D, E, and 26.04.07.22 A, B, C.

The 2004 OU-1 ROD evaluated the Resource Conservation and Recovery Act (RCRA) and COMAR landfill capping requirements as ARARs. RCRA requirements for hazardous waste landfills and COMAR capping requirements for sanitary landfills were determined to be relevant and appropriate. Because the ROD modification changes the remedy from impermeable cap to a low-permeability asphalt cap, the landfill capping requirements for hazardous waste landfills are still applicable but the COMAR sanitary landfill capping requirements, including use of an impermeable geosynthetic membrane, are no longer relevant and appropriate.

The low-permeability cap will be installed over the entire Plant Area, which was originally to be capped under the requirements of the 2004 ROD, after the principal threat waste is removed from the area via in-situ thermal treatment. The discharge from the site is captured by the existing Stream Isolation and Groundwater Treatment System (SI/GWTS), which has been demonstrated to be effective in reducing contaminant source material. The low-permeability cap will be installed to allow the dissolution of the residual contaminant mass and discharge and treatment of dissolved phase by the SI/GWTS, while eliminating the potential direct contact with contaminated soil and groundwater and minimizing the infiltration of precipitation that could potentially impact the SI/GWTS.

If you should have any questions, please contact me at (410) 537-3493.

Sincerely,

Irena Rybak
Project Manager, LRP

cc: Mr. Horacio Tablada
Mr. James R. Carroll
Mr. Kim Lemaster

MDE
MARYLAND DEPARTMENT OF THE ENVIRONMENT
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Martin O'Malley
Governor

Anthony G. Brown
Lieutenant Governor

Robert M. Summers, Ph.D.
Secretary

February 10, 2012

Mr. John Epps, Remedial Project Manager
U.S. Environmental Protection Agency
Region III
Hazardous Site Cleanup Division
Western PA/MD Branch (3HS22)
1650 Arch Street
Philadelphia, PA 19103-2029

Re: Record of Decision Amendment, Operable Unit 1, Soil and Overburden Groundwater
Spectron, Inc. Superfund Site, Elkton, Cecil County, Maryland, February, 2012.

Dear Mr. Epps:

The Maryland Department of the Environment (Department) has completed its review of the Record of Decision (ROD) Amendment for Operable Unit 1 (OU1) at the Spectron National Priorities List (NPL or Superfund) Site in Elkton, Cecil County, Maryland. This letter transmits the Department's concurrence with the amended remedy for the site.

The original ROD for OU1, dated September 2004, specified the continued operation of the stream isolation and groundwater treatment system (SI/GWTS), demolition to grade of the plant area structures (exclusive of the groundwater treatment facility), installation of an impermeable cap, in-situ reductive dechlorination to treat principal threat waste in the overburden, monitoring, and restrictions on land and groundwater use.

This ROD Amendment retains all the components of the 2004 ROD except for the in-situ reductive dechlorination in the overburden and impermeable cap. Since the 2004 ROD, the Responsible Parties have conducted treatability studies to determine the efficacy of applying the in-situ dechlorination technology at the site. The U.S. Environmental Protection Agency (EPA) and the Department oversaw and evaluated these studies. The agencies collectively determined that in-situ dechlorination was not a viable remedial technology.

Accordingly, alternative technologies to treat the overburden were evaluated, and in-situ thermal treatment of principal threat waste was selected. This ROD Amendment documents the decision by EPA to replace in-situ dechlorination with in-situ thermal treatment and the impermeable cap with low permeability, asphalt (or equivalent) cap. On October 14, 2011, the EPA presented this proposed remedy to the public with a Proposed Plan and the public meeting was held on November 8, 2011. The responsiveness summary from this effort is included in this ROD Amendment.

If you have any questions, please contact me or Irena Rybak, Project Manager, at (410) 537-3493.

Sincerely,

James R. Carroll, Program Manager
Land Restoration Program

JC:ir

cc: Mr. Horacio Tablada
Mr. Kim Lemaster
Ms. Irena Rybak