UNITED STATES

ENVIRONMENTAL PROTECTION AGENCY

REGION III

STATEMENT OF BASIS

Lehigh Valley Industrial Park, Inc.
Groundwater at Bethlehem Commerce Center
Bethlehem, Pennsylvania 18252

Formerly:
Bethlehem Steel Corporation
Bethlehem Structural Products

EPA ID NO. PAD 990824161

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I. INTRODUCTION

A. Facility Name/Ownership

The United States Environmental Protection Agency (EPA) has prepared this Statement of Basis (SB) for the groundwater at the approximately 1550-acre Bethlehem Commerce Center (hereinafter referred to as BCC or the Site) of the former Bethlehem Steel plant. This former steel plant (BSC Facility) was owned and operated by the Bethlehem Steel Corporation - Bethlehem Structural Products (BSC) and is located in the City of Bethlehem and Lower Saucon Township, Northampton County, Pennsylvania (see Fig. 1).

The BSC Facility is subject to the Corrective Action program under the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act (RCRA) of 1976, and the Hazardous and Solid Waste Amendments (HSWA) of 1984, 42 U.S.C. Sections 6901 to 6992k. The Corrective Action program is designed to ensure that certain facilities subject to RCRA have investigated and cleaned up any releases of hazardous waste and hazardous constituents that have occurred at their property.

Information on the Corrective Action program as well as a fact sheet for the BSC Facility can be found by navigating http://www.epa.gov/reg3wcmd/correctiveaction.htm.

EPA has prepared this SB in cooperation with the Pennsylvania Department of Environmental Protection (PADEP). EPA has reviewed all available Site groundwater data and has determined that long term monitoring, establishment of Technical Impracticability (TI) Zones and development of Institutional Controls (ICs) are necessary to satisfy the federal RCRA Corrective Action obligations for groundwater at the Site. Based on this review, EPA is proposing a remedy for Site groundwater and is proceeding with its remedy selection process, including providing opportunity for public comment and review.

B. Proposed Decision

This SB explains EPA's proposed decision to select "Natural Attenuation" as the final remedy for the groundwater at the Site. Long term monitoring will ensure the stability of the plumes and the natural attenuation processes already occurring. Part of any final remedy will be the establishment of two (2) TI Zones which will formalize EPA's determination that, within these areas, it is technically impracticable to clean up groundwater to drinking water standards due to the nature of the Site geology and plume dynamics. In addition, development of and compliance with ICs will prohibit use of groundwater as a drinking water supply. EPA believes these combined measures will protect human health and the environment.

The proposed final remedy is detailed in Section VIII.

C. Importance of Public Input

The public may participate in the remedy selection process by reviewing this SB and documents contained in the Administrative Record (AR). The AR contains the complete set of

reports that document the Site groundwater conditions, including a map of the Site, in support of EPA's proposed decision. EPA encourages anyone interested to review the AR. The AR is available for public review at the EPA Region III office, the address of which is provided in Section XI, below.

EPA will address all significant comments received during the public comment period. If EPA determines that new information or public comments warrant a modification to the proposed decision, EPA will modify the proposed decision or select other alternatives based on such new information and/or public comments. EPA will approve its final decision in a document entitled the Final Decision and Response to Comments (FDRTC).

EPA will also brief local officials and seek their comment in an effort to develop meaningful community input.

II. FACILITY BACKGROUND

A. BSC Facility Ownership

From approximately 1899 to 1995, BSC and its corporate predecessors manufactured steel at the approximately 1800-acre BSC Facility. In 1995, BSC discontinued steel manufacturing operations at the BSC Facility and in 2001, filed for bankruptcy under Chapter 7 of the United States Bankruptcy Code. In May 2003, with approval of the U.S. Bankruptcy Court for the Southern District of New York, International Steel Group Acquisition, Inc. (ISG) acquired substantially all of BSC's assets. Title to the BSC Facility was taken by Tecumseh Redevelopment, LLC (Tecumseh), a subsidiary of ISG. A 125-acre westernmost tract, the BW Tract, was sold to Sands Retail, LLC. In addition, Tecumseh sold approximately 1000 acres of the BSC Facility to Lehigh Valley Industrial Park (LVIP). That 1000-acre area is part of the parcel known as Bethlehem Commerce Center. In 2005, ISG merged with Mittal Steel USA, Incorporated (Mittal). Mittal sold 441 acres to Majestic Realty Company in 2007. Tecumseh, now a subsidiary of Mittal, retains the remaining acreage of the BSC Facility.

B. Site Ownership

The Site has been subdivided and is currently owned by several entities; LVIP, Majestic Realty Company, and Tecumseh. LVIP has responsibility for compliance with post-remedial care requirements for the groundwater across the Site, regardless of land ownership. The final remedy for groundwater will be implemented and maintained by LVIP.

III. SUMMARY OF ENVIRONMENTAL INVESTIGATIONS

Bethlehem Steel operated as a fully integrated manufacturing plant at the BSC Facility from the early 1900s until its bankruptcy in 2001. Two areas of the Site, the SI-1 and the Coke Works Areas, have been identified as the primary sources of Site-related groundwater contamination.

In general, the groundwater investigations conducted at the Site between 1988 and 2009 centered on assessing groundwater and surface water quality both on-Site and off-Site and

creating a conceptual model that identifies groundwater flow within the boundary of the Site and also in areas where sensitive receptors exist, e.g., surface water bodies, potable wells. The objective of the investigation was to develop a thorough understanding of the extent and magnitude of the contamination and evaluate potential routes of exposure associated with the Site and adjoining properties. These investigations are discussed extensively in the *Remedial Investigation Report/Final Report for Groundwater with Technical Impracticability Evaluation, November 2009* (RIR/FR/TI 2009).

Groundwater analytical results were compared to Pennsylvania's Statewide Health Standards Medium Specific Concentrations for non-residential used aquifers (MSCs) and Maximum Contaminant Levels (MCLs), promulgated at 40 C.F.R. Part 141 pursuant to Section 1412 of the Safe Drinking Water Act, 42 U.S.C. Section 300g-1, also known as drinking water standards. Table 1 summarizes the MSCs and MCLs for the Contaminants of Potential Concern (COPC) for the Site. As seen in Table 1, except for lead, the MSCs for the COPCs have the same value as their respective MCLs. The MSC for lead is more stringent than the MCL for lead.

PADEP Water Quality Criteria for Toxic Substances; Criteria Continuous Concentrations for Fish and Aquatic Life and Human Health Criteria were used to evaluate surface water and seep data.

Results of environmental investigations revealed that the historic steel manufacturing operations at the Site have caused groundwater across the Site to become contaminated with solvents, such as trichloroethylene (TCE), polyaromatic hydrocarbons (PAHs) such as benzene and naphthalene, and metals. In an effort to evaluate groundwater quality within a practical framework, EPA used benzene and naphthalene as "indicator contaminants" representing volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs), respectively. In all, six (6) metals, eight (8) VOCs and 21 SVOCs have been detected at concentrations exceeding their respective MSCs at least once on-Site. Table 1 lists the 35 compounds found exceeding their respective MSCs. These 35 compounds collectively will be known as Contaminants of Potential Concern (COPC) throughout this document.

A. Sources

The primary source areas of releases to groundwater have been identified as the Coal Chemical Area and the SI-1 Area (see Fig. 2), which show evidence of a number of organic and inorganic contaminants above their respective MSCs and MCLs. The highest levels of contamination on-Site are exhibited in shallow and deep wells immediately down-gradient of the former Coke Works Area, which encompasses Coal Chemical as well as nearby several waste disposal units.

Benzene and naphthalene are the most widespread Site-related contaminants and are found within the fractured bedrock at concentrations greater than 1% of their solubility limit. The presence of organic compounds at levels exceeding 1% of their respective solubility limits commonly is used to delineate the potential presence of a non-aqueous phase liquid (NAPL). Significant fractures at depth appear to have allowed movement of Site COPCs within the deeper

aquifer both as dissolved phase and as NAPL. Monitoring over time shows that the groundwater plumes are generally stable, and mostly contained within the Site. COPCs have migrated off-Site only along the western boundary of the Site in the area of MW-62 in the fractured bedrock at a depth of 150 to 300 feet below the ground surface. Due to the subsurface geology and geometry of the Site, migration of COPCs farther west of the Site is unlikely as groundwater contamination moves northerly, back onto the Site.

B. Plume Stability

In an effort to evaluate the stability of groundwater conditions throughout the Site, trends and linear regression analyses were performed on individual monitoring well data sets. Since benzene and naphthalene have been shown to represent the extent of groundwater contamination Site-wide, the analyses were performed for these compounds. Groundwater quality across the Site has been shown to be stable or improving slightly. In the NAPL areas at the Coke Works and SI-1, the trends show overall stable plumes, with no migration except in one area where the recently installed monitoring wells were shown to be the probable cause of a new, vertical preferential flow pathway on the westernmost edge of the Site, near well nests MW-62 and MW 67. Monitoring will continue at these wells to confirm plume stability.

Decreasing and stable trends are expected, as the contamination is the result of historical operations and disposal activities that took place many years ago and have had a considerable amount of time to reach equilibrium. However, the presence of significant NAPL in the fractured rock aquifer acts as a long-term subsurface source for the dissolved-phase plume.

C. Exposure

Although, high levels of Site-related groundwater contamination are present, they do not pose a significant risk to human health and the environment as all routes of exposure have been eliminated. There are no groundwater wells located down-gradient of the Site, other than the groundwater monitoring wells installed by LVIP and others to aide in characterization of the Site. The City of Bethlehem Water and Sewer Department and confirmed that all residences and businesses located down-gradient of the Site are supplied by public water. Groundwater ingestion and dermal routes of exposure to potential on-Site non-residential and off-Site residential and non-residential receptors are incomplete based on municipal ordinances requiring hookup to the public water supply in the area of the Site and through the use of Site-wide institutional controls which prohibit the use of groundwater on-Site. Therefore, contaminated groundwater does not impact, or threaten to impact, any current or potential sources of drinking water.

In 2003, a shallow-groundwater investigation was conducted in Saucon Park to assess off-Site shallow impacts and assess whether vapor intrusion is a concern for houses and businesses located between Route 412 and Saucon Creek. The results of the investigation show that shallow groundwater is not impacted by VOCs or SVOCs and that vapor intrusion is not a potential route of exposure for houses and businesses located between Route 412 and Saucon Creek. Vapor intrusion is a potential route of exposure on-Site in areas above the groundwater

contamination plume, but this route is currently incomplete and potential future exposures will be managed by engineering controls and Institutional Controls.

Surface water bodies (Laubach Creek, Saucon Creek and the Lehigh River) have been monitored regularly since 1999 as part of the Site-wide groundwater program. This monitoring has shown that there are no impacts to the surface water bodies from groundwater or seeps. Therefore, there no current and/or future risks to ecological receptors within or adjacent to the Site.

Table 1

COPCS IN GROUNDWATER
Bethlehem Commerce Center
Bethlehem, Northampton County, PA

Compound	PADEP Act 2 Non-Residential (TDS<2500 Used Aquifer) Limits (ug/l)	MCLs (ug/l)	Maximum Concentration in Groundwater (ug/l)	Monitoring Well
Metals/Inorganics				
Total Chromium	100	100	660	SW-14
Hexavalent Chromium	NS	NS	600	SW-14
Total Cyanide	200	200	1,690	SW-7
Lead	5	15	20.8	MW-51BR
Mercury	2	2	47	MW-41BR
Selenium	50	50	147	MW-26
Thallium	2	2	58.8	MW-26
VOCs				
Benzene	5	5	1,600,000	MW-26
1,1-Dichloroethene	7	7	16	MW-C
Ethylbenzene	700	700	5,800	MW-46OV
Methylene Chloride	5	5	120	SW-7& MW-40OV
Styrene	100	100	32,000	MW-26
Toluene	1,000	1,000	150,000	MW-26
Trichloroethene	5	5	300	MW-C
Xylenes	10,000	10,000	85,000	MW-26
SVOCs				
Naphthalene	100		960,000	SW-7
2,4-Dinitrotolene	8.4		280	MW-26
2-Methylnaphthalene	2,000		52,000	SW-7
Aniline	5.8		1,200	MW-26
Anthracene	66		680	MW-26
Benz(a)anthracene	3.6		520	MW-26
Benzo(a)pyrene	0.2	0.2	340	MW-26
Benzo(b)fluoranthene	1.2		530	MW-26
Benzo(g,h,i)perylene	0.26		230	MW-26
Benzo(k)fluoranthene	0.55		250	MW-26
Bis(2-ethylhexyl)phthalate	6	6	1,200	MW-22S
Chrysene	1.9		430	MW-26
Dibenz(a,h)anthracene	0.36		70	MW-26
Dibenzofuran	5		4,700	SW-7
Fluoranthene	260		6,300	MW-26
Ideno(1,2,3-cd)pyrene	280		280	MW-26
Nitrobenzene	51		66	MW-40BR
N-nitrosodi-n-propylamine	0.37		9.2	MW-59BR
Pentachlorophenol	1	1	4.8	MW-64D
Phenanthrene	1,100		4,700	SW-7
Pyrene	130		3,400	MW-26

NOTES: NS = No standard

IV. TI EVALUATION

Two source areas exist at the Site, one associated with the former Coke Works Area and the other a smaller zone associated with the SI-1 impoundment, where groundwater MSCs are exceeded in the overburden and bedrock aquifers and cannot be met by any practicable means. The TI Zone in the Coke Works Area encompasses approximately 206 acres and the SI-1 Area TI Zone encompasses approximately 18 acres (Fig. 3). Since benzene is the most widespread and mobile COPC, it is considered representative of the maximum extent of contamination. The limits of the TI Zones are based on concentrations of benzene exceeding its MSC of 5 ug/l. Metes and bounds descriptions of the proposed TI Zones are presented in *RIR/FR/TI 2009*.

Table 1 summarizes the COPCs detected in groundwater. The six inorganic compounds, eight VOCs, and 21 SVOCs listed in this table have been detected at concentrations greater than their respective MSCs and MCLs.

A. What is NAPL?

A non-aqueous phase liquid or NAPL is a chemical or mixture of chemicals that do not readily mix with water. In water, NAPLs form a separate liquid phase and do not readily dissolve. After a release, NAPLs migrate into the subsurface resulting in disconnected blobs of liquid referred to as "residual NAPL," and continuous distributions of NAPL sometimes referred to as "pools." Residual and pooled NAPL are considered the "NAPL source zone" and can occupy pore spaces within soil or fractures in bedrock. NAPL pools can be mobile, sinking below the water table and spreading to the base of an aquifer. Since NAPLs are only slightly soluble in water, NAPL source zones can persist for many decades and, in some cases, permanently.

For these reasons, delineating the subsurface extent of the NAPL source zone can be a substantial undertaking. Because there is often no direct measurement of the source zone size, commonly the presence of organic compounds at levels exceeding 1% of their respective solubility limits is used to delineate the potential presence of NAPL.

B. What is a TI Zone?

The goal for groundwater remediation at RCRA Corrective Action facilities is to protect human health and the environment, typically returning contaminated groundwater to quality consistent with its designated beneficial uses. Generally, such use means cleaning up to drinking water standards.

For the reasons discussed above, sites where NAPLs are present in the subsurface are very difficult to clean up to drinking water standards. Cleanup technologies applicable to these sites often include approaches intended to control migration of contaminants (containment), remove contaminants from the subsurface (extraction), or treat contaminants in place (in situ treatment). These technologies have been tried with limited success on NAPL source zones. A 2003 EPA report on NAPL remediation stated that ". . . achieving MCLs in the source zone is beyond the capabilities of currently available in-situ technologies in most geologic settings"

("The DNAPL Remediation Challenge: Is There A Case For Source Depletion?" Publication EPA/600/R-03/143, dated December 2003; page xi).

Therefore, the RCRA Corrective Action program allows alternative cleanup goals to be established at sites where attaining drinking water standards "throughout the plume" are determined to be technically impracticable (TI). EPA's 1993 *Guidance for Evaluating the Technical Impracticability of Groundwater Restoration* (USEPA, 1993) explains that a TI Zone is appropriate where EPA has determined that restoration of ground water to drinking water quality is technically impracticable from an engineering perspective using currently available technologies within a reasonable or foreseeable timeframe. For such a determination, EPA must evaluate:

- media cleanup standards – see Sections IV.C and IV.D
- spatial area of TI Zone – see Fig. 3
- site conceptual model – see Section III.
- restoration potential of site – see Section IV.E
- cost estimate of alternatives – see Section VI.

This SB summarizes supporting material for this evaluation. A detailed discussion can be found in the *RIR/FR/TI 2009* in the Administrative Record.

C. Coke Works Area

The Coke Works Area has multiple sub-areas where residual materials are believed to be contributing to groundwater impacts underlying the Site. These areas include: the former Coke Works, Coal Chemical (former chemical extraction operation), Agitator Sludge (acidic sludge and BETX impoundment), Veronica Lake (coking-waste impoundment), Crystal Lake (tar, coking and acid waste impoundment), and several injection wells that were used decades ago by BSC to manage a variety of waste streams. Products and wastes managed in the Coke Works Area included benzene, toluene, xylenes, naphthalene, phenol, wash oil, coke-oven gas, coke-oven condensate, and acid sludge from a BETX refinement process. Former production wells CP-5, -6, and -7 were also reportedly used to dispose of contact cooling water and weak-ammonia liquor through deep well injection.

Waste material and residuals are believed to have migrated from the disposal areas to the groundwater. Groundwater flow at the Coke Works Area is generally from areas of high elevation toward the Lehigh River, primarily northwestward. The primary pathway of potential concern regarding the transport of contaminants from the Coke Works Area is migration with groundwater through the fractured-bedrock aquifer beneath the Site. The contaminants are moving preferentially within the fracture zone of the bedrock aquifer.

Exceedances of specific compounds in wells associated with the Coke Works area include four dissolved metals (lead, mercury, selenium and thallium), cyanide, six VOCs (benzene, ethylbenzene, methylene chloride, styrene, toluene, and total xylenes), and 21 SVOCs. Benzene is the most wide-spread and mobile COPC and is considered representing the maximum extent of contamination, which is defined by the dissolved concentration of benzene exceeding

the drinking water standard of 5 ug/l. The extent of this dissolved-phase plume is relatively stable: even though it is fed by NAPL source zones, naturally occurring processes, such as biodegradation and dilution, serve to limit the maximum size the plume will achieve. Therefore, the proposed TI Zone limits are based on concentrations of benzene exceeding a standard of 5 ug/l. The horizontal area of the Coke Works Area TI Zone, as defined by the monitoring wells which currently exceed the benzene MSC, includes the portion of the Site east of Saucon Creek to Laubach Creek, north of the Intermodal and south of the groundwater monitoring well clusters MW-58 and MW-50. A small portion of the proposed Coke Works Area TI Zone is located off-Site at groundwater monitoring well cluster MW-62. The TI Zone in the Coke Works Area encompasses approximately 206 acres with a total depth of 500 feet. See Figure 3 for a depiction of the Coke Works Area TI Zone.

Long-term monitoring will confirm that the plume is stable and routes of exposure remain incomplete. Future monitoring data will be compared with current data to ensure the NAPL and its dissolved phase remain stable and that the configuration does not change in a manner that would cause a threat. A further discussion of post-remediation care and monitoring is found in Section VIII.

D. SI-1 Area

The SI-1 Area encompasses 26.4 acres of land located in the northeast portion of the Site. The SI-1 Area includes the SI-1 closed surface impoundment, the former SI-2 surface impoundment, and several additional areas of suspected historic residual tar, acid, caustics, and oil deposition within close proximity to the SI-1 impoundment. The SI-1 impoundment was constructed to store semi-solid tar sludge such as tar-decanter sludge and ammonia sulfate saturator tar sludge. Other wastes such as waste oils, desulfurizer sludge, bio-oxidation clarifier sludge and tank-bottom tar were also stored in the impoundment. The SI-1 Area also contains the former metallic revert storage area located east of the SI-1 impoundment.

Waste material and residuals have migrated from the disposal areas to the groundwater. Localized groundwater flow at SI-1 is generally to the west. The primary pathway of potential concern regarding the transport of contaminants from the SI-1 Area is migration with groundwater through the fractured-bedrock aquifer beneath the Site. The contaminants are moving preferentially within the fracture zone of the bedrock aquifer.

Exceedances of specific compounds in the SI-1 area include one dissolved metal (lead), four VOCs (benzene, 1,1-dichloroethene, and trichloroethene), and three SVOCs (naphthalene, bis(2-ethylhexyl)phthalate, and n-nitrosodi-n-propylamine). As benzene is the most widespread and mobile COPC and is considered representing the maximum extent of contamination, the proposed TI Zone limits are based on concentrations of benzene exceeding its MSC of 5 ug/l. As at the Coke Works Area, natural attenuation processes limit the extent of the VOC plume. The horizontal area of the SI-1 Area TI Zone includes all of the SI-1 impoundment south of the border with the Conectiv property, and sits completely beneath property owned by LVIP. It is bordered to the east, south, and west by the Majestic parcel and to the north by Conectiv. The TI Zone in the SI-1 Area encompasses total approximately 18 acres with a depth of 400 feet. See Figure 3 for a depiction of the SI-1 Area TI Zone.

Long-term monitoring will confirm that the plume is stable and routes of exposure remain incomplete. Future monitoring data will be compared with current data to ensure the NAPL and its dissolved-phase plume remain stable and that the configuration does not change in a manner that would cause a threat. A further discussion of post-remediation care and monitoring is found in Section VIII.

E. Restoration Potential of Groundwater

Groundwater-restoration remedies have often been unsuccessful at Sites such as this one with similar complex geological features, such as fractured bedrock, karst features, and deep aquifers, because the sources of groundwater contamination are present in inaccessible or difficult to identify locations.

Groundwater flow and contaminant transport occur predominately through the fractures while contaminant storage can occur predominately in the tight rock matrix. This heterogeneity makes characterization of contaminant distribution inherently uncertain and in situ remediation ineffective. Pump and treat systems do not mobilize the contaminants from the matrix. Failure to remove these inaccessible contaminants will result in long-term contamination problems.

Waste disposal has occurred on the Site for 100 years, where contaminants have been disposed in various locations and through various methods. In addition to land disposal of waste material, at certain times in the past, some of the production wells have been used as waste injection wells. Such long-term disposal affords contaminants time and conditions to fully penetrate any soil or bedrock matrix and to be subject to various migration conditions. Groundwater quality data collected from the Site demonstrates that concentrations are generally stable due to long persistent exposure to discharges for virtually all of the locations on the Site. Presence of contamination deep in the aquifers indicates that plumes are well developed.

As a majority of the contamination at the Site is in the bedrock aquifers, the long-term nature of contamination would indicate that the contaminants are now bound tightly to the bedrock matrix, as well as migrating along the flow paths that are sampled by the monitoring system. Since the pore contaminants act as a virtual, ongoing source, no timely remediation of groundwater to potable standards can be expected with any remedial technology.

V. REMEDIAL ACTION OBJECTIVES

Although the beneficial use of the aquifer as a potential drinking water source and restoration to its beneficial use would be an Remedial Action Objective (RAO), the presence of NAPL in the fractures and bedrock matrix precludes the ability to fully restore the affected portion of the aquifer to potable quality.

Thus, the RAOs for groundwater are as follows:

1) Prevent human exposures to hazardous constituents in the groundwater via inhalation, ingestion, and dermal contact;
2) Prevent further migration of the NAPL and dissolved phase plume; and

3) Implement institutional controls to prevent groundwater uses which would interfere with or adversely affect the integrity or protectiveness of the final remedy for the Site.

VI. DESCRIPTION OF ALTERNATIVES

Included below are the groundwater-specific alternatives EPA evaluated as potential remedial designs. Common to the four alternatives listed below are ICs to restrict land and groundwater use at the Site while groundwater remains contaminated. A full description of the institutional controls that EPA proposes to implement at the Site is found in Section VIII. of this SB.

EPA guidance on remediating sites prescribes that source control be given a high priority and that permanent remedies are preferred. A number of technologies are capable of removing mass from source zone areas. The following provides a discussion of the alternative technologies EPA considered for use at this Site:

1. Alternative 1: No Action

Capital Cost: $0
Annual O&M Cost: $0
Present Worth Cost: $0
Time to Implement: 0 years

The purpose of the No Action alternative is to provide a baseline for comparison against the other alternatives. Under this alternative, no remedial action would be taken to remove, control migration from, minimize exposure to or otherwise reduce or monitor the risks associated with Site-related contaminated groundwater. The No Action alternative would not meet any of the cleanup objectives described earlier in this SB. In addition, this alternative would not provide any controls necessary to protect people and the environment from the Site-related contamination.

2. Alternative 2: Pump and Treat

Capital Cost: $32,000,000
Annual O&M Cost: $1,100,000
Total Cost with 30-year O&M: $65,000,000
Time to Implement: 290 years

Alternative 2 includes the extraction and treatment of groundwater in the TI Zones to control the source of contamination to groundwater. Extracted groundwater would be treated and discharged to the Lehigh River. ICs and groundwater-use controls will be implemented.

Wells to capture the contaminated groundwater would replicate the capacity of the historically operated production wells, as some of them were used as injection wells for some time. The present deep wells generally are the most contaminated, so the focus would be on 200-250 feet deep pumping wells. If fractures could be found with yields of approximately 500

gallons per minute (gpm), which equals 0.7 million gallons per day (mgd), the contaminated formations may be intercepted. The total number of extraction wells would be determined during a pilot test to develop a final design; however, it is assumed that at least 8 wells would be needed, 6 in the Coke Works Area and 2 at the SI-1 Area. The total pumping rate would be estimated at 4,000 gpm, or 5.8 mgd. The projected rate initially removes 2% of the mass per year with that rate declining as secondary pore diffusion takes primacy in controlling contaminant recovery. This alternative is projected to meet the MSCs and MCLs in 290 years.

The treatment system for VOC and metals removal, along with other COPCs would be analogous to a public water treatment system due both to the volume and treatment requirements. To discharge this volume to a neighboring surface water body, effluent limits would be similar to drinking water standards. This proposed system would consist of air stripping to remove VOCs and to aerate the groundwater, followed by metals precipitation and sedimentation, and finished by rapid flow granular activated carbon filters, and discharge. At a precipitable solids concentration of 200 mg/L, over 5 tons per day of solids, or 15 tons per day of sludge (at 33% solids) would require dewatering and disposal.

Costs are projected for the first 30 years, although systems would have to operate indefinitely, estimated at nearly 300 years, to meet clean-up standards for the Site. System design studies, permitting, approvals, and design documents are projected to cost approximately $2,000,000. Well location work, testing, and production installation with pumps and piping are estimated at $3,000,000. Pumping costs with well operation and maintenance (O&M) will depend on final system design, but should be anticipated at $100,000 per year, or $3,000,000 over 30 years. A conventional filtration plant cost is estimated at $27 million in 2009, using the state of Texas draft Cost Estimating procedures. Annual operating costs (including disposal of sludges) will add an additional $1,000,000 per year, for a total operating cost over 30 years of $30 million. These costs totaling $65 million are prohibitive for a remedy that has a low probability of achieving the established MSCs.

3. Alternative 3: Bioremediation and Chemical Oxidation

Capital Cost: $32,000,000
Annual O&M Cost: $1,100,000
Total Cost with 30-year O&M: $65,000,000
Time to Implement: 290 years

Bioremediation, which uses microbes to remediate harmful chemicals in the environment, is a presumptive remedy for benzene and naphthalene related compounds due to their ease of biodegradation and demonstrated successful performance. When microbes completely digest these compounds under the optimum temperature, nutrients and oxygen, they are changed into water and gases such as carbon dioxide.

Bioremediation of benzene and naphthalene related compounds is most effective as an aerobic reaction, whereas the aquifer on the Site is anaerobic as evidenced by the presence of methane. The high concentrations of methane indicate a robust anaerobic system currently in place with a significant volume of COPC mass still on-Site. The anaerobic aquifer conditions

would dictate that either oxygen be injected into the aquifer, or that groundwater be treated ex-situ, after pumping it from the aquifer as described in Alternative 2 above. To set up the injection system, it is estimated that it would be necessary to install 30 wells to a depth of 250 feet.

Based on the production of methane in the subsurface, anaerobic bioremediation is already occurring on the Site at a rate of approximately 1.1 kg HC/kg – methane. Any attempt to increase the efficiency to simulate an engineered aerobic or more productive anaerobic system would require pumping the groundwater to facilitate better distribution of the nutrients and biomass. As the pumped water would have to be treated at the surface, the same cost parameters applied to Alternative 2 would apply.

Therefore, it is anticipated that Alternative 3 would have a similar cost analysis over the life of the remedial program as that estimated for groundwater pump and treat presented in Alternative 2.

4. Alternative 4: Natural Attenuation with TI Zones

Capital Cost: $0 (wells currently installed)
Annual O&M Cost: $100,000
Total Cost with 30-year O&M: $ 3,000,000
Time to Implement: 300+ years

Natural attenuation relies on natural attenuation processes within the context of a carefully controlled and monitored site cleanup approach to achieve site-specific remediation objectives within a timeframe that is reasonable compared to that offered by other more active methods. These natural attenuation processes include a variety of physical, chemical, or biological processes that, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in soil or groundwater.

EPA has determined that:

1. The groundwater plume is generally stable or shrinking in most of the areas of interest;
2. Biodegradation products, such as methane, are measurable and indicative of a robust anaerobic system in the deeper aquifer, and
3. COPCs are largely contained on-Site; i.e., there is no exposure to human health or the environment with respect to groundwater contamination associated with the SI-1 and Coke Works Areas, and, therefore, no risk to human health or the environment.

For a natural attenuation remedy, groundwater monitoring is typically required to confirm plume stability and concentrations of the primary COPCs over time to ensure that no routes of exposure and/or threats to human health or the environment occur in the future. With this option, TI Zones will be created where EPA has determined that the groundwater cannot be remediated to traditional cleanup standards. Long term monitoring will ensure that the highest

contamination remains within the designated TI Zones ensuring protection of human health and the environment.

Costs for natural attenuation would primarily consist of groundwater and surface-water monitoring and reporting expenses. The cost of sampling, lab analysis and reporting is estimated to be $100,000 for each event. Such events would be performed annually for 5 years, then in alternate years with some optimization and refinement of the assessments as the work progresses. The cost for this alternative for 30 years based on the proposed post-remediation care plan is estimated at $3 million dollars.

VII. COMPARISON OF ALTERNATIVES

This section provides a description of the criteria EPA uses to evaluate proposed remedies under the Corrective Action program. The criteria are applied in two phases. In the first phase, EPA evaluates three criteria, known as Threshold Criteria. In the second phase, EPA sometimes uses as many as seven balancing criteria to select among remedial alternatives, if more than one is proposed.

The Threshold Criteria are:

1. Overall protection of human health and the environment,
2. Attaining media clean-up standards and
3. Control of sources of release.

The Balancing Criteria are:

1. Long-term effectiveness and permanence,
2. Reduction of toxicity, mobility, or volume,
3. Short-term effectiveness,
4. Implementability,
5. Cost,
6. Community acceptance and
7. State acceptance.

EPA believes that final remedies selected for RCRA Corrective Action facilities should achieve all three (3) threshold criteria, if possible. However, as discussed in Section IV, below, EPA believes that no remedial technology will attain clean up of groundwater to drinking water standards throughout the plume. Therefore, the media cleanup standard criteria were evaluated at points beyond the TI Zone. Table 2 summarizes EPA's evaluation of the alternatives based on the above criteria.

A. Threshold Criteria

1. Overall Protection of Human Health and the Environment

The No Action Alternative would not provide adequate protection of human health and the environment. This alternative was developed as a baseline for comparison against the other

alternatives. Because the No Action Alternative does not include long term monitoring, protection of human health cannot be ensured. Monitoring of the NAPL stability and waste concentrations in the Coke Waste Area and SI-1 Area are requisite for ensuring there is no exposure to contaminated groundwater. The No Action Alternative will not be evaluated further because it does not satisfy the threshold criterion of providing overall protection to human health and the environment.

As Alternatives 2, 3, and 4 all involve groundwater monitoring for the entire Site as well as plume size, those alternative meet the Overall Protection criteria. Such monitoring is necessary to ensure exposure routes to groundwater remain incomplete.

2. Attaining Media Clean-up Standards

Under Alternatives 2, 3 and 4, at points beyond the TI Zone, groundwater is expected to meet Pennsylvania's residential standards for groundwater, thus protecting areas where groundwater discharges into surface water bodies such as the Lehigh River and Saucon Creek. For areas of contaminated soils, the overall Soil Management Plan will apply. The soils on a given parcel will either meet PA non-residential standards or will be capped in the future to eliminate soil exposure.

3. Control of Sources of Release

At this time, it is anticipated that there will be engineering controls and capping across most of the Site, to reduce surface infiltration and minimize the migration of contaminants downward in the soil column to the water table underlying the Site. These controls include, but are not limited to, caps, concrete building pads, sidewalks, asphalt roadways and parking lots. These source control measures will be detailed as a part of EPA's future proposed remedy for soils.

B. Balancing Criteria

1. Long-term effectiveness and permanence

Alternatives 2, 3, and 4 all will potentially provide long-term effectiveness, as each remedy is designed to operate for several centuries. Alternatives 2 and 3 require more complex and active remedial functions during this extensive timeframe. As a practical matter, Alternatives 2 and 3 would likely not remain as designed throughout their required lifespan.

2. Reduction of toxicity, mobility, or volume

NAPL contamination is very difficult to remediate, as discussed earlier in this document. As the NAPL plume at the Site has been shown to be stable, none of the alternatives will achieve reduction in toxicity or volume in the foreseeable future.

3. Short-term effectiveness

Alternatives 2, 3 and 4 are designed to remediate the groundwater contamination over a very long timeframe. However, the IC component of each of these alternatives will be implemented in the short-term.

4. Implementability

EPA expects Alternatives 2 and 4 to be easily implemented. Alternative 4's monitoring network is already established while Alternative 2 would require additional wells in some locations as well as the construction of a treatment plant. Alternative 3, however, would require additional study for placement of injection wells with several iterations to ensure optimal network design.

5. Cost

Based on design and construction costs, as well as extensive long-term activities, the costs for Alternatives 2 and 3 are extremely high. Alternative 4 is also costly, but is at least one order of magnitude lower than the costs of the others.

6. Community acceptance

Community acceptance will be evaluated during the public comments period.

7. State acceptance

PADEP supports EPA's proposal that Alternative 4 be the final remedy for groundwater at the Site.

C. Sustainability

EPA is now supplementing its evaluation of alternatives with its August 2009 guidance, Principles for Greener Cleanups. This guidance helps assess remedy options in light of anticipated future land use of the site, and reducing the environmental footprint of the cleanup. A detailed evaluation of the alternatives using the *USEPA OSWER, August 2009, Principles for Greener Cleanups* is found in *RIR/TI/TI* 2009.

The primary five elements of a green cleanup are presented in Table 3:

- Total Energy Use and Renewable Energy Use
- Air Pollutants and Greenhouse Gas Emissions
- Water Use and Impacts to Water Resources
- Materials Management and Waste Reduction
- Land Management and Ecosystems Protection

Table 2

ALTERNATIVE ANALYSES SUMMARY
Bethlehem Commerce Center
Bethlehem, Northampton County, PA

	No Action	**Pump and Treat**	**Bioremediation**	**Natural Attenuation With TI Zones**
REMEDIAL CRITERIA				
Threshold Criteria				
Overall protection of human health and the environment	No	Yes	Yes	Yes
Obtain media cleanup objectives	No	Yes	Yes	Yes
Source control	Yes- slow	Yes- slow	Yes- slow	Yes- very slow
Balancing Criteria				
Long term effectiveness and permanence	Poor	Poor	Poor	Poor
sustainable	Yes	No	No	Yes
Reduction in toxicity, mobility and volume	Minimal	Minimal	Minimal	Minimal
Short term effectiveness	No	Yes	Yes	Yes
Implementability	Yes	Yes	Suspect	Yes
Cost	No	High	High	Moderate
Community acceptance	No	To be determined	To be determined	Yes
State acceptance	No	No	No	Yes
Conclusion	No	No	No	Recommended

Table 3

SUSTAINABILITY OF REMEDIAL ALTERNATIVES FOR GROUNDWATER
Bethlehem Commerce Center
Bethlehem, Northampton County, PA

	REMEDIAL ALTERNATIVE	**No Action**	**Pump and Treat**	**In Situ Bioremediation**	**Natural Attenuation with TI Zones**
SUSTAINABILITY ELEMENT					
Total Energy		None	Energy intensive, esp. with thermal oxidation and sludge drying	Small	Minimal
Air Pollution and GHG Emissions		Minimal	Construction and transport of wastes	Minimal	Minimal
Water Use and Impacts		Reduces the minimal impacts over several decades	Reduces the minimal impacts over several decades	Reduces the minimal impacts over several decades	Reduces the minimal impacts over several decades
Materials Management and Waste Reduction		N/A	Major resources for construction, disposal of sludges	Significant resources for implementation	Minimal resources for monitoring
Land Use and Ecosystem Protection		No resources and no ecosystem protection	Land for facilities, adds little ecosystem protection	Few resources, adds little ecosystem protection	No resources, adds little ecosystem protection

VIII. EPA'S PREFERRED REMEDY

EPA's preferred alternative for Site groundwater is Alternative 4: Natural Attenuation with TI Zones. This remedial alternative would rely on monitored natural attenuation to address the dissolved-phase COPCs in conjunction with institutional controls designed to restrict future usage of Site groundwater as long as contaminants in the groundwater continue to exceed their respective MSCs and MCLs.

Alternative 4 includes the following remedial components:

- Monitored natural attenuation of hazardous constituents across the Site.
- TI determination for 35 contaminants that are found within and above-described two NAPL plumes. This determination formalizes EPA's decision that restoration of ground water to drinking water quality is technically impracticable from an engineering perspective using currently available technologies within a reasonable or foreseeable timeframe.
- Long-term groundwater, surface water and seep sampling to confirm that contaminants of concern are not migrating outside the limits of the TI Zones at concentrations that exceed their concentrations.
- Institutional controls, including restricting the installation and use of groundwater and prohibiting any use of the Site that would interfere with the protectiveness or integrity of the selected remedy.

EPA proposes that these components, as set forth in greater detail below, be implemented through a permit, an order or other enforceable mechanism.

1. Institutional Controls

VOC, SVOCs and metals remain in the groundwater above levels appropriate for residential and domestic uses at areas across the Site. Therefore, EPA's proposed remedy requires ICs to restrict land and groundwater use at the Site while groundwater remains contaminated. ICs are generally non-engineered instruments such as administrative and/or legal controls that minimize the potential for human exposure to contamination and protect the integrity of a remedy by limiting land or resource use. Institutional controls may be include, but not be limited to, Environmental Covenants to be implemented pursuant to Pennsylvania's Uniform Environmental Covenants Act (UECA) and municipal ordinances already enacted by the City of Bethlehem and Lower Saucon Township. Details concerning environmental covenants and municipal ordinances are as follows:

Environmental Covenants

1. For each property parcel (Parcel) at the BCC, an environmental covenant will be drafted and recorded in accordance with the Pennsylvania Uniform Environmental Covenants

Act (UECA), 27 Pa.C.S. §§6501-6517 (December 18, 2008). The environmental covenants shall include the following restrictions and requirements:

(a) The Parcel shall not be used for residential or agricultural purposes or as unpaved playgrounds, campgrounds, day care centers, hospitals or cemeteries unless EPA provides written approval for such use;

(b) Groundwater underlying the Parcel shall not be used for any purpose, except for the purpose of monitoring, treating, and remediating such groundwater;

(c) No wells for the extraction of groundwater shall be installed, permitted, or utilized on the Parcel, except that monitoring wells may be installed and operated on the Parcel solely for the purpose of monitoring, treating, and remediating such groundwater;

(d) No digging, excavating, grading, pile-driving, or other earth-moving activities shall be conducted on the Parcel including, without limitation, the excavation or removal of asphalt, concrete, soil or other ground cover, and foundations and the digging of foundations for buildings and trenches for utilities, unless such activities are in compliance with all applicable federal, state, and local rules, regulations, and ordinances including, without limitation, those pertaining to the environment and those pertaining to human health and occupational safety, and in compliance with any post-remediation care plan or soil management plan (SMP) approved by PADEP and/or USEPA as part of a Cleanup Plan. With regard to these activities, if any asphalt, concrete, soil, or other ground cover is excavated or removed from any part of the Parcel, such materials shall be stored, managed, transported, and disposed of in compliance with the Soil Management Plan approved by the PADEP and/or the USEPA as part of a Cleanup Plan.

(e) In the event the Parcel owner(s) intends to convey an interest in all or any portion of such Parcel, the owner(s) shall notify EPA at least thirty (30) calendar days prior to such sale and provide written documentation to EPA which demonstrates that the prospective buyer is aware of the restrictions placed on land and groundwater use;

(f) The Parcel owner(s) and each subsequent owner(s) shall submit, to EPA and PADEP, written documentation concerning proposed changes in use of the Parcel property; the filing of applications for building permits, or proposals for any site work affecting the contamination on the Parcel property;

(g) Each Parcel shall be surveyed and described in the environmental covenant as prescribed below:

(1) Each Parcel, and each use and activity limitation area applicable to and within each Parcel, shall be surveyed by a licensed professional surveyor, who shall provide a metes and bounds description of each Parcel or area. Metes and bounds descriptions define boundaries based on distance and direction from point to point. The description defines a Point of Beginning and each subsequent point, returning to the Point of Beginning.

(2) In addition to the metes and bounds description for each Parcel or area, the survey shall provide geographic survey coordinates for each point identified in the metes and bounds description. The survey coordinates shall be provided as follows: longitude and latitude in decimal degrees, to at least 7 decimal places, using the World Geodetic System (WGS) 1984 datum, with west longitude indicated as a negative number. The coordinates shall be provided in a tabular format, following the metes and bounds description. The first and last coordinate values in the table shall be the same, and shall represent the coordinates of the Point of Beginning of the metes and bounds description. The text introducing the table of coordinate values shall indicate that the table represents the geographic coordinates, in WGS 1984, of the preceding metes and bounds description.

(3) If the metes and bounds description includes arc segments (rather than straight line segments) defined by the beginning and ending of an arc of a specific radius, additional geographic control points shall be calculated along the arc so that a straight line approximation from point to point does not deviate from the true arc by more than 0.1 foot.

(4) The table of coordinate values shall also be provided separately as an electronic file, in a comma separated value (CSV) format.

Conversion of Existing Covenants to Environmental Covenants

Prior to the effective date of the Pennsylvania UECA, several covenants for the BCC Facility were recorded; in addition, the City of Bethlehem recorded a covenant for the Saucon Park portion of the Facility. All of these covenants shall be converted to environmental covenants in accordance with Section 6517(b) of UECA, 27 Pa.C.S. § 6517(b).

Municipal Ordinances

Both the City of Bethlehem and Lower Saucon Township supply public water to residents and businesses within the municipalities. As such, both municipalities have passed ordinances that restrict the use of private supply wells for drinking water. Complete copies of the municipal ordinances pertaining to water supply are presented in Attachment O of the *RIR/FR/TI 2009*.

2. Post Remediation Care and Monitoring

Monitoring

A detailed sampling, inspection, and documentation program will be followed to continue to demonstrate that there is no migration of the plume and no complete exposure pathways to contaminated groundwater. This post-remediation care program will be submitted to EPA for review and approval, and thereafter recorded in a manner consistent with environmental covenants under the Pennsylvania Uniform Environmental Covenants Act (UECA), 27 Pa.C.S. §§6501-6517 (February, 2008). This covenant will also include the geospatial information described in 1.(h) (1-4), of the Deed Restrictions above, for the limits of the TI Zones as well as the perimeter of the property.

3. Annual Certification

After any written request by EPA or PADEP and/or annually, LVIP will submit to EPA and PADEP written documentation concerning the use, activity, non-compliance, and property transfer at the Site. In addition, every fifth year, LVIP will conduct a database well search within a ½-mile radius of the site to determine if any new off-site water supply wells have been installed in the vicinity of the Site. The details of the certification program are identified in the *RIR/FR/TI 2009*.

4. Reporting

An annual report will be submitted to EPA and PADEP containing a summary of analytical results for groundwater, surface water, and seeps samples collected within the prior monitoring period. The details of the reporting program are identified in the *RIR/FR/TI 2009*.

5. Monitoring Trigger

Upon review of the analytical data collected during the post-remediation monitoring program, if any of the analytical results indicate a significant increase in concentrations of any COPC in any of the post-closure monitoring well, surface water, or seep samples collected, EPA and PADEP will be promptly notified and jointly these agencies and LVIP will make a decision regarding any necessary actions needed to address the condition.

Application of the statistical "75/10X" rule for each TI Zone will indicate whether a significant increase in concentration has occurred. The following conditions must be met to "pass" the 75/10X rule, and therefore indicate that the plumes are stable:

1. For each monitoring point that, as of July 2009, meets the media cleanup standards for benzene (5 ug/l) and naphthalene (100 ug/l) (outside the TI Zone), results shall not exceed the clean-up standards by more than 10 times.

2. For monitoring points that, as of July 2009, meet the media cleanup standards for benzene (5 ug/l) and naphthalene (100 ug/l) (outside the TI Zones), 75 % of results shall not exceed the clean-up standards for each monitoring constituent for each monitoring event.

3. For each monitoring point that, as of July 2009, exceeds the media cleanup standards for benzene (5 ug/l) and naphthalene (100 ug/l) (within the TI Zones), no single sample result may exceed its July 2009 concentration by more than 10 times, for each monitoring constituent.

TABLE 4

POST-REMEDIATION CARE AND MONITORING PROGRAM
Groundwater, Surface Water, and Seep Sample Locations
Bethlehem Commerce Center
Bethlehem, PA

PROPOSED GROUNDWATER SAMPLES

BS-2	MW-45OV	MW-62D
MW-13	MW-46OVR	MW-62M
MW-13M	MW-47BR	MW-62S
MW-13D	MW-47S	MW-64S
MW-14	MW-48BR	MW-64D
MW-20	MW-48OV	MW-64DBR
MW-25	MW-50BR	MW-65D
MW-26	MW-50OV	MW-67D
MW-27	MW-58D	MW-67DBR
MW-31	MW-58DBR	MW-68DBR
MW-33	MW-58S	MW-M7D
MW-34	MW-59BR	P-1D
MW-38BR	MW-59OV	SW-7
MW-38OV	MW-60BR	SW-17
MW-43BR	MW-60OV	SW-18
MW-43OV	MW-61BR	SW-19
MW-45BR	MW-61OV	SW-22

PROPOSED SURFACE WATER SAMPLES

LCSW-01a	LCSW-05	SCSW-03a
LCSW-02a	LCSW-08	SCSW-04a
LCSW-03a	SCSW-01a	NTSW-01a
LCSW-04a	SCSW-02a	

PROPOSED SEEP SAMPLES

HDR-LC-04	HDR-LC-36	HDR-SC-07
HDR-LC-34	HDR-SC-03	

ANALYTIC PARAMETERS

Analytical Parameter	**Method**
Target Compound List VOCs	SW-846 Method 8260B
Target Compounds List SVOCs	SW-846 Method 8270C
Dissolved Target Analyte List Metals	SW-846 Methods 6010B and 7470A
Hexavalent Chromium (select sample locations)	SW-846 Method 7196A
Free Cyanide	MCAWW 335.1

IX. ENVIRONMENTAL INDICATORS

Under the Government Performance and Results Act (GPRA), EPA has set national goals to address RCRA corrective action facilities. Under GPRA, EPA evaluates two key environmental clean-up indicators for each facility: (1) Current Human Exposures Under Control and (2) Migration of Contaminated Groundwater Under Control. The BSC Facility met these indicators on January 7, 2004.

X. FINANCIAL ASSURANCE

LVIP estimates that the cost of the Final Remedy for groundwater at the Site is $3,000,000. EPA will require LVIP to provide assurances of financial responsibility for completing the Final Remedy as required by Section 3004(u) of RCRA, 42 U.S.C. § 6924(u).

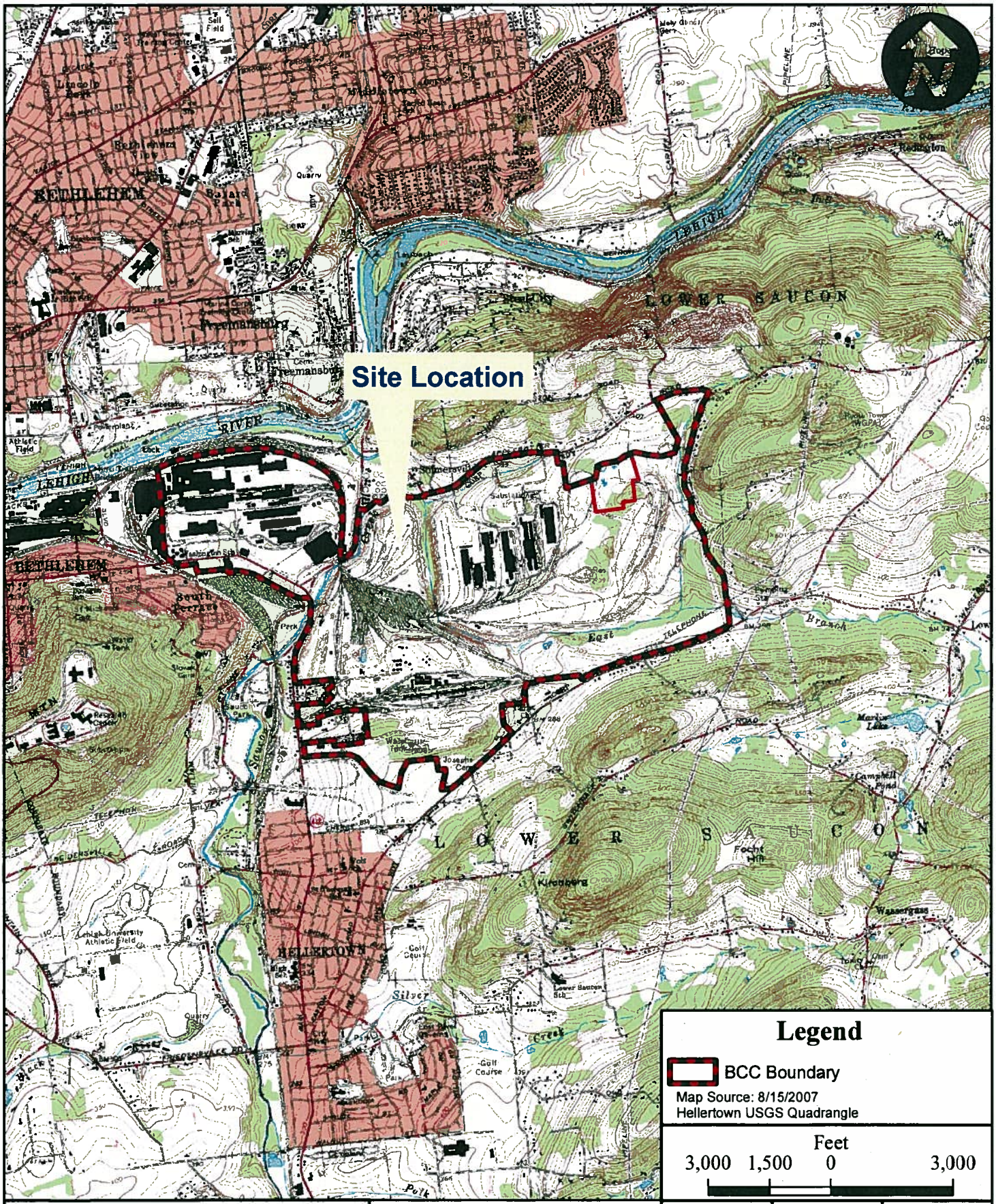
XI. PUBLIC PARTICIPATION

Interested persons are invited to comment on EPA's proposed remedy. The public comment period will last thirty (30) calendar days from the date that notice is published in a local newspaper. Comments may be submitted by mail, fax, e-mail, or phone to Ms. Linda Matyskiela at the address listed below.

A public meeting will be held upon request. Requests for a public meeting should be made to Ms. Linda Matyskiela at the address listed below. A meeting will not be scheduled unless one is requested.

The Administrative Record contains all the information considered by EPA for the proposed decision at these Parcels. The Administrative Record is available at the following location:

U.S. EPA Region III
1650 Arch Street
Philadelphia, PA 19103
Contact: Ms. Linda Matyskiela (3LC30)
Phone: (215) 814-3420
Fax: (215) 814-3113
Email: matyskiela.linda@epa.gov



HDR ONE COMPANY | Many Solutions LVIP VII, 1720 Spillman Drive Suite 280 Bethlehem, PA 18015-2165	**Bethlehem Commerce Center** **SITE LOCATION MAP**	

Job No.	Date	Figure No.
41406	06/15/09	1

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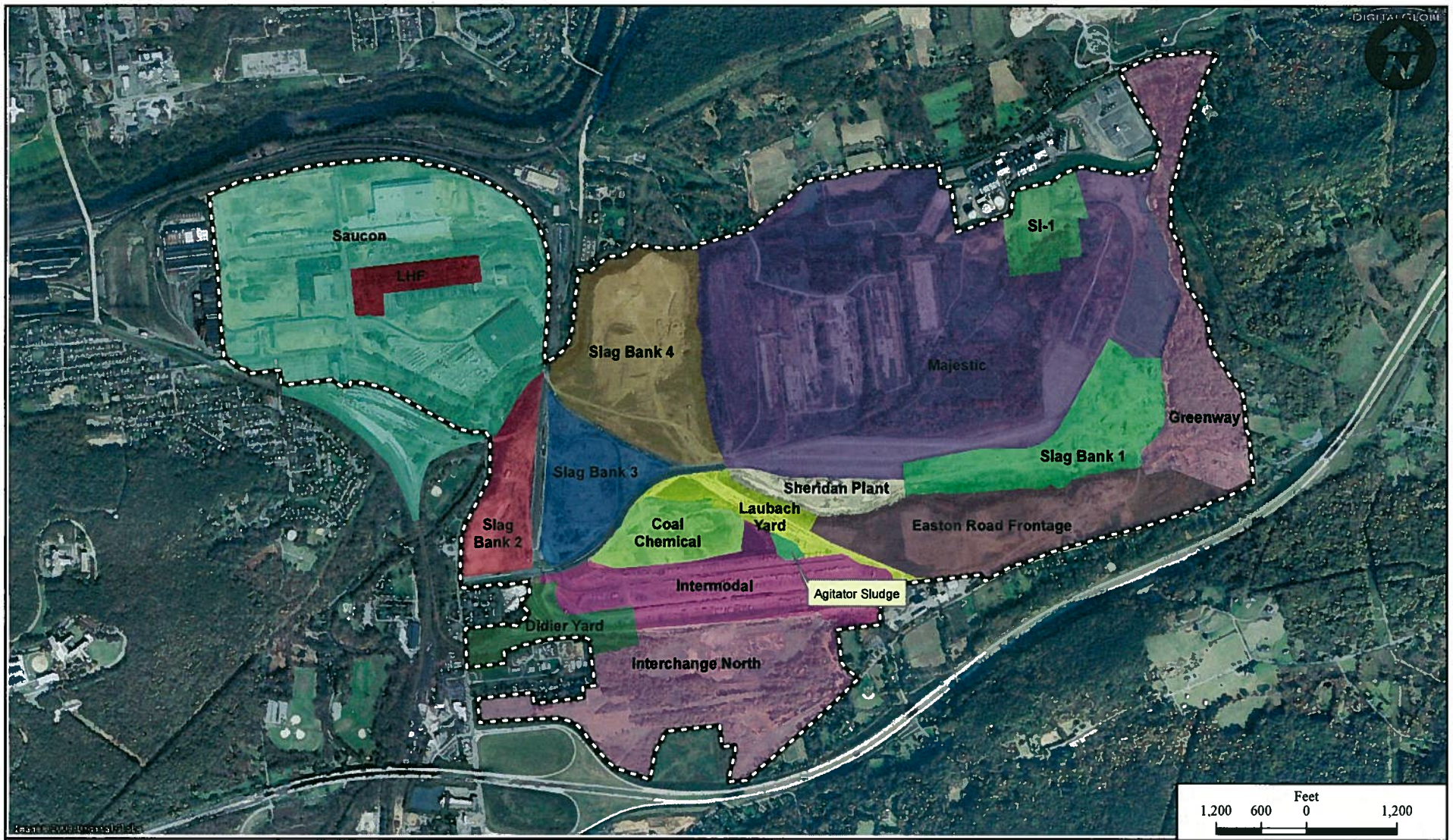

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Bethlehem, PA 18015-2165
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BETHLEHEM COMMERCE CENTER
NORTHAMPTON COUNTY, PENNSYLVANIA

Environmental Area Map

Job No.	Date	Figure No.
41406	08/25/09	2

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HDR LVIP VII, 1720 Spillman Drive Suite 280 Bethlehem, PA 18015-2165 ONE COMPANY | Many Solutions	**BETHLEHEM COMMERCE CENTER** **NORTHAMPTON COUNTY, PENNSYLVANIA**	**Technical Impracticability Areas and Proposed Locations for Post–Remediation Sampling**	**Job No.**	**Date**	**Figure No.**
			41406	09/01/09	10

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