Arsenic Mine Superfund Site

Putnam County, New York

EPA

April 2020

PURPOSE OF THIS DOCUMENT

This document describes the remedial alternatives considered as an early action for the first operable unit (OU1) of the Arsenic Mine Superfund site and identifies the preferred alternative along with the rationale for this preference. This Proposed Plan was developed by the U.S. Environmental Protection Agency (EPA) in consultation with the New York State Department of Environmental Conservation (NYSDEC). EPA is issuing this Proposed Plan as part of its public participation responsibilities under Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended, and Sections 300.430(f) and 300.435(c) of the National Oil and Hazardous Substances Pollution Contingency Plan. The nature and extent of the contamination at the site and the remedial alternatives summarized in this Proposed Plan are described in the March 2020 focused feasibility study (FFS) report. EPA and NYSDEC encourage the public to review this document to gain a more comprehensive understanding of the site and the Superfund activities that have been conducted there.

This Proposed Plan is being provided as a supplement to the FFS report to inform the public of EPA's preferred alternative, upon which NYSDEC concurs, and to solicit public comments pertaining to all of the remedial alternatives evaluated, including the preferred alternative. The preferred alternative is to dissociate the residents from exposure to arsenic-contaminated soils and consists of offers of acquisition of certain affected properties and permanent relocation of the related affected residents. Following permanent relocation, vacated structures would be demolished. This alternative would also include institutional controls (ICs)[1] (*e.g.,* easements) to limit current and future use of the properties. Until the residents from each affected residence are permanently relocated, or until a final remedy is completed, monitoring and maintenance of the existing protective measures would continue at each respective residence to ensure the effectiveness of these measures in eliminating exposure pathways in areas that these measures were installed.

The alternative described in this Proposed Plan is the preferred alternative for the site. Changes to the preferred alternative, or a change from the preferred alternative to another alternative, may be made if public comments or additional data indicate that such a change will result in a more appropriate remedial action. The final decision regarding the selected remedy will be made after EPA has taken into consideration all public comments. EPA is soliciting public comment on all of the alternatives considered in the Proposed Plan and in the detailed analysis section of the FFS report because EPA and NYSDEC may select a remedy other than the preferred alternative.

[1] ICs are non-engineered actions or requirements, such as administrative and legal controls, that help minimize the potential for human exposure to contamination and/or protect the integrity of a remedy.

MARK YOUR CALENDAR

April 8, 2020 – May 8, 2020: *Public comment period related to this Proposed Plan.*

April 22, 2020 at 7:00 P.M.: *Virtual public meeting.*

One may find meeting-participation details using the following link:

https://www.epa.gov/superfund/arsenic-mine

Alternately, one may participate by telephone using the following conference line number:

(315) 565-0493, code number 262234153#

Please register in advance of the virtual meeting by accessing:

https://www.eventbrite.com/e/us-epa-arsenic-mine-proposed-plan-virtual-public-meeting-tickets-101328528356

or emailing Pat Seppi, Community Involvement Coordinator, at:

seppi.pat@epa.gov

or calling her at (646) 369-0068.

Anyone interested in receiving materials for the public meeting in hard copy should either email or call Ms. Seppi with such a request by Friday, April 17.

The Administrative Record (supporting documentation) for the site is available at:

https://www.epa.gov/superfund/arsenic-mine

COMMUNITY ROLE IN SELECTION PROCESS

EPA and NYSDEC rely on public input to ensure that the concerns of the community are considered in selecting

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an effective remedy for each Superfund site. To this end, the FFS report and this Proposed Plan have been made available to the public for a public comment period that begins on April 8, 2020 and concludes on May 8, 2020.

A public meeting will be held via webinar and telephone conference on April 22, 2020 at 7:00 p.m. to present the conclusions of the FFS, to elaborate further on the reasons for recommending the preferred alternative, and to receive public comments.

Written comments on the Proposed Plan should be addressed to:

Mark Granger
Remedial Project Manager
Central New York Remediation Section
U.S. Environmental Protection Agency
290 Broadway, 19th Floor
New York, New York 10007-1866

email: granger.mark@epa.gov

Comments received at the public meeting, as well as written comments, will be documented in the Responsiveness Summary Section of the Record of Decision (ROD), the document that formalizes the selection of the remedy.

SCOPE AND ROLE OF ACTION

Site remediation activities are sometimes segregated into different phases, or OUs, so that remediation of different aspects of a site can proceed separately, resulting in a more expeditious cleanup of the entire site. This site is being addressed by EPA in two OUs. The first OU (OU1) addresses dissociating the residents from exposure to arsenic-contaminated surface soils. This Proposed Plan describes EPA's preferred alternative for OU1.

The second OU (OU2) will address the nature and extent of all site-related contamination in various media (*e.g.,* surface and subsurface soil, groundwater, sediment, *etc.*) as well as ecological considerations.

SITE BACKGROUND

Site Description

The Arsenic Mine site is located in Kent, Putnam County, New York and includes an historic mine, previously known as Pine Pond Mine, Silver Mine, and Brown's Serpentine Mine. There are two former entry shafts. The site includes the northern mine shaft, which is located on private property. A second shaft, the southern mine shaft, is located in the adjacent Nimham Mountain Multi-Use Area, a state recreational area. The Arsenic Mine site includes undeveloped and residential properties around and downslope from the northern mine shaft, near the intersection of Gipsy Trail Road and Mt. Nimham Court. See Figure 1.

The site is situated in the Hudson Highlands area, which is a northeast-southwest trending band of igneous and metamorphic rocks that extends from New England through New York. The Hudson Highlands are almost entirely blanketed by a thin layer of glacial till with frequent bedrock outcrops.

The area is sparsely populated and the terrain is highly variable, with steep, forested hillsides. Occupied properties in the area consist of single-family residential homes. Public water is not available in the area; residents rely on private wells for their drinking water.

Site History

Mining operations at the site were conducted intermittently from the mid-1800s through approximately 1918. The mine contains arsenopyrite, a metal ore that was used in ammunition, pesticides, pigments, and other industries. During the mining operations, rocks were crushed on-site to concentrate the ore. The arsenic-contaminated waste materials, which are known as tailings, were disposed of in areas surrounding the mine pits/shafts. Mining operations ceased in 1918 reportedly because of the lack of a satisfactory smelting forge nearby for processing the ore.

While the area has naturally high levels of arsenic in the soil and groundwater, significantly higher levels of arsenic are found on the residential properties as a result of the dispersal of arsenic associated with the mine tailings relative to the northern mine entrance.

In 1987, residents living in a house adjacent to the northern mine entrance were hospitalized as a result of exposure to arsenic from their drinking water well that had been installed through tailings from the mining operations. EPA installed a cistern at that residence for drinking water deliveries as an alternative drinking water supply. During the late 1980s and early 1990s, the Putnam County Department of Health (PCDOH), in conjunction with EPA and the New York State Department of Health (NYSDOH), conducted limited soil sampling on the properties near the northern mine entrance, revealing significant concentrations of arsenic in surface soils. The PCDOH placed a warning sign near the northern mine entrance indicating the presence of elevated arsenic levels in soil. Because of naturally-elevated regional arsenic concentrations in the soil, manmade deposition of arsenic-laden materials related to the past mining operations was not delineated.

In 2016, the owner of the cistern requested EPA's assistance with a repair to the cistern. During the repairs, it was determined that sediments with high concentrations of arsenic were entering the cistern. In 2017 and 2018, EPA collected soil samples on and around the location of previous mining operations. In 2018, EPA also conducted potable water sampling at seven residential properties located in the vicinity of the northern mine and the former mining operations, residential properties that have since been designated as part of the site. In 2019, EPA initiated quarterly drinking-water assessments.

In April 2019, the EPA Removal Program mobilized to perform interim measures to protect public health and reduce direct contact threats relative to surface soil by providing residents with indoor and outdoor door mats and boot brushes, excavating soil in dog pens and backfilling with woodchips, creating woodchip or stone walkways, covering residential high-use areas with woodchips and paving or adding stone to exposed earthen driveways. High efficiency particulate air vacuums, which contain filters capable of capturing extremely small particles, were provided to each household in an effort to reduce indoor dust.

NYSDOH released a Health Consultation on April 30, 2019, in which it evaluated shallow residential soils at the site. The conclusion in the Health Consultation was that short-term exposure of children to surface soils with the highest concentrations of arsenic poses an immediate and significant threat to human health, constituting an urgent public health hazard. It also contained a conclusion that long-term exposure of children and adults to arsenic in surface soils poses a significant threat to human health, constituting a public health hazard. EPA supported these conclusions in a Determination of Significant Threat memorandum, finding that all residential properties at the site contain exposure point concentrations that result in calculated risks or hazards to residents that are at or above the threshold for unacceptable risk. Additional action beyond the interim measures was recommended to protect the long-term health of affected residents. Also, on April 30, 2019, the Agency for Toxic Substances and Disease Registry issued a Public Health Advisory recommending that EPA take immediate short- and long-term measures to dissociate persons, especially children, from exposure to arsenic in shallow soils at the site.

Following the inclusion of the site on the National Priorities List on November 8, 2019, EPA commenced an FFS to identify and evaluate alternatives to dissociate the residents from exposure to arsenic-contaminated soils.

A final FFS report was completed on March 27, 2020.

RESULTS OF THE FIELD INVESTIGATIONS

To determine the extent of contamination from mining waste and to support a removal assessment at the site, EPA collected surface soil samples in August 2017, December 2017, and June 2018 at and around the mine and the residential properties. As part of this investigation, approximately 800 soil samples were collected and analyzed at 517 locations. Arsenic was detected in all soil samples, with concentrations ranging from 3.2 milligrams per kilogram (mg/kg) to 56,000 mg/kg.

The mine-related contamination remains uncontrolled at the site. In addition to baseline mine-related contamination associated with the mine and residential properties, it is likely that mine-related wastes have further spread or migrated to the residential properties as a result of surface water flow and aerial deposition from wind. In addition, in the development of the properties, there was the potential that mine-related wastes were redistributed within the residential area as a result of regrading activities.

The mine-related arsenic contamination is a principal threat waste (PTW), a source material that is considered to be highly toxic or highly mobile, that generally cannot be reliably contained, or will present a significant risk to human health or the environment should exposure occur.

SUMMARY OF SITE RISKS TO HUMAN HEALTH

Based upon the results of the field investigation, a four-step human health risk assessment (HHRA) process was undertaken to evaluate cancer risks and noncancer health hazards associated with arsenic in site surface soils. Under the HHRA, the current and potential future property conditions were considered presuming the absence of any additional remedial action. The four-step process is comprised of: Hazard Identification, Exposure Assessment, Toxicity Assessment, and Risk Characterization (see box "What is Risk and How is it Calculated" for more details on the risk assessment process).

The cancer risks and noncancer health hazard estimates in the HHRA and summarized below are based on current and potential future reasonable maximum exposure scenarios (upper bound exposures reasonably expected to occur) and were developed by taking into account various health protective estimates about the frequency and duration of an individual's exposure to arsenic, as well as its toxicity. The HHRA was performed using only soil concentrations of arsenic and the risk posed from accidental ingestion and dermal contact. The risk scenarios did not include risk from drinking water, vegetable gardens, *etc*. Risk from other media and other contaminants at the site, as well as PTW, will be evaluated under OU2.

The results of the risk assessment indicated that lifetime cancer risks exceed EPA's acceptable range of $1x10^{-6}$ to $1x10^{-4}$ for the reasonable maximum exposure (RME) scenario at six properties with calculated risks ranging from $2x10^{-4}$ to $1x10^{-2}$. Cancer risks were at the upper bound of the acceptable risk range for two additional properties. Child and adult resident cancer risks are primarily as a result of exposure via incidental ingestion of arsenic-contaminated surface soil and, to a lesser extent, exposure via dermal contact.

The total noncancer hazards are higher for child receptors (age 0-6) than for adults, indicating a greater potential for noncancer health effects for child residents. The total RME noncancer hazard indices (HIs) for child residents exceed EPA's hazard threshold of 1 for nine properties, with calculated hazards ranging from 2-300; the HI at the remaining property is equal to 1. For adult residents, the total RME noncancer HIs exceed EPA's threshold at five properties, with calculated hazards ranging from 2-30. Noncancer hazards for residents are driven primarily by potential exposure to arsenic via incidental ingestion of soil. Dermal contact with soil also contributed to elevated total HIs, but to a lesser extent than ingestion. Exposure to high concentrations of arsenic can impact several organ systems, including the skin and peripheral vascular system.

In the HHRA, residential exposure to arsenic in surface soils was evaluated. Risk estimates do not account for potential exposure to arsenic in other media (*e.g.,* groundwater, sediment, surface water) or to other contaminants that may be present because of historical mining operations; risk estimates may therefore be underestimated.

Summary

Based upon the results of the HHRA, supported by the 2019 Health Consultation, Determination of Significant Threat memorandum, and Public Health Advisory, EPA has determined that actual or threatened releases of hazardous substances at the site, if not addressed by the preferred alternative or one of the other active measures considered, may present a current or potential threat to human health.

REMEDIAL ACTION OBJECTIVE

Remedial action objectives are specific goals to protect human health and the environment. These objectives are based on available information and standards, such as applicable or relevant and appropriate requirements (ARARs), to-be-considered guidance, and site-specific risk-based levels.

The remedial action objective established for the site is to reduce or eliminate residential exposure to arsenic-contaminated surface soils.

SUMMARY OF REMEDIAL ALTERNATIVES

CERCLA §121(b)(1), 42 U.S.C. §9621(b)(1), mandates that remedial actions must be protective of human health and the environment, cost-effective, comply with ARARS, and utilize permanent solutions and alternative treatment technologies and resource recovery alternatives to the maximum extent practicable. Section 121(b)(1) also establishes a preference for remedial actions that employ, as a principal element, treatment to permanently and significantly reduce the volume, toxicity, or mobility of the

WHAT IS RISK AND HOW IS IT CALCULATED?

A human health risk assessment is an analysis of the potential adverse health effects caused by hazardous substance(s) release(s) at a site in the absence of any actions to control or mitigate these under current- and future-land uses. A four-step process is utilized for assessing site-related human health risks for reasonable maximum exposure scenarios.

Hazard Identification: In this step, the chemicals of potential concern (COPCs) at a site in various media (*i.e.*, soil, groundwater, surface water, and air) are identified based on such factors as toxicity, frequency of occurrence, and fate and transport of the contaminants in the environment, concentrations of the contaminants in specific media, mobility, persistence, and bioaccumulation.

Exposure Assessment: In this step, the different exposure pathways through which people might be exposed to the contaminants in air, water, soil, etc. identified in the previous step are evaluated. Examples of exposure pathways include incidental ingestion of and dermal contact with contaminated soil and ingestion of and dermal contact with contaminated groundwater. Factors relating to the exposure assessment include, but are not limited to, the concentrations in specific media that people might be exposed to and the frequency and duration of that exposure. Using these factors, a "reasonable maximum exposure" scenario, which portrays the highest level of human exposure that could reasonably be expected to occur, is calculated.

Toxicity Assessment: In this step, the types of adverse health effects associated with chemical exposures and the relationship between magnitude of exposure and severity of adverse effects are determined. Potential health effects are chemical-specific and may include the risk of developing cancer over a lifetime or other noncancer health hazards, such as changes in the normal functions of organs within the body (*e.g.*, changes in the effectiveness of the immune system). Some chemicals are capable of causing both cancer and noncancer health hazards.

Risk Characterization: This step summarizes and combines outputs of the exposure and toxicity assessments to provide a quantitative assessment of site risks for all COPCs. Exposures are evaluated based on the potential risk of developing cancer and the potential for noncancer health hazards. The likelihood of an individual developing cancer is expressed as a probability. For example, a 1×10^{-4} cancer risk means a "one in ten thousand excess cancer risk"; or one additional cancer may be seen in a population of 10,000 people as a result of exposure to site contaminants under the conditions identified in the Exposure Assessment. Current Superfund regulations for exposures identify the range for determining whether remedial action is necessary as an individual excess lifetime cancer risk of 1×10^{-4} to 1×10^{-6}, corresponding to a one in ten thousand to a one in a million excess cancer risk. For noncancer health effects, a "hazard index" (HI) is calculated. The key concept for a noncancer HI is that a threshold (measured as an HI of less than or equal to 1) exists below which noncancer health hazards are not expected to occur. The goal of protection is 1×10^{-6} for cancer risk and an HI of 1 for a noncancer health hazard. Chemicals that exceed a 1×10^{-4} cancer risk or an HI of 1 are typically those that will require remedial action at a site and are referred to as contaminants of concern (COCs) in the ROD.

hazardous substances, pollutants, and contaminants at a site. CERCLA §121(d), 42 U.S.C. §9621(d), further specifies that a remedial action must attain a level or standard of control of the hazardous substances, pollutants, and contaminants that at least attains ARARs under federal and state laws, unless a waiver can be justified pursuant to CERCLA §121(d)(4), 42 U.S.C. §9621(d)(4).

Detailed descriptions of the remedial alternatives to dissociate the residents from exposure to arsenic-contaminated areas at the site can be found in the FFS report. The FFS report presents three alternatives to dissociate the residents from exposure to arsenic-contaminated areas. The remedial alternatives are:

Alternative 1: No Action

Capital Cost:	$0
Annual Operation and Maintenance (O&M) Cost:	$0
Present-Worth Cost:	$0
Implementation Time:	0 months

The Superfund regulations require that the "no-action" alternative be considered as a baseline for comparison with the other alternatives. The no-action remedial alternative does not include any physical remedial measures to dissociate the residents from exposure to arsenic-contaminated areas.

Alternative 2: Monitoring and Maintenance of Existing Protective Measures

Capital Cost:	$161,000
Annual O&M Cost:	$330,000
Present-Worth Cost:	$2,641,000
Implementation Time:	6 months

This alternative consists of monitoring and maintenance of the existing protective measures. The monitoring and maintenance program would ensure the effectiveness of these measures in eliminating exposure pathways in areas that these measures were installed.

Monitoring activities would include, among other things, performing visual inspections to assess the integrity of the outdoor and indoor protective measures. For cost-estimating purposes it was assumed that monitoring and maintenance activities would be performed twice per year.

The outdoor protective measures to be monitored and maintained include paving, stone pathways, and installed woodchip and mulch covers. If visual inspection indicates there is a breach in the integrity of the woodchip, stone, or pavement covers, repairs of the covers would be completed. This would involve adding woodchips, adding stone, or sealing cracks in pavement. Maintenance would include replacement of outdoor doormats and boot brushes.

The indoor protective measures to be monitored and maintained include indoor door mats and high-efficiency particulate air vacuums.

This alternative would also include ICs (*e.g.,* easements) to limit current and future use of the properties.

It is estimated that it would require six months to implement the ICs and prepare a plan related to the ongoing monitoring and maintenance of the existing protective measures.

It is assumed that the monitoring and maintenance would be performed for 10 years (the estimated time to perform the OU2 investigation and select, design, and implement an OU2 remedy).

Alternative 3: Property Acquisition, Permanent Relocation, Demolition

Capital Cost:	$5,603,000
Annual O&M Cost:	$330,000
Present-Worth Cost:	$5,828,000
Implementation Time:	1.5 years

This alternative consists of offers of property acquisition and permanent relocation. Affected property owners would be compensated for the acquired real property, and affected residents would receive relocation assistance. Following permanent relocation, vacated structures would be demolished. Superfund-related permanent relocations and property acquisitions would be conducted under the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended.

Real property would be appraised in accordance with federal standards to determine the comparable replacement-housing value, and an offer to purchase would be made to each residential property owner.

Permanent relocation would include federal financial and logistical support for residents to move out of the OU1 study area permanently. Residents would be assisted in the relocation process, including identifying and moving into replacement residences.

Until the residents from each affected residence are permanently relocated, or until the completion of the OU2 effort (if there are residents that decline to be relocated), monitoring and maintenance of the existing protective measures (see Alternative 2 for details) would continue at each respective residence to ensure the effectiveness of these measures in eliminating exposure pathways in areas that these measures were installed. For cost-estimating purposes, it is presumed that the monitoring and maintenance would be performed at each residence every six months for one year.

The residential structures would be demolished following property acquisition and relocation to remove potential exposure and safety hazards associated with the continued existence of unoccupied, unmaintained structures until completion of the OU2 effort.

Engineering controls (*i.e.,* fencing) would be utilized to prevent trespassing once the structures are vacated.

This alternative would also include ICs (*e.g.,* easements) to limit current use and to prevent future residential use of the properties as well as the preparation of a plan related to the monitoring and maintenance of the existing protective measures until the residents from each affected residence are permanently relocated or until completion of the OU2 effort.

It is estimated that it would require one year to acquire the properties, relocate the residents, and demolish the structures, and an additional six months to implement the ICs.

COMPARATIVE ANALYSIS OF ALTERNATIVES

During the detailed evaluation of remedial alternatives, each alternative is assessed against nine evaluation criteria, namely, overall protection of human health and the environment, compliance with applicable or relevant and appropriate requirements, long-term effectiveness and permanence, reduction of toxicity, mobility, or volume through treatment, short-term effectiveness, implementability, cost, and state and community acceptance.

The evaluation criteria are described below.

- Overall protection of human health and the environment addresses whether a remedy provides adequate protection and describes how risks posed through each exposure pathway (based on a reasonable maximum exposure scenario) are eliminated, reduced, or controlled through treatment, engineering controls, or ICs.
- Compliance with ARARs addresses whether a remedy would meet all of the applicable or relevant and appropriate requirements of other federal and state environmental statutes and requirements or provide grounds for invoking a waiver.
- Long-term effectiveness and permanence refers to the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup goals have been met. It also addresses the magnitude and effectiveness of the measures that may be required to manage the risk posed by treatment residuals and/or untreated wastes.
- Reduction of toxicity, mobility, or volume through treatment is the anticipated performance of the treatment technologies, with respect to these parameters, that a remedy may employ.
- Short-term effectiveness addresses the period needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the implementation period until cleanup goals are achieved.
- Implementability is the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular alternative.
- Cost includes estimated capital and O&M costs, and net present-worth costs.
- State acceptance indicates if, based on its review of the FFS and Proposed Plan, the state concurs with the preferred alternative at the present time.
- Community acceptance will be assessed in the ROD and refers to the public's general response to the alternatives described in the Proposed Plan and the FFS report.

A comparative analysis of these alternatives based upon the evaluation criteria noted above follows.

Overall Protection of Human Health and the Environment

Alternative 1 would not be protective of human health because residents would remain on their properties and the existing protective measures would not be maintained. Alternatives 2 and 3 would be protective of human health because both of the alternatives would rely upon a remedial strategy to prevent residential exposure to contaminated surface soils. However, Alternative 3 would be somewhat more protective of human health than Alternative 2 because the residential dissociation from surface soils would be permanent and no maintenance would be required to ensure effectiveness. Additionally, Alternative 2 would rely more on ICs to prevent residents from exposure to contaminated soils where protective measures were not employed than Alternative 3.

Compliance with ARARs

Because no action would be taken under Alternative 1, no chemical-, location-, or action-specific ARAR would be triggered.

Alternative 2’s maintenance activities and Alternative 3’s demolition activities would be implemented in accordance with pertinent action-specific ARARs. Air Quality Standards would be pertinent to the demolition activities associated with Alternative 3. Permanent relocation and property acquisition to be performed under Alternative 3 would be performed in accordance with the requirements of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 and its implementing regulations.

Long-Term Effectiveness and Permanence

Alternative 1 would involve no active remedial measures and, therefore, would not be effective in eliminating the potential exposure to contaminants in the surface soil.

Alternative 2 would rely on monitoring and maintenance of the existing protective measures to provide protection until a permanent remedy is selected, designed, and implemented, which could take up to 10 years. While a monitoring and maintenance plan would be tailored to address this, in the interim, properties have the potential to be re-contaminated because tailing waste would not be contained. Additionally, Alternative 2 would require ICs (*e.g.,* easements) that would limit the full use of the properties. Alternative 3 would provide protection in the long-term, as the residents would be permanently relocated from their contaminated properties, thereby eliminating any exposure to arsenic-contaminated surface soils. Under this alternative, the residential structures would be demolished following property acquisition and relocation of the residents so as to remove potential exposure and safety hazards associated with the continued existence of unoccupied, unmaintained structures until completion of the OU2 effort.

Reduction in Toxicity, Mobility, or Volume Through Treatment

Reduction of toxicity, mobility, and/or volume through treatment would not occur under any of the alternatives; however, it is anticipated that this criterion will be addressed as part of OU2.

Short-Term Effectiveness

Because Alternative 1 does not include any physical construction measures in any areas of contamination, this alternative would present the least potential adverse impacts to remediation workers or the community as a result of its implementation.

The maintenance and soil sampling activities under Alternative 2 would pose some risk to remediation workers and nearby residents. This exposure could, however, be mitigated by following appropriate health and safety protocols, which include following a site-specific community air monitoring program (CAMP), exercising sound engineering practices, and by utilizing proper protective equipment. Under Alternative 3, the use of heavy equipment during demolition activities would cause disturbance of the surface soils and the generation of contaminated dust, resulting in the potential for contaminant migration to the environment. There would also be the potential for increased local traffic. The dust-related impacts would be mitigated through the implementation of decontamination measures and dust suppression practices. A traffic control plan would be implemented to reduce the potential for traffic accidents. Workers would encounter arsenic-contaminated surface soils during their work and, potentially, hazardous building materials during abatement. This exposure could, however, be mitigated by following appropriate health and safety protocols, which include following a site-specific CAMP, exercising sound engineering practices, and by utilizing proper protective equipment.

Because no actions would be performed under Alternative 1, there would be no implementation time. Under Alternative 2, it is estimated that it would require six months to implement the ICs and prepare a plan related to the monitoring and maintenance of the existing protective measures. Under Alternative 3, it is estimated that it would require one year to prepare a plan related to the monitoring and maintenance of the existing protective measures, relocate the residents and demolish the structures, and six months to implement the ICs.

Implementability

Alternative 1 would be the easiest alternative to implement, as there are no activities to undertake.

Under Alternative 2, the maintenance of the existing protective measures would be easy to implement, because it is a continuation of the maintenance of existing protective measures that is currently being conducted. There would be administrative implementability challenges, as it would require coordination with Putnam County and the property owners to implement the ICs.

Equipment, services, and materials needed for the demolition of the houses under Alternative 3 are readily available, and the actions under this alternative would be administratively feasible. Implementability relative to Alternative 3 would rely on resident cooperation for property acquisition, permanent relocation, and maintenance of existing protective measures.

Cost

The present-worth cost associated with Alternative 2 is calculated using a discount rate of seven percent and a 10-year time interval. The present-worth cost associated with Alternative 3 is calculated using a discount rate of seven percent and a one-year time interval.

Alternative 3 includes the demolition of the residential structures following property acquisition and relocation of the residents. If the vacated structures are not demolished to remove potential exposure and safety hazards associated with the continued existence of unoccupied, unmaintained structures, security measures would need to be implemented. The security measures for these structures for an estimated 10 years would likely be more costly than demolishing the structures.

The estimated capital, O&M, and present-worth costs for each of the alternatives are presented below.

Alternative	Capital	Annual O&M	Total Present Worth
1	$0	$0	$0
2	$161,000	$330,000	$2,641,000
3	$5,603,000	$330,000	$5,828,000

State Acceptance

NYSDEC concurs with the proposed alternative.

Community Acceptance

Community acceptance of the preferred alternative will be addressed in the ROD following review of the public comments received on the Proposed Plan during the public comment period.

PREFERRED ALTERNATIVE

Based upon an evaluation of the various alternatives, EPA, in consultation with NYSDEC, recommends Alternative 3, property acquisition, in which the residents are compensated for the real property that is being offered to be acquired; relocation assistance, in which the residents are assisted in identifying and moving into replacement residences; and demolition of the vacated structures, as the preferred alternative to dissociate the residents from exposure to arsenic-contaminated areas. This alternative would also include ICs (*e.g.,* easements) to limit current and future use of the properties. Until the residents from each affected residence are permanently relocated, or until the completion of the OU2 effort (if there are residents that decline to be relocated), monitoring and maintenance of the existing protective measures would continue at each respective residence to ensure the effectiveness of these measures in eliminating exposure pathways in areas that these measures were installed. Engineering controls (*i.e.,* fencing) would be utilized to prevent trespassing once structures are vacated.

Basis for the Remedy Preference

While Alternative 3 is more expensive than Alternative 2, EPA considered the balance between the cost difference and the uncertainty of when a decision regarding a final remedy (OU2) would be made and when it would be designed and implemented (estimated 10 years). In addition, it is the most protective because the data indicates that the properties may become re-contaminated because the source is not contained.

The preferred alternative is believed to provide the greatest protection of human health and the environment, provide the greatest long-term effectiveness, and is cost effective. Therefore, it has been determined that the preferred alternative will provide the best balance of tradeoffs among alternatives with respect to the evaluating criteria. EPA, with the concurrence of NYSDEC, believes that the preferred alternative will be protective of human health and the environment, comply with ARARs, be cost-effective, and utilize permanent solutions to the maximum extent practicable.

The environmental benefits of the preferred alternative may be enhanced by consideration of technologies and practices that are sustainable in accordance with EPA Region 2's Clean and Green Energy Policy and NYSDEC's Green Remediation Policy.[1] This will include consideration of green remediation technologies and practices.

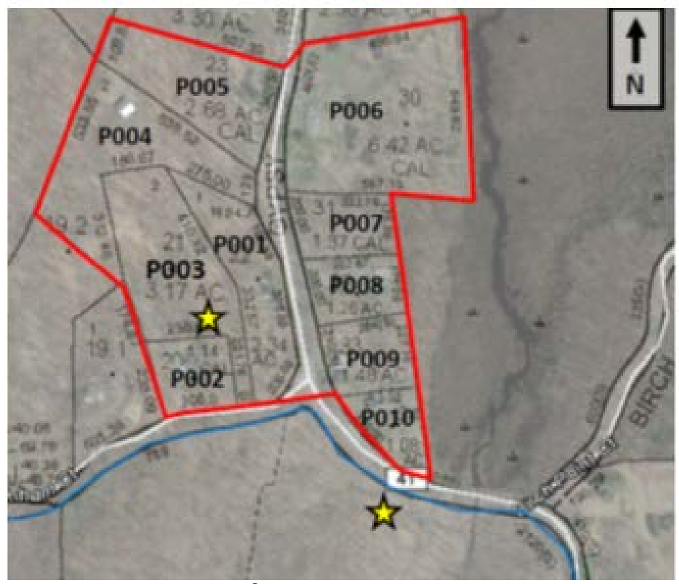

Figure 1—Site Plan[2]

[1] See http://epa.gov/region2/superfund/green_remediation and http://www.dec.ny.gov/docs/remediation_hudson_pdf/der31.pdf.

[2] The stars denote the locations of the mine entry shafts. The southern mine shaft is located in the Nimham Mountain Multi-Use Area, a state recreational area.