OHIO ENVIRONMENTAL PROTECTION AGENCY

DECISION DOCUMENT
FOR THE

SHIELDALLOY METALLURGICAL CORPORATION SITE
CAMBRIDGE, OHIO

April 1, 1997

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1.0 INTRODUCTION

The Shieldalloy Metallurgical Corporation facility is located near Cambridge, Ohio on State Route 209, Guernsey County, Ohio ("the Site"). The Shieldalloy facility has produced vanadium and other metal alloys since the 1950s. The facility has disposed much of its wastes, including radioactive slags and vanadium-contaminated soils, at the Site. The Site includes two slag piles, known as the East Slag Pile and the West Slag Pile, that span 11 acres. The Site also has contamination in soils, wetlands, and Chapman Run.

Ohio EPA prepared a Preferred Plan to describe its proposed strategy to abate pollution at, and prevent migration of wastes from, the Site. On or about December 13, 1996, Ohio EPA publicly announced the availability of the Preferred Plan and requested comments from interested members of the public. The Byesville Public Library held for public review copies of the Preferred Plan and other documents relevant to remediation of the site. On January 6, 1997, Ohio EPA held a public information session on the Preferred Plan at the Guernsey County Public Library. On January 22, 1997, Ohio EPA held a public hearing on the Preferred Plan at the Pritchard Laughlin Center, Cambridge. Ohio EPA extended the public comment period to February 28, 1997 as a result of a request from an interested member of the public.

Ohio EPA has considered the public comments. Attached to this document is Ohio EPA's Responsiveness Summary, which describes the comments Ohio EPA received and Ohio EPA's responses to them.

This Decision Document describes the remedial action selected by Ohio EPA for the Shieldalloy Site. This Decision Document has three parts. First, it describes the history of the Site, including facility operations, waste generation and disposal, and state and federal oversight. Second, this Decision document summarizes the remedial investigation and feasibility study report for the Site. The remedial investigation is a study of the type and extent of the contamination at the Site. The feasibility study is a description of options for addressing the contamination.

Ohio EPA oversaw the development of the remedial investigation and feasibility (RI/FS) study by Shieldalloy Metallurgical Corporation and Cyprus Foote Mineral Company (former Site owner). These companies prepared the RI/FS report under the requirements of an agreed court order. On July 11, 1995, the Guernsey County Court of Common Pleas issued the order (Consent Order for Preliminary Injunction) in the case of *State of Ohio, ex rel Montgomery v. Shieldalloy Metallurgical Company and Cyprus Foote Mineral Company,* Case No. 95CV242.

The third part of this Decision Document is a description of the remedy selected by Ohio EPA for abating pollution at, and preventing migration of wastes from, the Site. Ohio EPA's selected remedy for the Shieldalloy Site includes:

1. Excavate and remove contaminated sediments and soils from the Site;

- The slag in the East Slag Pile is more likely to be used in the future, therefore, adding offsite slag and excavated soils would only make future excavation and use of the slag more difficult.

As with the previous alternative, this alternative would contain the slag by constructing one of the following caps:

- Completing the existing decommissioning cap, including capping the offsite slag consolidated with the Pile,

- Constructing a solid waste cap over the entire Slag Pile, including the offsite slag consolidated with the Pile,

- Constructing a hazardous waste cap over the entire Slag Pile, including the offsite slag consolidated the Pile.

Cost Estimates for Capping with Offsite Slag

Decommissioning Cap:

Capital Costs	$2,318,400
Operation and Maintenance (O&M)	$ 657,650
Total Present Worth	$2,976,000

Solid Waste Cap:

Capital Costs	$3,319,700
Operation and Maintenance (O&M)	$ 657,650
Total Present Worth	$3,977,000

Hazardous Waste Cap

Capital Costs	$5,717,600
Operation and Maintenance (O&M)	$ 657,650
Total Present Worth	$6,375,000

4.1.4 Removal and Offsite Disposal

This alternative involves removing all of the material in the West Slag Pile and disposing of it in an offsite licensed disposal facility. For the purpose of this report, it is assumed that the slag would be loaded into rail cars and transported to the Envirocare facility in Clive, Utah for disposal. The estimated volume of material (including slag, soil, and Chemfix®) in the West Slag Pile (including

2. Place excavated sediments and soils on top of the West Slag Pile;

3. Cap the West Slag Pile in accordance with state solid waste rules under Ohio Administrative Code Chapter 3745-27;

4. Ensure long term care of the West Slag Pile and;

5. For the East Slag Pile:

a.if feasible, sell and legally remove East Slag Pile materials, expeditiously; and/or

b.if the foregoing is not feasible, then cap the East Slag Pile in accordance with state solid waste rules under Ohio Administrative Code Chapter 3745-27 and ensure long term care.

The remedy selected by Ohio EPA is substantially the same as the remedy proposed by Ohio EPA in the Preferred Plan. The remedy meets applicable, relevant and appropriate requirements. Treatment of the radioactivity in the slag is not practicable. According to the RI/FS report, the projected cost of this remedy is $10.3 million. For a more complete description of Ohio EPA's selected remedy, see section 5.0 of the Decision Document. Actual or threatened releases of hazardous substances from the Site, if not addressed by implementing the remedy selected in this Decision Document, may endanger public health, welfare or the environment. This Decision Document does not preclude Ohio EPA from seeking other remediation at the Site in the future in a manner not inconsistent with the U.S. Environmental Protection Agency's National Contingency Plan (NCP) at Title 40 of the Code of Federal Regulations, Part 300. Procedures under the NCP call for periodic review to ensure that the remedy will protect human health and the environment. This Decision Document does not address remediation of Cambridge area locations away from the Site where radioactive slag from the facility was used as fill material.

2.0 SITE HISTORY

2.1 Site Location

This Decision Document concerns property that is located on Route 209 about 1.5 miles south of Interstate 70 near Cambridge, Ohio in Guernsey County ("the Site"). The Site features are shown in Figure 1. A detailed topographic map is presented in Figure 2. The Site is located approximately 1 mile southwest of the municipal limits of Cambridge, Ohio. The Site is roughly triangular and covers approximately 130 acres. To the north, between the facility and Cambridge, lies open land, several residences and an interstate interchange (Interstates 70 and 77), with several hotels and other businesses north of Interstate 70. The closest residence is approximately one quarter of a mile northeast of the facility. Route 209, an industrial park, and a country club lie to the southwest. To the immediate north and south are former strip mines and open land. Chapman Run, a tributary to Wills Creek, lies to the west of the facility. A school is located to the south of the facility. To the east are a few residences, open fields, and Interstate 77. The town of Byesville is approximately 1 mile southeast of the facility.

2.2 Facility Ownership and Operation

Prior to 1952, the Site had been the location of a racetrack and farmland. Vanadium Corporation of America constructed the facility in 1952, and began production operations in 1953. Over the next 15 years, Vanadium Corporation of America operated the facility, which included a 2.5-megawatt arc furnace for separating vanadium and other valuable metals from ores and other raw materials. In 1956, the company added chemical manufacturing operations and a chemical laboratory, including a Pilot Plant to support research and development.

In 1967, Foote Mineral Corporation, a subsidiary of Newmont Mining Company, merged with Vanadium Corporation of America. Foote Mineral added a 7.5 megawatt arc furnace and a baghouse in 1970, and a second baghouse in 1976.

Shieldalloy Metallurgical Corporation ("Shieldalloy") acquired the facility from Foote Mineral Corporation in May 1987. Shieldalloy is a subsidiary of Metallurg, Inc. In 1991, Shieldalloy added to the facility a roaster and a new pole barn for ore storage. For a more detailed history of the Site, see *Onsite Slag Characterization and Distribution at the Shieldalloy Metallurgical Corporation Site in Cambridge, Ohio* (PTI 1995b). This document is available at the Byesville Public Library, along with other documents relevant to remediation of the Site.

2.3 Metal Alloy Production

Alloy production began at the Site in 1953, and the facility is still in operation today. The primary products manufactured at the facility are vanadium alloys (ferrovanadium and Ferovan®), which account for approximately 80 percent of the total production. In addition, the facility has

manufactured lesser quantities of Grainal®, Solvan®, ferrotitanium, ferroboron, and ferrocolumbium. The Pilot Plant has produced small quantities of vanadium chemical compounds. The facility used ores or other raw materials containing naturally occurring radioactivity in the production of some alloys (e.g., ferrocolumbium, ferrovanadium and Grainal®).

2.4 License for Ferrocolumbium Slag under the Atomic Energy Act

In 1953, Vanadium Corporation of America obtained an operating license from the Atomic Energy Commission (AEC) to possess a raw material known as niobium ore (formally known as columbium ore) which contained uranium and thorium (Atomic Energy Commission license SMB-00850). From 1953 to 1973, Vanadium Corporation of America and Foote Mineral produced ferrocolumbium alloy under the license. In 1975, the operating license expired and was not renewed.

In 1987, when it purchased the facility from Foote Mineral, Shieldalloy applied for and received a license from the AEC's successor, the Nuclear Regulatory Agency (NRC), on May 29, 1987 (license SMB-1507). The license is for the possession of the radioactive slag and not for production. Shieldalloy has not manufactured ferrocolumbian during its ownership of the site.

2.5 Slag and Other Wastes

For every metal alloy produced, the facility generated a corresponding waste slag. The facility generated three types of radioactive slag (ferrocolubium, ferrovanadium, and Grainal® slags) and about five types of nonradioactive slags. The facility also generated baghouse dust and other wastes.

Since it began operation, and continuing until the late 1980s, the facility disposed of most of its waste slags and other wastes in various areas across the Site. The facility disposed of waste slag in the West Slag Pile, the East Slag Pile and the Grainal® Slag Pile. The West Slag Pile contains most types of radioactive and nonradioactive slag. The East Slag Pile contains all types of radioactive slags and some nonradioactive slags.

The Grainal Slag Pile contained both radioactive and nonradioactive slag. Grainal slag produced prior to 1987 is radioactive because the zircon sand used to manufacture the Grainal contains naturally occurring uranium and thorium. Grainal Slag produced after 1987 does not contain radioactive material. Starting in 1987, Grainal was manufactured using a non-radioactive feed material (zircalloy). This resulted in a slag which was non-radioactive. This non-radioactive slag was placed on the Grainal Slag Pile from 1987 to 1989 when the slag pile was consolidated with East Slag Pile.

In 1987, when Shieldalloy purchased the facility, the facility had waste stored at various locations on the Site, including the East and West Slag Piles, the Grainal® Slag Pile and the Baghouse Dust area (Figure 3). The Site also had soils contaminated with radioactive wastes and nonradioactive

hazardous wastes, as a result of operations such as the handling of raw material and slags.

2.6 NRC Oversight

NRC is overseeing certain decontamination/decommissioning work at the Site under the Atomic Energy Act and the National Environmental Policy Act.

2.6.1 Partial Decommissioning Under the Atomic Energy Act

In 1988, Shieldalloy submitted a decommissioning plan to NRC to decommission (remediate) ferrocolumbium slag at the Site. In 1989, Shieldalloy excavated approximately 140,000 tons of soil and slag, contaminated with chemical and radiological wastes, from sixteen operational areas around the Site (Figure 3), and placed them on top of the West Slag Pile. The soil from the operational areas was excavated on the basis of radiological characteristics only. Shieldalloy then reshaped the West Slag Pile for erosion control, and protected the exposed base from seasonal flooding.

After the placing the soil/slag material on the West Slag Pile, Shieldalloy also placed treated and untreated baghouse dust on this pile. In particular, Shieldalloy placed on the pile Ferovan baghouse dust (treated through the Chemfix treatment process) and 1600 tons of untreated baghouse dust. The baghouse dust had high concentrations of hexavalent chromium, total chromium, and lead. The baghouse dust was treated with ferrous sulfate to reduce the hexavalent chromium to trivalent chromium. This was followed by treatment in the Chemfix solidification process. The resulting slurry was pumped to containment cells constructed in a circular arrangement on the West Slag Pile.

Following the placement of the treated (Chemfix) and untreated baghouse dusts, Shieldalloy covered this material with a geotextile and twelve inches of sand. These decommissioning activities brought the volume of the West Slag Pile to 548,000 tons of material with a surface area of 8.2 acres.

In 1989, Shieldalloy moved the 14,000 ton Grainal® Slag Pile to the top of the East Slag Pile. This consolidation increased the volume of the East Slag Pile to approximately 58,000 tons. Following the placement of the treated (Chemfix) and untreated baghouse dusts, Shieldalloy covered this material with a geotextile and twelve inches of sand.

In 1990, while performing decommissioning activities, Shieldalloy learned from NRC that the level of radioactivity in the waste slags, soils, and sediments at the Site was higher than what NRC had expected, and that NRC would impose additional requirements. Shieldalloy then stopped the decommissioning activities, leaving the West Slag Pile partially capped and the East Slag Pile uncapped.

In 1992, Shieldalloy installed a fence around the East Slag Pile consistent with NRC requirements. A purpose of the fence is to secure licensed material from unauthorized removal.

2.6.2 Environmental Impact Statement under NEPA

In March 1990, NRC listed the Site in its Site Decommissioning Management Plan (SDMP). On November 26, 1993, NRC published a Notice of Intent to prepare an Environmental Impact Statement (EIS) for the Site in accordance with the National Environmental Policy Act (NEPA) of 1969. In May 1994, NRC issued a report summarizing NRC's EIS scoping process. On July 26, 1996, NRC announced the availability of its Draft EIS for the Site for public review. 58 *Federal Register* 62384. NRC's Draft EIS presents five options for addressing certain radioactive contamination at the Site: onsite stabilization and containment; offsite disposal; onsite separation processing with offsite disposal; onsite dilution processing and disposal; and no action.

NRC prepared its Draft EIS based, in part, on information provided in drafts of the Remedial Investigation/Feasibility Study report for the Site. Shieldalloy and Cyprus Foote prepared the Remedial Investigation/ Feasibility Study report in response to an agreed court order in a court case filed by the State of Ohio.

2.7 Ohio EPA Oversight

The Ohio EPA is overseeing remediation/cleanup of all contaminants at the Site (including radioactive wastes, nonradioactive hazardous wastes and other wastes) consistent with Federal and state law as discussed below.

2.7.1 Remediation/Cleanup Process under CERCLA

Federal law establishes a six step process for remediating/cleaning up contaminated sites. The federal law that establishes these steps is known as the Comprehensive Environmental Response, Compensation and Liabilities Act (CERCLA), 42 U.S.C. 9601, et seq. The six major steps are[1]:

1) Remedial Investigation (RI);
2) Feasibility Study (FS);
3) Remedy Selection;
4) Remedial Design (RD);
5) Remedial Action (RA); and
6) Operation and Maintenance (O&M).

Ohio EPA typically carries out these six steps in the following manner. Persons or companies that contributed to the contamination carry out the first two steps under Ohio EPA oversight. The Remedial Investigation (RI) identifies the type of contaminants present at or near the Site, assesses the degree of contamination, and characterizes the actual and potential risks to the community and

[1]For more information, see United States Environmental Protection Agency's National Contingency Plan, 40 CFR 300.

environment. The Feasibility Study (FS) then evaluates several alternative remedies to address contaminants at the Site.

Upon completion of the Remedial Investigation/Feasibility Study (RI/FS) report, Ohio EPA prepares a Preferred Plan that summarizes the Remedial Investigation/Feasibility report and describes Ohio EPA's proposed remedy for the Site. Ohio EPA then holds a public comment period of at least 30 days. This period allows the public an opportunity to learn about the remedy proposed for the Site and offer input.

After considering public comments, Ohio EPA prepares a Decision Document that selects a long-term remediation/cleanup action ("remedy") to protect human health and the environment. Ohio EPA also prepares a Responsiveness Summary that addresses pertinent questions and concerns submitted by the public.

Then, the persons or companies that contributed to the contamination develop detailed plans to carry out the selected remedy. This is called the Remedial Design (RD) stage. When the design is complete and approved, the responsible persons or companies carry out the selected remedy. This step is called the remedial action (RA) stage. The RA stage implements of the Remedial Design. The RA stage may involve construction activity.

When the Remedial Action (RA) is complete, Operation and Maintenance (O&M) may be required if waste materials are left at the Site. O&M may include ongoing monitoring and maintenance of permanent structures.

2.7.2 Remedial Investigation / Feasibility Study

On July 11, 1995, the State of Ohio filed a Complaint concerning the Site in the Guernsey County Court of Common Pleas. The Complaint asks the Court to order Shieldalloy and Cyprus Foote to remediate all contamination at the Site (including radioactive wastes, nonradioactive hazardous wastes and other wastes), to reimburse the State of Ohio for its costs in overseeing the remediation, and to take other actions. The case is docketed as *State of Ohio, ex rel Montgomery v. Shieldalloy Metallurgical Company and Cyprus Foote Mineral Company*, Case No. 95CV242.

On July 11, 1995, the Guernsey County Court of Common Pleas issued in the case a Consent Order for Preliminary Injunction (COPI). The COPI is an agreed order that requires Shieldalloy and Cyprus Foote to conduct a remedial investigation/feasibility study for the Site under Ohio EPA oversight.

The companies performed an Remedial Investigation/Feasibility (RI/FS) for the Site under Ohio EPA oversight. On January 17, 1997, Ohio EPA conditionally approved the RI/FS report.

2.7.3 Preferred Plan

On December 13, 1996, Ohio EPA issued for public comment its Preferred Plan for the Site. The Preferred Plan set forth Ohio EPA's proposed plan for remediation of the site. Ohio EPA's proposed plan included excavating and removing contaminated sediments and soils and capping the West Slag Pile. The proposed plan also included selling and legally removing the East Slag Pile, if feasible. If this is not feasible, the proposed plan was to cap the East Slag Pile.

2.7.4 Public Participation

Ohio EPA afforded interested members of the public the following opportunities to learn more about or comment on Ohio EPA's Preferred Plan for the Site:

1. Document Review - The Byesville Public Library held for public review copies of the Preferred Plan and other documents relevant to the Site. Ohio EPA files were open for public review at the agency's Southeast District Office in Logan, Ohio.

2. Discussion with Ohio EPA officials - On January 6, 1997, Ohio EPA officials held a public information session at the Guernsey County Public Library. On January 22, 1997, Ohio EPA officials held a second information session. Also, Ohio EPA officials were available at their offices to discuss the Site with interested members of the public.

3. Opportunities to Comment - On January 22, 1997, Ohio EPA officials held a public hearing to receive comments. Ohio EPA also received written comments. Ohio EPA extended the period for submitting written comments to February 28, 1997, as a result of a request from an interested member of the public.

4. Public Notice - Ohio EPA provided public notice of these events and opportunities through press releases and newspaper announcements.

2.7.5 Decision Document

This Decision Document is the document in which Ohio EPA selects a remedy for the Shieldalloy Site. This Decision Document describes the history of the site, summarizes the RI/FS report, and selects a remedy. The remedy that Ohio EPA selects for the Site includes:

1. Excavate and remove contaminated sediments and soils from the Site;

2. Place excavated sediments and soils on top of the West Slag Pile;

3. Cap the West Slag Pile in accordance with state solid waste rules under Ohio Administrative Code Chapter 3745-27;

4. Ensure long term care of the West Slag Pile and;

5. For the East Slag Pile:

   a. if feasible, sell and legally remove East Slag Pile materials, expeditiously; and/or

   b. if the foregoing is not feasible, then cap the East Slag Pile in accordance with state solid waste rules under Ohio Administrative Code Chapter 3745-27 and ensure long term care.

The remedy selected by Ohio EPA is substantially the same as the remedy proposed by Ohio EPA in the Preferred Plan. The remedy meets applicable, relevant and appropriate requirements. Treatment of the radioactivity in the slag is not practicable. According to the RI/FS report, the projected cost of this remedy is $10.3 million. For a more complete description of Ohio EPA's selected remedy, see section 5.0 of the Decision Document. Actual or threatened releases of hazardous substances from the Site, if not addressed by implementing the remedy selected in this Decision Document, may endanger public health, welfare or the environment. This Decision Document does not preclude Ohio EPA from seeking other remediation at the Site in the future in a manner not inconsistent with the U.S. Environmental Protection Agency's National Contingency Plan (NCP) at Title 40 of the Code of Federal Regulations, Part 300. Procedures under the NCP call for periodic review to ensure that the remedy will protect human health and the environment. This Decision Document does not address remediation of Cambridge area locations away from the Site where radioactive slag from the facility was used as fill material.

Attached to this Decision Document is Ohio EPA's Responsiveness Summary. The Responsiveness Summary summarizes the public comments Ohio EPA received on the Preferred Plan and Ohio EPA's responses to them.

3.0 NATURE AND EXTENT OF CONTAMINATION

In 1995 and 1996, Shieldalloy and Cyprus Foote conducted a remedial investigation under an agreed court order in a case brought by the State of Ohio in the Guernsey County Court of Common Pleas. Ohio EPA reviewed and commented on drafts of the remedial investigation report. The remedial investigation has the following objectives:

- Identify any chemicals (contaminants) that have been released to the environment
- Determine the extent of contaminants that have been released to the environment
- Determine the location of contaminants
- Determine potential migration pathways of contaminants
- Identify the environmental impacts, risks to human health and risks to ecological receptors potentially associated with any exposure to contaminants
- Develop the information necessary to support the feasibility study and subsequent remedial design.

3.1 Hydrogeology and Groundwater

Several phases of environmental investigation have been conducted at the Shieldalloy facility since the early 1980's. These investigations typically entailed the installation and sampling of monitoring wells to monitor the groundwater at the Site. During the remedial investigation eleven monitoring wells and four piezometers were installed at the Site. Piezometers are groundwater wells used to provide groundwater elevation data but not water quality data. Four additional monitoring wells were installed on the southeastern portion of the Site for purposes of monitoring the recent baghouse dust storage area. Currently, thirty-four wells are present at the Site for groundwater monitoring purposes (Figure 4). Information from these monitoring wells were used to characterize the geology, groundwater and the extent of contamination.

The geology below the Site consists of two distinct geological formations. The first geological formation is a bedrock formation, consisting of alternating sandstones, shales, coal and limestone, and is present at depths ranging between 25 and 60 feet beneath the Site. The private well survey conducted during this investigation found that practically all private wells in the area surrounding the Site were installed into the bedrock.

The second geological formation at the Site is a formation of unconsolidated deposits consisting of sand, silts and clays. The unconsolidated deposits lie above, or on top of, the bedrock geology and range in thickness of 25 to 60 feet. The unconsolidated deposits can be classified into three

general groups: the lower unit consisting of 15 to 20 feet of silty clay; an intermediate zone of 15 to 20 feet of silty sand; and, an upper zone consisting of brown, silty clay with a thickness of 15 feet. The intermediate silty sand was the primary geological unit that was investigated and monitored during the remedial investigation.

The direction of groundwater flow is generally from east to west, toward Chapman Run. The rate of groundwater flow was estimated to be 0.0968 feet per day or 35 feet per year. The time of travel from the West Slag Pile to Chapman Run is estimated as ten years.

The water level data was also used to evaluate vertical flow directions of groundwater. The water level data indicated that there was a small upward flow of groundwater in the silty sand unit. This is important in determining that the groundwater system is connected to Chapman Run, the wetlands, and other surface water bodies. An upward groundwater flow inhibits the downward migration of contaminants. This upward flow of groundwater reduces the likelihood of groundwater contamination at the Site.

Groundwater Quality

Groundwater sampling conducted during the remedial investigation indicated that groundwater is not currently contaminated at the Site (other than the maintenance shop area). In April and May of 1995, two rounds of groundwater sampling were conducted. In the first round, twenty-four wells were sampled for metals, while selected wells were sampled for radionuclides and organic compounds. In the second round, seven wells were sampled for metals and radionuclides.

Of the contaminants analyzed, none exceeded background concentrations except zinc (in the bedrock monitoring well). Manganese and iron were detected at elevated levels in several wells. The distribution of manganese and iron in groundwater at the Site indicates that the elevated concentrations of these metals are due to regional influences, such as acid mine drainage, and not attributable to the Site. In addition, magnesium and sodium were detected at elevated concentrations in one well downgradient of the East Slag Pile; however, groundwater from other wells downgradient of both the East and West Slag piles did not contain elevated levels of magnesium or sodium.

Radionuclide analyses of groundwater confirmed the findings of previous investigations that radionuclides are not found in groundwater above background levels.

No volatile organic compounds were detected in groundwater with the exception of organics found in the vicinity of the maintenance shop area. Samples from this process area show that trace amounts of the solvents tetrachloroethylene (PCE) and trichloroethylene (TCE) exist in groundwater. It is believed that the source of the solvent was removed from the area during the decommissioning of 1988/1989. The remaining solvents detected are believed to be residual amounts from the source.

From the results of groundwater sampling conducted during the remedial investigation, groundwater is not currently contaminated at the Site (excluding the maintenance shop area).

3.2 Onsite Soils

Soil samples were collected and analyzed to determine migration of the contaminants. Vanadium and chromium were the metal contaminants most often detected in onsite soils at concentrations exceeding background levels.

The former Grainal® Slag Pile and baghouse dust areas had metal contaminants at or above background levels. Elevated metal concentrations were also observed in the empty drum accumulation area and the field southeast of the Roaster Building. Vanadium and chromium were detected in soil from these areas at concentrations of up to 2,050 and 521 mg/kg, respectively. Fill from the empty drum accumulation area was identified as a mixture of ferrovanadium and Grainal® slags. Fill from the field southeast of the Roaster Building is elevated in metal contaminants, the origin of this fill was not determined. Soil samples collected near the Pilot Plant had elevated concentrations of copper, lead, zinc, and vanadium.

Soil samples from the perimeter of the slag piles did not have elevated concentrations of metal contaminants, with the exception of soil from the 0 to 5 foot depth collected next to the Slag Piles. Samples collected during the installation of MW-20 had elevated concentrations of metals possibly due to slag or coal fragments observed in the upper 18 inches of soil .

Samples collected from beneath the West Slag Pile contained calcium and magnesium at elevated levels. The high levels of calcium and magnesium are probably the result of historical runoff from fresh slag when the piles were originally being amassed.

Soils from the perimeter of the West Slag Pile were analyzed for PCBs to help determine if these compounds were present in the soil layer of the pile. PCBs were not detected in the perimeter soil samples.

The remedial investigation detected above background levels of the radionuclides thorium-230, actinium-227, and radium-228 in samples from the sedimentation delta of the south side of the West Slag Pile and in the area southeast of the Roaster Building where fill had been found.

3.3 Surface Water

Sampling of surface waters in onsite wetlands and ditches and Chapman Run showed elevated levels of contaminants at various locations. Existing surface water data was supplemented by the collection of additional samples. Eighteen additional areas were sampled during the remedial investigation. Eight areas were located in onsite ditches and tributaries. Metal contaminants detected above background concentrations included arsenic, chromium, copper, lead, selenium, vanadium, and zinc.

Vanadium was the only contaminant to consistently exceed background levels. Samples from the west Mill Building ditch, which lies downstream of the active slag pile, yielded the highest concentrations of arsenic, copper, selenium, and vanadium.

Surface water samples were also collected from the wetland areas north of the East Slag Pile. Vanadium was detected at concentrations exceeding three times background in the wetland water samples. One sample collected from Chapman Run exceeded background levels for most contaminants. Vanadium concentrations in offsite surface water (Chapman Run) were highest in the samples collected from the northern property boundary.

Radionuclides were not elevated in either onsite or offsite surface water with the exception of thorium-230. Thorium-230 was slightly elevated downstream of the West Slag Pile when compared to concentrations at areas upstream of the pile, but not when compared to background concentrations in Wills Creek.

3.4 Sediments and Wetland Soil

Sampling of sediments in drainage ditches and wetlands showed elevated levels of metals and other contaminants at various locations. Sediment sampling was conducted during the remedial investigation to supplement data from previous investigations. Six onsite and three downstream offsite sediment samples collected during the remedial investigation were analyzed for metal contaminants. Selected samples were analyzed for radionuclides. In addition, soil samples were collected from wetland areas located north and west of the East Slag Pile to supplement wetland soil data collected by Ohio EPA.

The elements most frequently observed exceeding background levels in onsite sediments were arsenic, beryllium, cobalt, manganese, nickel, vanadium, and zinc. The highest metals concentrations in sediment were in drainage downstream of the active slag pile and the East and West Slag Piles. Elevated concentrations of metals downgradient of the active slag pile suggests the contamination is the result of both current runoff from the active pile and historical runoff from the East and West Slag piles. Concentrations of contaminants, in particular vanadium, exceeded background levels in sediment samples from Chapman Run that were collected immediately downstream of outlets of drainage from the Site. However, concentrations of contaminants were lower in samples collected a short distance downstream of these outlets. Concentrations of arsenic, beryllium, chromium, manganese, nickel, thallium, vanadium, and zinc consistently exceeded background levels in wetland soils.

3.5 Transport and Fate of Contaminants

Past and present contaminant sources were evaluated to determine potential present and future contamination of soils, surface water, sediments, and groundwater. This evaluation included soil erosion, sediment resuspension and sedimentation, weathering, dissolved phase transport, and

infiltration to groundwater.

3.5.1 Surface Water Transport

Redistribution of particles by over-bank, high-water events is probably the most significant process in contaminant transport at the Site. Elevated concentrations of contaminants in soils and sediments at the Site indicate redistribution from source areas by soil erosion and sediment transport. Migration of contamination is influenced by surface water pH. Surface water pH ranges from approximately three, where acid mine drainage enters the Site, to approximately twelve in a ditch that drains the Active Slag Pile. Concentrations and loading rates of contaminants in water from onsite indicate that the Site is a source of vanadium to Chapman Run, but is a negligible source of arsenic, barium, beryllium, copper, lead, selenium, and zinc to Chapman Run. Vanadium is relatively mobile and is transported in surface water primarily in the dissolved phase, even at neutral pH and high suspended solids concentrations.

3.5.2 Vadose Zone and Groundwater Transport

The remedial investigation concludes that, based on the groundwater model, the contaminants are not expected to contribute to groundwater contamination. Groundwater sampling and analysis conducted during the remedial investigation found that groundwater had not been significantly impacted by the source areas, other than the maintenance shop area. Given the results of the remedial investigation and some of the limitations of the groundwater model, future groundwater monitoring will be necessary to ensure no future impact to groundwater.

3.5.3 Atmospheric Transport

Ambient concentrations were determined for fugitive emissions by modeling onsite areas. Onsite areas that contributed to fugitive emissions were limited to areas with vehicular traffic. The conservative modeling, which included emissions and dispersion calculations, demonstrates that air quality at the Site does not pose unacceptable risk.

3.6 Risk Assessments

3.6.1 Human Health Risk Assessment

The Remedial Investigation contains a human health risk assessment that evaluates the potential for adverse human health effects from exposures to Site-related radiological and chemical contaminants under current and potential future Site conditions, if no remedial action is taken. Several potential scenarios of human exposure were evaluated, including an onsite occupational (industrial) scenario, an offsite recreational scenario, and a hypothetical future onsite residential scenario. Environmental media that were examined include soil, sediments, groundwater, and surface water. Exposures to direct radiation from slag are also considered.

The incremental (above background) lifetime cancer risk as calculated by Shieldalloy and Cyprus Foote for the Site is 2×10^{-5} for the current onsite occupational scenario, including workers who hunt and trap at the Site. The primary contributor to potential exposures is external radiation emanating from the East Slag Pile. The primary contributor to cancer risks estimated by Shieldalloy and Cyprus Foote for the hypothetical future onsite residential scenario (i.e., 3×10^{-5} (if bioavailability adjustment factors are included in the calculations, or 7×10^{-5} if they are omitted)) is exposure to contaminants (i.e., arsenic, beryllium, and thorium-230) in soil. Risk estimated for the offsite recreational scenario is approximately one order of magnitude less (i.e., 3×10^{-6}).

Site wide risk from radionuclides were also evaluated by Ohio EPA using standard USEPA Superfund methods based on concentrations reported by Shieldalloy and Cyprus Foote on October 16, 1996 and using assumptions about the presence of actinium-227 and its daughter products. Incremental carcinogenic risk was 1.7×10^{-4} for a hypothetical residential scenario, and 3.84×10^{-5} for an industrial scenario. See Appendix R of the remedial investigation for discussion on these calculations. USEPA's accumulative risk range (from all contaminants and all media) is 10^{-4} to 10^{-6}, with a goal of 1×10^{-6}.

The primary contributor to hazards other than cancer is vanadium in the soil. In assessing the potential non-cancer health effects at the Site, the hazard index calculated for the offsite recreational exposure scenario (0.5) is less than USEPA's safe target level of 1. For the occupational scenario, a hazard index of 2 is estimated regardless of whether bioavailability adjustment factors are included in the calculations and whether additional exposures associated with hunting and trapping activities at the Site are included in the analyses. Thus, the hazard index for the onsite occupational scenario exceeds USEPA's target level. The hazard index calculated for the hypothetical onsite residential scenario is 9 (or 20, if the bioavailability adjustment factors are omitted from the calculations). A hazard index of 20 is also associated with dermal contact with certain vanadium concentrations found in onsite surface water in several localized areas.
For an overview of the human health risk assessment, please refer to *Remedial Investigation/ Feasibility Study at the Shieldalloy Metallurgical Corporation Site in Cambridge, Volume I, Section 6 and appendix R (September 1996).*

3.6.2 Phase I Ecological Assessment

Data from several sampling events was used in the Phase I Ecological Risk Assessment. Fish tissue, fish community, and benthic macroinvertebrate community data from existing documents as well as more recent sampling data was used in the Phase I Ecological Risk Assessment. Onsite surface soil, wetland soil, sediment, and surface water and offsite sediment and surface water were analyzed for selected metals and radionuclides.

Several ecological receptor species and aquatic and terrestrial exposure pathways were evaluated in this assessment. In accordance with Ohio EPA's generic statement of work for a remedial investigation / feasibility study, the Phase I ecological assessment included the four components outlined below:

- Site Characterization: Physical characteristics of the Site and associated ecological habitats and vegetation community types were described, Contaminants were selected, and ecological receptors likely to come into contact with contaminants were identified.

- Initial Toxicity Assessment: A literature-based toxicity assessment and benchmark screening analysis were used to evaluate the effects of contaminants on wildlife and terrestrial plants; Site-specific toxicity tests using *Chironomus tentans* and *Hyalella azteca* were used to evaluate the toxicity of Site sediments to aquatic invertebrates; and surveys of the fish community and comparison of measured concentrations of contaminants in water to water quality criteria were used to assess the toxicity of surface waters.

- Preliminary Ecological Assessment: Results of the initial toxicity assessment were used to evaluate the probability of adverse effects on ecological receptors.

- Evaluation of Uncertainties and Limitations: The degree of confidence in the risk estimates was determined; the most important limitations and sources of uncertainty were described.

Using conservative assumptions, the results of the wildlife toxicological benchmark screening analysis show that arsenic, barium, chromium, copper, selenium, vanadium, and zinc could potentially cause environmental impacts to several receptors and should be further evaluated. A bioconcentration factor for estimating the concentration of lead in invertebrates is not available. Exposures of belted kingfishers and red-winged blackbirds were estimated in the Phase II Ecological Risk Assessment using measured concentrations of lead in invertebrates.

Concentrations of contaminants in soils from the former Grainal® Slag Pile area, the former baghouse dust area, the empty drum accumulation area, and the field southeast of the Roaster Building were compared to concentrations in soils that caused reduced growth expressed as relatively low root, shoot, or leaf weight in agricultural plants. These areas were found to contain metal concentrations in soils which exceed USEPA benchmark values for plant toxicity.

The lack of vegetation on the sedimentation delta located on the north side of the West Slag Pile is due to the chemical and physical characteristics of the deposited sediment.

Survival and growth of *Chironomus tentans* exposed in the laboratory to sediments from the Site were not reduced relative to survival and growth of this species exposed to sediments from reference areas. Results of the amphipod survival bioassay showed significant sediment toxicity at station SB-04, which was also impacted by untreated industrial sewage overflow from the Cambridge sewer

lift station. Survival of amphipods exposed to the onsite beaver pond sediments (station SB-03) was 66 percent.

The macroinvertebrate communities in Chapman Run were in the fair to poor range. All Sites sampled were in the fair range except at river mile 0.9, downstream from the Shieldalloy Site, which fell in the poor range. Marginal habitat conditions existed at all locations with worst conditions being downstream from the Shieldalloy Site, due largely to the pervasive silt load originating from Shieldalloy property. The poor macroinvertebrate community performance at river mile 0.9 is below what would be expected given the habitat conditions, based on a comparison of the data results with other data with similar habitat conditions.

The results of the wildlife toxicological benchmark screening analysis and the sediment toxicity tests indicated that a focused Phase II Ecological Risk Assessment was needed. During the Phase II Ecological Risk Assessment, Site-specific data were collected to address data gaps and uncertainties identified in the Phase I Ecological Risk Assessment.

3.6.3 Phase II Ecological Risk Assessment

The Phase II Ecological Risk Assessment assesses the impact of specific contaminants associated with activities at the Site on selected ecological receptor species. The Phase II Ecological Risk Assessment was designed to meet three specific objectives:

- Identify contaminants from the initial analyte list
- Characterize risk to selected ecological receptors
- Identify areas of concern to be addressed in the feasibility study.

The analyses conducted to achieve these objectives included additional sediment toxicity bioassays, an assessment of surface water quality relative to water quality criteria for the protection of aquatic life, a survey of amphibian communities onsite, and an assessment of contaminants risk to birds and mammals based on food web exposure modeling. The following contaminants from Phase I Ecological Risk Assessment were considered in the Phase II Ecological Risk Assessment: arsenic, barium, chromium, copper, lead, selenium, silver, vanadium, and zinc.

The Phase I Ecological Risk Assessment shows that terrestrial receptors are at risk due to exposure to arsenic and vanadium. The remaining contaminants do not demonstrate risk to terrestrial receptors and therefore, these contaminants were evaluated for aquatic pathways only. Exposure of receptors to arsenic and vanadium was evaluated for both aquatic and terrestrial pathways. In addition, nine metals detected during surface water sampling were sampled in the Phase II Ecological Risk Assessment. These metals were aluminum, antimony, cadmium, cobalt, magnesium, manganese, mercury, nickel, and thallium. Exposure of receptors to these nine additional contaminants through both aquatic and terrestrial pathways was evaluated in the Phase II Ecological Risk Assessment.

The same ecological receptors considered in the Phase I Ecological Risk Assessment were considered in the Phase II Ecological Risk Assessment. Exposure of receptors to contamination onsite was estimated from contaminant concentrations in surface water, sediment, and soils reported in the Phase I Ecological Risk Assessment. In addition, as part of the Phase II Ecological Risk Assessment, sediment samples were collected and tested for toxicity to amphipods, and sediment and biological tissue samples were collected and analyzed for contaminants. Concentrations of chemicals in fish from Chapman Run as reported by Ohio EPA were also used in the exposure assessment.

In Site-specific tests, sediment toxicity to amphipods correlated with vanadium concentrations in sediment. The survival of amphipods did not significantly decrease relative to survival of amphipods exposed to sediments from reference areas until vanadium concentrations in sediment reached 1,280 mg/kg (dry weight). This concentration of vanadium in sediments is considered the apparent effects threshold for aquatic macroinvertebrates.

In the surface water assessment, vanadium was the only contaminant with concentrations in Chapman Run that exceeded Ohio chemical water quality criteria. Exceedances of the vanadium criterion occurred at all stations, except for Chapman Run stations CHRN-02 and CHRN-03 and station UTEF-01 in the south ditch. One water sample collected in the north ditch exceeded the chemical water quality criterion for mercury.

Vanadium concentrations in Chapman Run exceed Ohio's Water Quality Criteria. The analysis of fish tissue conducted by Ohio EPA provides additional evidence that Chapman Run fish are exposed to vanadium as well as other chemicals from upstream sources. Lead and mercury were detected in fish tissue sampled in Chapman Run upstream of the Site and in Wills Creek. Other factors potentially influencing Chapman Run fish communities include non-point source pollution upstream of the Site, degradation of habitat quality resulting from development of the watershed, and influences of a malfunctioning sewer lift station. Impacts on the fish community per the fish community studies of Ohio EPA reflect the cumulative effects of multiple stressors throughout Chapman Run.

Results of the exposure modeling indicate that the exposure of mink and muskrat to vanadium accounts for potentially significant risk related to Site contaminants identified in the Phase II Ecological Risk Assessment. Qualitative evaluation of cumulative impacts from exposures to aluminum and vanadium in the context of trapping, habitat loss, and chemicals offsite suggest that the rate of population increase of mink and muskrats that use the Site could decline. Results of the food web model indicate that there is a low risk to terrestrial mammals (as represented by white-tailed deer) from exposure to vanadium. Uncertainties affecting the interpretation of the risk characterization include the extent to which wildlife use the Site, the quality of habitat throughout the year, the specific toxicity of each chemical to each receptor, and the precise distribution of chemicals in relation to the foraging and breeding habitats of receptors.

Under the no-action alternative, the use of onsite aquatic habitats by fish and wildlife is likely to vary

as a result of physical modifications of habitat unrelated to contamination. Wetlands onsite are maintained by beaver; if beaver remain absent or are removed through trapping, there will be a reduction in available aquatic habitat and a loss of wildlife associated with beaver ponds. Return of beaver from offsite areas will result in reestablishment of beaver dams and open water. Loading of vanadium to Chapman Run via sediment transport would be expected to continue. Under the no-action alternative, the wetland soils and the area in Chapman Run at the confluence with the north ditch will continue to contain sediments that are toxic to amphipods.

4.0 DESCRIPTION OF REMEDIATION ALTERNATIVES

Shieldalloy and Cyprus Foote developed a feasibility study under an agreed court order. Ohio EPA reviewed and commented on drafts of the feasibility study report. The feasibility study identifies and screens technologies and alternatives for all areas requiring remedial action. The feasibility study evaluates methods to meet the remedial action objectives, which are to:

- Develop remedial action objectives and preliminary remediation goals for media of concern developed in the investigation
- Identify and screen remedial technologies applicable to the Site based on the remedial action objectives and preliminary remediation goals
- Develop remedial action alternatives from the remedial technologies retained after screening
- Conduct a detailed analysis of the alternatives, including cost estimates for implementation of the alternatives and relative rankings of the alternatives.

The remedial investigation for the Site identified the following chemicals (including radiological isotopes) of potential concern:

arsenic, barium, beryllium, chromium, copper, lead, selenium, silver, thorium-232 and progeny, uranium-235 and progeny, uranium-238 and progeny, vanadium, and zinc.

The remedial investigation for this Site identified the following areas of potential concern:

- East and West Slag Piles
- Offsite slag (included for the purpose of evaluating onsite remedial alternatives; offsite slag is not otherwise evaluated in the feasibility study)
- Wetland soil
- Onsite sediment (drainage ditches)
- Offsite sediment (Chapman Run)
- Surface water

The feasibility study for this Site evaluated the following alternatives for remediating the areas of potential concern:

- West Slag Pile
  - no action
  - capping in place (without offsite slag)
  - capping in place (with offsite slag)
  - removal and offsite disposal
- Onsite Sediment
  - no action
  - capping
  - removal and onsite containment
  - removal and offsite disposal
- Wetland Soil
  - no action
  - wetlands mitigation
  - capping
  - removal and onsite containment
  - removal and offsite disposal
- East Slag Pile
  - no action
  - capping in place
  - removal and offsite disposal
  - removal and sale of the slag
- Offsite Sediment
  - no action
  - natural recovery
  - rechannelization
  - removal and onsite containment
  - removal and offsite disposal

This section describes the remedial alternatives for the West and East Slag Piles, onsite/offsite sediment and wetland soil that were selected for detailed analysis. This section also includes cost estimates for the remediation alternatives provided. Cost estimates for this section are taken from Appendix C and E of the Feasibility Study and are used for comparison purposed only. This section proceeds in the following order: West Slag Pile, East Slag Pile, onsite sediment, offsite sediment, and wetland soil. For a more detailed analysis of all the alternatives, please refer to the Feasibility Study.

4.1 West Slag Pile

The West Slag Pile covers approximately 8.2 acres as shown in Figure 1. It includes most types of radioactive and nonradioactive slag that have been generated at the SMC Cambridge facility. The West Slag Pile has an estimated weight of 532,150 tons, and an estimated volume of 220, 663 yd^3.

4.1.1 No Action

The no-action alternative is the baseline to which all other alternatives must be compared. No-action consists of the current conditions at the Site. It assumes that no future remedial actions will be conducted at the Site.

Some decontamination/decommissioning activities that have already occurred on the West Slag Pile include placing stabilized baghouse dust on the pile, resloping the edges of the piles, installing silt fencing around the pile, and restricting access. The 1989 partial "decommissioning cap" was

constructed using the stabilized baghouse dust (Chemfix material). The Chemfix material was pumped into cells constructed of clay and allowed to harden. Then, the pile was covered with a geotextile cloth and twelve inches of sand. The geotextile cloth was intended to function as a barrier layer for plants. The growth of plants into the Chemfix would break the material apart, creating fractures that would allow migration of water through this unit. Migration of water through this unit would increase the leachate generated and the potential for surface water contamination or groundwater contamination.

The only active component of this alternative is the incomplete "decommissioning cap" that provides a partial barrier for the decommissioning soils that were disposed of in the pile during the decontamination/decommissioning activities of 1989/1990. However, the incomplete decommissioning cap does not adequately protect human health and the environment.

Cost Estimates

The cost of work needed to implement this alternative would be zero dollars. This alternative assumes that no additional work will be conducted and no monies spent.

4.1.2 Capping in Place

This alternative would contain the slag in the existing West Slag Pile by constructing one of the following caps:

- Completing the cap that Shieldalloy began to construct in 1989 and 1990 (Decommissioning Cap)

- Constructing a solid waste cap over the entire slag pile in accordance with solid waste rules under Ohio Administrative Code Chapter 3745-27 (solid waste cap)

- Constructing a cap over the entire slag pile in accordance with hazardous waste rules under Ohio Administrative Code Rule 3745-57-10 and the guidelines presented in U.S. EPA's Technical Guidance Document: Final Covers on Hazardous Waste Landfills and Surface Impoundments (U.S. EPA 1989).

Measures to protect wetlands during remediation and restoration efforts would be implemented. Institutional controls, including deed restrictions, survey markers, monitoring, and financial assurance, would also be implemented.

Decommissioning Cap

Completing the decommissioning cap would first require placing clay around the perimeter of the West Slag Pile. The new clay layer would have a thickness of 3 feet with a permeability 10^{-6} to 10^{-8} cm/sec and would extend from the edge of the Chemfix/baghouse dust layer down to ground

surface, followed with 12 inches of silty sand and geotextile fabric. Upon the completion of the capping of the perimeter, 9 inches of top soil would be placed over the entire West Slag Pile. (See Figure 8)Erosion control measures would be included in completing construction of this cap. A portion of the West Slag Pile is in the 100 year floodplain. Therefore, in addition to the vegetative growth, these measures would include approximately seven rip rap drainage channels placed along the side slopes of the pile and rip rap placed at the base of the pile.

Solid Waste Cap

The development of the solid waste cap is based on the Ohio Administrative Code, Rule 3745-27-11. This alternative would contain the slag in the West Slag Pile by constructing a new cap over the entire pile. The cap would consist of a 2 foot thick recompacted soil barrier (e.g. clay with a permeability of $1x10^{-7}$ cm/s) placed on top of the entire slag pile, followed by a 1 foot thick granular drainage layer, a geotextile fabric, and a 9 inch topsoil layer that is seeded to provide vegetation. The topsoil would be seeded with a grass compatible with the local climate and conducive to long-term growth and minimum maintenance. Erosion control measures and institutional controls, including monitoring, would be similar to the preceding alternative. All materials for the cap would be imported from offsite sources. The conceptual design of this cap is shown in Figure 8. The solid waste cap would further reduce the leaching of contaminants.

Hazardous Waste Cap

The development of the hazardous waste cap is based on the requirements presented in state hazardous waste rules, including Ohio Administrative Code Rule 3745-57-10 and the guidelines presented in U.S. EPA's Technical Guidance Document: Final Covers on Hazardous Waste Landfills and Surface Impoundments (U.S. EPA 1989). This alternative includes many of the elements that are part of the decommissioning cap.

This alternative would contain the slag in the West Slag Pile by constructing a new cap over the entire pile. The cap would consist of 2 foot thick layer of clay (compacted to a permeability equal to $1x10^{-7}$ cm/s), a flexible membrane liner (with a thickness of 40 mil), a 1 foot thick drainage layer (permeability equal to 1×10^{-2} cm/s or greater) placed on top of the entire Slag Pile, followed by geotextile fabric, and a 2 foot thick topsoil layer that is seeded to provide vegetation. All materials for the cap would be imported from offsite sources. The conceptual design of this cap is shown in Figure 8. The topsoil would be seeded with a grass compatible with the local climate and conducive to long-term growth and minimum maintenance. Erosion control measures and institutional controls, including monitoring, would be the same as the decommissioning cap alternative. The Hazardous Waste Cap would further reduce any leaching of contaminants.

Cost Estimates for Capping

Decommissioning Cap:

Capital Costs	$1,636,300
Operation and Maintenance (O&M)	$ 629,138
Total Present Worth	$2,265,000

Solid Waste Cap:

Capital Costs	$3,216,600
Operation and Maintenance (O&M)	$ 629,138
Total Present Worth	$3,846,000

Hazardous Waste Cap

Capital Costs	$4,020,800
Operation and Maintenance (O&M)	$ 629,138
Total Present Worth	$4,650,000

4.1.3 Capping in Place (with soils, sediments and offsite slag)

The Site has contaminated soils and sediments at various locations. The RI/FS report evaluated the possibility of excavating these soils and sediments and containing them under a cap for the West Slag Pile. For more information on this alternative, see discussions under this section 4.0 for onsite sediments, offsite sediments and soils.

Offsite Slag

For this alternative, slag located offsite displaying radiological and metallurgical characteristics similar to slag produced by the Cambridge facility would be excavated and returned to the Site. An estimated 10,000 yd^3 of slag and soil has been used to analyze this alternative. This alternative is similar to the capping alternative discussed above, but also includes hauling the offsite slag back onsite, placing it directly on top of the West Slag Pile to the extent feasible (or to the extent this is not feasible, then placing it adjacent to the pile), and capping it. Only slag that is substantially similar to the slag in the West Slag Pile, and that originated on the Site, would be brought back onsite. The offsite slag would be placed on the West Slag Pile instead of the East Slag Pile for the following reasons:

- The West Slag Pile already contains slag and a soil/slag mixture that is more likely to be representative of the offsite slag,

- The West Slag Pile offers better access,

the Chemfix®) is 220,663 yd^3. The estimated weight of the material is 532,150 tons. The pile covers 8.2 acres.

Prior to loading the rail cars, a staging area would be established in the vicinity of the East Slag Pile to serve as a temporary stockpile and loading area for the slag. If both the East Slag Pile and the West Slag Pile were to be removed, the slag in the East Slag Pile would be removed first and then the footprint of that pile would serve as the staging area for stockpiling and loading the slag from the West Slag Pile. Construction of an additional railroad spur may also be needed to accommodate temporary storage and loading of the cars and is included. Additional Site preparation activities would include adding onto the existing facility road network, as needed, to accommodate the truck traffic between the West Slag Pile and the staging area. It is assumed that the existing roads could accommodate trucks for most of the distance, but that another 500 linear feet of gravel road would be constructed to modify the existing system to reduce the impact on plant traffic.

Removal of the material from the West Slag Pile would include five main phases that to some degree would be conducted concurrently. The five phases are:

- Removing the decommissioning cap (i.e. cover) material (approximately 45,500 yd^3) and transporting it to a licensed solid waste landfill for disposal
- Moving the slag and soil (approximately 175,300 yd^3) from the West Slag Pile to the staging area located near the East Slag Pile
- Crushing the slag to meet the size requirements of the offsite facility
- Loading the slag and soil from the staging area into the rail cars
- Transporting the slag and soil to the offsite facility and disposing of it.

A front-end loader would be used to load the slag into trucks at the West Slag Pile. A wheel-mounted 5 yd^3 capacity loader or comparable equipment would be used. The estimated production rate is 185 yd^3 per hour. The slag would be hauled to the staging area in 20 yd^3 dump trucks. Approximately three trucks would be used. A bulldozer would be used on the West Slag Pile to loosen the material and move it toward the loader. A grader and water truck would be used for the haul road and as otherwise needed. Slightly larger front-end loader and haul trucks could be used if available to increase productivity.

The stockpiled slag would be crushed to meet sizing requirements and then loaded into rail cars using a front-end loader similar to that used at the West Slag Pile. Instead of having two loaders, another option would be to operate in two shifts and load the rail cars at night as well. A small locomotive would be required to shift the rail cars around as they are loaded. The railcar capacity is 90 tons of slag. Using this capacity, a total of 4,865 rail cars would be needed assuming that all of the rail cars are loaded to capacity. Exclusive-use closed transport rail cars would be used.

The same type of measures to protect wetlands during remediation and wetlands restoration efforts that were included in the capping alternatives would also be implemented as part of this alternative. After the slag is removed from the West Slag Pile, the area would be graded. Topsoil would then be placed onto the area, if needed, and seeded to provide vegetation. It is assumed that 1 foot of topsoil would be placed over the entire area. This results in an estimated quantity of topsoil of 13,300 yd^3.

The estimated time to complete the actions for this alternative is approximately 4 years from the date that a contractor is retained and given authorization to proceed based on the facility being able to receive 15 rail cars per day and a construction season of 5 months each year. This assumes that a sufficient number of rail cars will be available.

Cost Estimates for Removal and Disposal

Capital Costs	$147,090,100
Operation and Maintenance (O&M)	$ NA
Total Present Worth	$147,090,100

4.2 East Slag Pile

The East Slag Pile covers approximately 3 acres as shown in figure 1. The estimated volume of the pile is 37,000 yd^3. The estimated weight of the pile is 58,405 tons.

4.2.1 No Action

The no-action alternative is the baseline to which all other alternatives must be compared. No action consists of the current conditions at the Pile. It assumes that no future remedial actions will be conducted on the Pile.

The current conditions of the Pile include the following decontamination/decommissioning actions:

- Resloping the edges of the pile: The pile was extensively graded during the decontamination project carried out by Shieldalloy in 1989. The north, south, and east sides of the pile have steep cuts; the west side is curved with a shallow slope.
- Excavating and placing all of the slag from the Grainal® Slag Pile onto the East Slag Pile: Approximately 9,600 yd^3 of slag or soil was excavated from the Grainal® Slag Pile and added to the top of the East Slag Pile during the 1989/1990 decontamination project.

- Constructing a chain link fence with controlled access around the perimeter of the pile: The pile has a chain link fence around the perimeter of the pile. Access is controlled through a locked gate.

- Posting signs that state there is a radioactive hazard: The pile is currently posted with radiation hazard signs and the property boundaries are posted with *No Trespassing* signs.

Cost Estimates

The cost of implementing of this alternative would be zero dollars. Because this alternative assumes that no additional work will be conducted, no monies would be spent.

4.2.2 Capping in Place

This alternative would contain the slag in the existing East Slag Pile by capping the entire pile. Prior to placement of the cap, grading would be conducted. Conventional heavy construction equipment would be used for constructing the cap. A water truck would be used, as needed, to minimize dust emissions.

An evaluation of different capping alternatives is presented in Appendix E of the feasibility study. A soil cap would address only the radioactive materials in the pile. Small quantities of spent carbon anodes, scrap steel and crushed drums have also been placed in the pile, however.

Installation of a cap over radioactive materials typically serves four purposes:

1. Containment of the material from environmental pathways, such as rain water intrusion and wind erosion

2. Erection of a barrier to potential intruders (plant, animal, and human) that might be exposed to the waste matrix

3. Reduction in the flux of radon from the radioactivity in the matrix.

4. Shielding potentially exposed persons from the direct radiation being given off by the material.

For the shielding criterion, a 2 foot thick layer of soil will reduce the exposure rate from the East Slag Pile by a factor of 200. This reduction is expected to bring exposure rates around the East Slag Pile to levels below background. This soil layer will also act as an effective intruder barrier, so long as the soil is not lost through interstitial spaces between the pieces of slag or eroded away by wind and water. The loss of soil through the slag will be addressed by grading and reworking the slag on the pile prior to capping to minimize the interstitial spaces between the pieces of slag, and by

providing additional soil to serve as a transition layer between the slag and the cap. The supplemental soil will be spread onto the slag and compacted in lifts in order to work the soil into the interstitial spaces. A vegetative cover will be placed on top of the final cap to prevent the loss of soil to erosion.

Decommissioning Cap

The decommissioning cap for the East Slag Pile would be made up of the following:

- Twelve inches of soil that will serve as a transition layer to separate the slag and overlying soil
- Eighteen inches of soil to cover the pile
- Six inches of topsoil.

The top layer will be provided with a vegetative cover to ensure long-term stability. All materials for the cap would be imported from offsite sources. The conceptual design of the proposed cap is shown in Figure 9.

The soil portion of the cap would be keyed into the ground surface. The key would be constructed around the perimeter of the pile and would have an estimated width of 3 feet and depth of 5 feet. The quantity of soil for the cap, including the transition layer and key, but excluding the topsoil, is an estimated 12,300 yd^3. The soil layer would be constructed and compacted in lifts to achieve uniform compaction. The topsoil would be seeded with a grass compatible with the local climate and conducive to long-term growth and minimum maintenance.

Erosion control measures would be included in construction of the cap. In addition to the vegetative growth, these measures would include approximately four rip rap drainage channels placed along the side slopes of the pile and rip rap placed at the base of the pile.

Institutional controls including Site access restrictions, monitoring, financial assurance, and deed restrictions would be implemented as part of this alternative. The East Slag Pile is currently completely enclosed by 1,540 linear feet of chain link fence with controlled access. Signs are posted stating that there is a radioactive hazard. The same type of deed restrictions, survey markers, financial assurance, and monitoring that were included in the capping alternative for the West Slag Pile would also be implemented as part of this alternative. In addition, the same type of wetlands restoration measures that were included in the capping alternative for the West Slag Pile would also be implemented as part of this alternative.

Solid Waste Cap

The development of the solid waste cap is based on the Ohio Administrative Code, Section 3745-27-11. This alternative would contain the slag in the East Slag Pile by constructing a new cap over

the entire pile. The cap would consist of a 2 foot thick recompacted soil barrier (e.g. clay with a permeability of $1x10^{-7}$ cm/s) placed on top of the entire slag pile, followed by a 1 foot thick granular drainage layer, a geotextile fabric, and a 9 inch topsoil layer that is seeded to provide vegetation (see Figure 8). The topsoil would be seeded with a grass compatible with the local climate and conducive to long-term growth and minimum maintenance. Erosion control measures and institutional controls, including monitoring, would be the same as the preceding alternative. All materials for the cap would be imported from offsite sources. The solid waste cap would reduce the leaching of all contaminants.

Hazardous Waste Cap

The development of the hazardous waste cap is based on the requirements presented in Ohio Administrative Code 3745-57-10 and the guidelines presented in U.S. EPA's Technical Guidance Document: Final Covers on Hazardous Waste Landfills and Surface Impoundments (U.S. EPA 1989).

This alternative would contain the slag in the East Slag Pile by constructing a new cap over the entire pile. The cap would consist of 2 foot thick layer of clay (compacted to a permeability equal to $1x10^{-7}$ cm/s), a flexible membrane liner (with a thickness of 40 mil), a 1 foot thick drainage layer (permeability equal to 1×10^{-2} cm/s or greater), geotextile fabric, and a 2 foot thick topsoil layer that is seeded to provide vegetation (see Figure 8). All materials for the cap would be imported from offsite sources. The topsoil would be seeded with a grass compatible with the local climate and conducive to long-term growth and minimum maintenance. Erosion control measures and institutional controls, including monitoring, would be the same as the decommissioning cap alternative. The Hazardous Waste Cap would further reduce the leaching of all contaminants.

All capping alternatives for the East Slag Pile would need to address, during the remedial design/ remedial action phase, any and all setbacks from the railroad spur, underground utilities, and the access road to the plant.

Cost Estimates for Capping

Decommissioning Cap:

Capital Costs	$798,100
Operation and Maintenance (O&M)	$ 91,553
Total Present Worth	$890,000

Solid Waste Cap:

Capital Costs	$1,339,200
Operation and Maintenance (O&M)	$ 91,553
Total Present Worth	$1,431,000

Hazardous Waste Cap:

Capital Costs	$1,679,400
Operation and Maintenance (O&M)	$ 91,553
Total Present Worth	$1,771,000

4.2.3 Removal and Offsite Disposal

This alternative would involve removing all of the material in the East Slag Pile and disposing of it in an offsite licensed disposal facility. For the purpose of this report, it is assumed that the slag would be loaded into rail cars and transported to the Envirocare facility in Clive, Utah for disposal.

The estimated volume of material in the East Slag Pile is 37,000 yd^3. The estimated weight of the material is 58,405 tons.

Removal of the material from the East Slag Pile would include three main phases that would be conducted concurrently. The three phases are:

- Crushing the slag to meet the size requirements of the offsite facility
- Loading the slag from the East Slag Pile into the rail cars
- Transporting of the slag to the offsite facility and disposing of it.

Crushing and loading of the slag into the rail cars would take place at the East Slag Pile. Construction of an additional railroad spur may be needed to accommodate temporary storage and loading of the cars and is included. A front-end loader would be used to load the slag into rail cars. A wheel-mounted 5 yd^3 capacity loader or comparable equipment would be used. The estimated production rate is 185 yd^3 per hour. A slightly larger front-end loader could be used if available to increase productivity. A bulldozer would be used on the pile to loosen the material. A water truck would be used to minimize dust emissions, as needed.

The railcar capacity is 90 tons of slag. Using this capacity, a total of 672 rail cars would be needed assuming that all of the rail cars are loaded to capacity. Exclusive-use closed transport rail cars would be used.

The same type of wetlands restoration measures that were included in the capping alternative for the West Slag Pile would also be implemented as part of this alternative. After the slag is removed from the East Slag Pile, the area would be graded. Topsoil would then be placed onto the area, if needed, and seeded to provide vegetation. It is assumed that 1 foot of topsoil would be placed over the entire area. This results in an estimated quantity of topsoil of 3,900 yd^3.

Cost Estimates for Removal and Disposal

Capital Costs	$21,889,400
Operation and Maintenance (O&M)	$ NA
Total Present Worth	$21,889,400

4.2.4 Removal and Sale of Slag

This alternative would involve removing slag from the East Slag Pile, processing it to generate a consistent product, and selling it in batches to either steel companies or material distributors. For the purpose of this evaluation, it will be assumed that the slag product will be shipped in bulk form using tractor-trailer trucks.

A number of uncertainties concerning the sale of slag from the East Slag Pile are still being evaluated. Prior to the sale of this material, all regulatory and licensure requirements of the State of Ohio, NRC and other regulators must be satisfied for both the generator and the buyer of the material. Assuming that it is viable, the processing required to convert slag from the East Slag Pile to a product would require a series of steps. Conceptually, these steps could involve the following:

- A portion of the slag pile would be collected (e.g. using a front end loader) and moved to a staging area
- The slag would be spread out in the staging area and foreign matter would be removed
- The slag would be crushed to achieve a uniform size
- Different batches of crushed slag would be blended to ensure homogeneous consistency of the product
- The product material would be staged for shipment
- Periodically the product would be loaded onto trucks for shipment to customer companies.

It is assumed that the area to the north and east of the Roaster Building would be used for slag staging , sorting, crushing, and blending. Road improvements and some modifications to boundary fencing may be needed to allow movement of the East Slag Pile into the area and movement of product out of the plant.

Front-end loaders or a track-mounted backhoe would be used to load the slag into dump trucks. The trucks would move the slag to the staging area and deposit the load as flat as possible.

Once in the staging area, front-end loaders would be used to spread out any piled material. Sorting operations would be performed manually. A separate waste container would be utilized to collect

non-slag materials, if any, found in each load. Upon completion of the sorting operation, the slag would be loaded into a crusher, which reduces the slag to a predetermined maximum size.

Upon completion of the crushing operation, the material would be sampled to determine its radioactivity content and metallurgical composition. Material meeting the required specifications for sale would be transferred to a stockpile area, from which the product would be drawn. Material not meeting specifications would be mixed with other slags being delivered from the East Pile and sent back though the crusher. This process would continue until the desired composition was achieved. (It may be also be possible to separate very large chunks of slag exhibiting elevated radioactivity for offsite disposal.)

Crushing campaigns would be managed based on the demand for the product. If the entire inventory of the East Pile could be sold in a discrete time period the entire pile would be processed. If demand was not high enough to warrant processing the pile in one operation, processing would be done on a campaign basis. (Currently Shieldalloy is selling slag from the Newfield, New Jersey facility. The slag is not contaminated with radiological material and is used in steelmaking processes. The slag removes sulfur from the steel and minimizes sulfur air pollution.)

Once removal of all of the East Pile Slag was accomplished, a survey of the pile area would be conducted. If the concentrations of contaminants in the soil met remedial action objectives and preliminary remediation goals, there would be a combination of direct radiation readings and samples collected for radiological and metals analysis. The data collected would be compiled into a report to be submitted for regulatory review.

Upon regulatory concurrence that residual concentrations of contaminants met remedial action objectives and preliminary remediation goals, all fencing and signs would be removed from the area.

Cost Estimates

The feasibility of selling the slag in the East Slag Pile has yet to be determined. Once evaluation of the sale of the slag has been completed, a cost estimate will be prepared.

4.3 Onsite Sediment

Onsite sediments include sediments in drainage ditches.

4.3.1 No Action

The no-action alternative is the baseline to which all other alternatives must be compared. No action consists of the current conditions at the Site. It assumes that no present or future remedial actions will be conducted at the Site. Note, however, that a stormwater permit is required to control rainwater discharges at the Site independent of the remedial investigation / feasibility study.

4.3.2 Capping

This alternative would involve containing the sediment with elevated levels of contaminants in the onsite drainage ditches by capping them. The cap would consist of a 1-foot thick layer of coarse gravel. Minor grading and some clearing and removal of debris may be conducted prior to placing the cap. Conventional construction equipment would be used to construct the cap; however, the equipment may have to be modified (e.g., have large balloon tires mounted) to be able to work in wet, soft soils.

The estimated area of onsite sediment that may have elevated levels of contaminants is approximately 13,560 ft^2. The quantity of coarse material needed for capping this area is an estimated 500 yd^3.

This alternative also assumes that the drainage ditches would be stabilized with check dams and vegetation. It is estimated that 16 check dams would be installed throughout the onsite drainage ditch network. The check dams would be constructed of rock or comparable material, would be approximately 2 feet high, and would have a slope of 2:1 (horizontal to vertical). The estimated quantity of rock needed for all of the check dams is 19 yd^3.

The same type of wetlands protective measures used during remediation that were included in the capping alternative for the West Slag Pile would also be implemented as part of this alternative. In addition, institutional controls including Site access restrictions, regular inspection of the grounds, monitoring, and deed restrictions would be implemented as part of this alternative. The Site has controlled vehicle access and signs that state no trespassing is allowed. The same type of deed restrictions, survey markers, financial assurance, and monitoring that were included in the capping alternative for the West Slag Pile would also be implemented as part of this alternative. Source control measures would be implemented in the operational portion of the Site to prevent the migration of material from that area.

The estimated time to complete the actions for this alternative, other than long-term monitoring and maintenance, is approximately 3 months from the date that a contractor is retained and given authorization to proceed.

Cost Estimates for Capping

Capital Costs	$304,600
Operation and Maintenance (O&M)	$ 50,000
Total Present Worth	$355,000

4.3.3 Removal and Onsite Containment (on the West Slag Pile)

This alternative would contain the onsite sediment by removing the onsite sediment with elevated contaminants, placing the sediment on the West Slag Pile, and capping it with a low-permeability

cap. Conventional heavy construction equipment would be used for excavating the sediment and capping it; however, the equipment may have to be modified (e.g., have large balloon tires mounted) to be able to work in wet, soft soils. The estimated area of onsite sediment that may have elevated levels of contaminants is approximately 13,560 ft^2. The sediment would be temporarily stockpiled by the ditch and drained, as needed, prior to hauling and placing it on the West Slag Pile.

The location for placement of the excavated sediment on the West Slag Pile was assumed to be the same area that was previously designated for the offsite slag. Assuming an average depth of 5 feet for placement of the sediment, the resulting area is 1,900 ft^2.

The sediment would be placed on top of the West Slag Pile and one of the three previously discussed cap options would then be implemented for the Pile. Institutional controls, including monitoring and financial assurance, would be implemented as discussed for capping the West Slag Pile. Constructing check dams, vegetating the drainage ditch banks, and implementing source control measures are also included in this alternative. It is assumed that replacement sediment would not be needed for the area where sediment is removed from the ditches.

During remediation, protective measures for wetlands would be implemented. The estimated time to complete the actions for this alternative, other than long-term monitoring and maintenance, is approximately 3 months from the date that a contractor is retained and given authorization to proceed.

Cost Estimates for Removal and Onsite Containment (on the West Slag Pile)

Capital Costs	$256,300
Operation and Maintenance (O&M)	$ 50,000
Total Present Worth	$306,000

4.3.4 Removal and Offsite Disposal

This alternative would involve removing the onsite sediment with elevated levels of contaminants and disposing of it in a regulated offsite landfill. The area and volume of sediment that would be removed are approximately 13,560 ft^2 and 350 yd^3. The sediment would be temporarily stockpiled by the ditch and drained, as needed, prior to loading it into trucks for disposal. It would then be loaded into 20 yd^3 watertight dump trucks and hauled to a appropriate permitted facility.

Mitigation measures to protect wetlands during remediation, as previously discussed, would be implemented. After the sediment is removed, check dams would be constructed, drainage ditch banks would be vegetated, and source control measures would be implemented. The estimated time to complete the actions for this alternative is approximately 3 months from the date that a contractor is retained and given authorization to proceed.

Cost Estimates for Removal and Offsite Disposal

Capital Costs	$269,000
Operation and Maintenance (O&M)	$ 50,000
Total Present Worth	$319,000

4.4 Offsite Sediment

Offsite sediments constitute sediments located in Chapman Run adjacent to and downstream of the Site.

4.4.1 No Action

The no-action alternative is the baseline to which all other alternatives must be compared. No action consists of the current conditions at the Site. It assumes that no present or future remedial actions will be conducted at the Site.

4.4.2 Natural Recovery

This alternative would allow natural sedimentation processes to contain (i.e., bury) the sediment with elevated levels of contaminants. Natural recovery may be enhanced by introducing additional sediment material such as sand into the stream and allowing it to settle out. The surface area of the sediments in Chapman Run is estimated to be 231,320 ft^2. Allowing for 3 inches of sand for this area, the quantity of sand needed would be 2,100 yd^3. The sand would consist of varied-density grains to allow for differential settling. It would be sprayed into the stream at various locations along the 1.3-mile-length stream segment. Sampling of the sediment would be conducted annually for ten years to determine whether the remedial action objectives are met. Five samples would be collected each year and analyzed for vanadium and gross alpha and beta. The estimated time to complete the actions for this alternative, other than long-term monitoring, is approximately three months from the date that a contractor is retained and given authorization to proceed. An analysis to estimate the time for natural recovery to meet the remedial action objectives has not been conducted. For the purpose of this report it is assumed that remedial action objectives would be met in ten years.

Cost Estimates for Natural Recovery

Capital Costs	$250,300
Operation and Maintenance (O&M)	$ 50,000
Total Present Worth	$300,000

4.4.3 Rechannelization

This alternative would involve creating a new stream channel and using the excavated soil to fill the

existing channel of Chapman Run. Conventional construction equipment would be used to construct the new channel; however, the equipment may have to be modified (e.g., have large balloon tires mounted) to be able to work in wet, soft soils.

The newly constructed channel would be similar in size to the existing channel. It would have a width that ranges from approximately 26 feet upstream to 54 feet downstream. The channel length would be 1.3 miles including meanders. The average channel depth is assumed to be 10 feet. These dimensions would result in a volume of excavated soil of 85,700 yd^3 that would be placed in the existing channel.

The new channel would be constructed first. The soil would be scraped off and temporarily stockpiled separately during construction of the channel. After construction of the new channel the water would be diverted to it and the existing channel would be blocked. The existing channel would then be filled and the stockpiled topsoil would be placed as the final layer. The filled existing channel would then be seeded to establish vegetation.

The banks of the new channel and areas that were disturbed during construction would be seeded to stabilize them. Habitat enhancement measures such as the addition of wood debris to create a favorable environment for aquatic life would also be implemented.

Protective measures to protect wetlands, including Chapman Run, during remediation would be implemented as previously discussed . Institutional controls that include deed restrictions would be included as part of this alternative. The estimated time to complete the actions for this alternative, other than long-term monitoring, is approximately six months from the date that a contractor is retained and given authorization to proceed. This assumes that the acquisition of the property or property easements needed to implement this alternative has already been completed prior to procurement of a remedial contractor.

Cost Estimates for Rechannelization

Capital Costs	$2,299,000
Operation and Maintenance (O&M)	$ N/A
Total Present Worth	$2,299,000

4.4.4 Removal and Onsite Containment (on the West Slag Pile)

This alternative would contain the offsite sediment by removing the offsite sediments with elevated contaminants, placing the sediment on the West Slag Pile, and capping it with a low-permeability cap. Conventional heavy construction equipment would be used for removing the sediment and capping it; however, the equipment may have to be modified (e.g., have large balloon tires mounted) to be able to work in wet, soft soils. The estimated area of offsite sediment that may have elevated levels of contaminants is approximately 231,320 ft^2. Assuming a removal depth of 0.75 feet to 1 foot, the estimated volume of sediment that would be removed is 7,400 yd^3. Removal of the

sediment would be conducted during low stream flow, and silt curtains or comparable measures would be used to limit turbidity during removal. The sediment would be placed in temporary lined basins to allow for drainage prior to hauling and placing it on the West Slag Pile.

The location for placement of the excavated sediment on the West Slag Pile was assumed to be the same area that was previously designated for the offsite slag. Assuming an average depth of five feet for placement of the sediment, the resulting area is 46,300 ft^2.

The sediment will be placed on top of the West Slag Pile and one of the three previously discussed cap options would then be implemented for the Pile. Institutional controls, including monitoring and financial assurance, would be implemented as discussed for capping the West Slag Pile. It is assumed that replacement sediment would not be needed for the area where sediment is removed from the stream.

The quantity of clay for capping the onsite sediment portion of the West Slag Pile, including the key, is an estimated 5,500 yd^3. The estimated quantities for the geotextile and silty sand are 5,100 yd^2 and 1,700 yd^3, respectively. The estimated quantity of topsoil is 1,300 yd^3. The estimated quantity of rip rap is 400 yd^3.

Protective measures for wetlands during remediation, as previously discussed, would be implemented. The estimated time to complete the actions for this alternative, other than long-term monitoring and maintenance, is approximately six months from the date that a contractor is retained and given authorization to proceed.

Cost Estimates for Removal and Onsite Containment (on the West Slag Pile)

Capital Costs	$1,283,300
Operation and Maintenance (O&M)	$ 50,000
Total Present Worth	$1,333,000

4.4.5 Removal and Offsite Disposal

This alternative would involve removing the offsite sediment with elevated levels of contaminants and disposing of it in a regulated offsite landfill in accordance with applicable regulations. The area and volume of sediment that would be removed are approximately 231,320 ft^2 and 7,400 yd^3, respectively, assuming a 0.75 ft to 1 ft removal depth. Removal of the sediment would be conducted during low stream flow, and silt curtains or comparable measures would be used to limit turbidity during removal. The sediment would be placed in temporary basins to allow for drainage prior to loading it into trucks for disposal. It would then be loaded into 20 yd^3 watertight dump trucks and hauled to an appropriate permitted facility. Using this capacity for the dump trucks, a total of 370 trips would be needed assuming that all of the trucks are loaded to capacity.

Protective measures as previously discussed to protect wetlands during remediation would be implemented. The estimated time to complete the actions for this alternative is approximately six months from the date that a contractor is retained and given authorization to proceed.

Cost Estimates for Removal and Offsite Disposal

Capital Costs	$2,934,200
Operation and Maintenance (O&M)	$ N/A
Total Present Worth	$2,934,200

4.5 Wetland Soil

4.5.1 No Action

The no-action alternative is the baseline to which all other alternatives must be compared. No action consists of the current conditions at the Site. It assumes that no present or future remedial actions will be conducted at the Site.

4.5.2 Wetland Mitigation

This alternative includes wetland mitigation for onsite wetland areas that may have been affected by siltation (i.e., the two deltas adjacent to the West Slag Pile). The estimated area of the deltas is 85,300 ft^2.

Wetland mitigation would consist of restoration or enhancement of degraded wetlands in the Cambridge area. The function and value of the onsite wetland that will be mitigated are assumed to be equivalent to the new wetland. It is estimated that it would take approximately 6 months to acquire and enhance the new mitigated wetland acreage.

4.5.3 Capping

This alternative would involve containing wetland soil with elevated levels of contaminants by capping them. The cap would consist of a 1-ft thick layer of topsoil that is seeded to provide vegetation. Minor grading and some clearing and removal of large objects may be conducted prior to placing the cap. Conventional construction equipment would be used to construct the cap; however, the equipment may have to be modified (e.g., have large balloon tires mounted) to be able to work in wet, soft soils.

The estimated area of wetland that may have elevated levels of contaminants is approximately 465,900 ft^2. The quantity of topsoil for capping this area is an estimated 19,000 yd^3. This quantity allows for some overlap and sloping onto adjacent soils. It is assumed that drainage ditches would be installed around a portion of the delta areas to divert runoff and thereby prevent it from eroding the cap on the deltas. It is estimated that 1,200 linear feet of drainage ditches may be needed. Rip

rap, coarse gravel material, and/or vegetation would be used to stabilize the drainage ditches. If rip rap or coarse material is used, it is estimated that approximately 1,800 yd^3 would be needed.

If this alternative is implemented, wetland mitigation must also be included and may consist of the measures described in the preceding alternative except the total area potentially requiring mitigation may be about 10.7 acres. In addition, the same type of wetlands protective measures during remediation that were included in the capping alternative for the West Slag Pile would also be implemented as part of this alternative.

Institutional controls including Site access restrictions, regular inspection tours, monitoring, and deed restrictions would be implemented as part of this alternative. The Site has controlled access and signs that state no trespassing is allowed. The same type of deed restrictions, survey markers, financial assurance, and monitoring that were included in the capping alternative for the West Slag Pile would also be implemented as part of this alternative.

The estimated time to complete the actions for this alternative, other than long-term monitoring and maintenance, is approximately six months from the date that a contractor is retained and given authorization to proceed.

Cost Estimates for Capping

Capital Costs	$ 1,857,600
Operation and Maintenance (O&M)	$ 73,844
Total Present Worth	$ 1,931,000

4.5.4 Removal and Onsite Containment (on the West Slag Pile)

This alternative would contain the wetland soil by removing wetland soil with elevated contaminants, placing the soil on the West Slag Pile, and capping it with a low-permeability cap. The West Slag Pile instead of the East Slag Pile would be used for consolidation of the soil for the reasons that were presented for the capping alternatives (with offsite slag) for the West Slag Pile. Conventional heavy construction equipment would be used for excavating the soil and capping it; however, the equipment may have to be modified (e.g., have large balloon tires mounted) to be able to work in wet, soft soils. The estimated area of wetland that may have elevated levels of contaminants is approximately 465,900 ft^2. Assuming a removal depth of 1.5 feet, the estimated volume of wetland soil that would be removed would be 25,900 yd^3.

The location for placement of the excavated sediment on the West Slag Pile was assumed to be the same area that was previously designated for the offsite slag. Assuming an average depth of 5 ft for placement of the wetland soil, the resulting area is 139,800 ft^2.

The excavated wetland soils would be placed on top of the West Slag Pile and one of the three previously discussed cap options would be implemented for the pile. Institutional controls, including

monitoring and financial assurance, would be implemented as discussed for capping the West Slag Pile.

The quantity of clay for capping the wetland soil portion of the West Slag Pile only, including the key, is an estimated 16,100 yd^3. The estimated quantities for the geotextile and silty sand are 15,500 yd^2 and 5,200 yd^3, respectively. The estimated quantity of topsoil is 3,900 yd^3. The estimated quantity of rip rap is 630 yd^3. (Note: only the quantities of material related directly to the portion of the cap that includes the wetland soil are included here in order to provide an equivalent basis for comparing costs among the wetland soil alternatives).

The same type of wetlands protective measures used during remediation that were included in the capping alternative for the West Slag Pile would also be implemented as part of this alternative. In addition, it is estimated that replacement soil would be needed for approximately one-half of the area where wetland soil is removed. This results in an estimated quantity of replacement soil of 12,900 yd^3. The replaced soil and the remaining area would be seeded or otherwise restored to pre-existing conditions.

The estimated time to complete the actions for this alternative, other than long-term monitoring and maintenance, is approximately three to six months from the date that a contractor is retained and given authorization to proceed.

Cost Estimates for Removal and Onsite Containment (on the West Slag Pile)

Solid Waste Cap

Capital Costs	$ 3,256,900
Operation and Maintenance (O&M)	$ 73,844
Total Present Worth	$ 3,331,000

Hazardous Waste Cap

Capital Costs	$ 3,777,200
Operation and Maintenance (O&M)	$ 73,844
Total Present Worth	$ 3,851,000

4.5.5 Removal and Offsite Disposal

This alternative would involve removing the wetland soil with elevated levels of contaminants and disposing of it in a regulated offsite landfill. The area and volume of wetland soil that would be removed are approximately 465,900 ft^2 and 25,900 yd^3, respectively, assuming a 1.5 foot removal depth. The soil would be loaded into 20 yd^3 dump trucks and hauled to an appropriate permitted facility. Using this capacity for the dump trucks, a total of 1,296 trips would be needed assuming that all of the trucks are loaded to capacity.

Protective measures for wetlands during remediation, as previously discussed, would be implemented. After the soil is removed, the area would be restored as discussed for the preceding alternative. The estimated time to complete the actions for this alternative is approximately 3 months from the date that a contractor is retained and given authorization to proceed.

Cost Estimates for Removal and Offsite Disposal

Capital Costs	$ 6,241,100
Operation and Maintenance (O&M)	$ N/A
Total Present Worth	$6,241,100

5.0 OHIO EPA'S SELECTED REMEDY

This chapter sets out Ohio EPA's selected remedy and includes performance standards for remediation of the Shieldalloy Site.

5.1 Selection Criteria

In selecting a remedy for a contaminated site, Ohio EPA considers the following eight criteria as outlined under USEPA's National Contingency Plan (NCP) promulgated under CERCLA (40 CFR 300):

1. Overall protection of human health and the environment - addresses whether or not a remedy provides adequate protection, and describes how risks are eliminated, reduced or controlled through treatment, engineering controls, and/or institutional controls;

2. Compliance with all State, Federal and Local laws and regulations - addresses whether or not a remedy will attain applicable, relevant and appropriate requirements under federal, state, and local environmental laws;

3. 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 pollution has been abated and clean-up goals have been met;

4. Reduction of toxicity, mobility, or volume through treatment - is the anticipated performance of the treatment technologies to yield a permanent solution. This includes the ability of the selected alternative to reduce the toxic characteristics of the chemicals of concern or remove the quantities of those chemicals to an acceptable risk concentration or regulatory limit and/or decrease the ability of the contaminants to migrate through the environment;

5. Short-term effectiveness - involves the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period until pollution has been abated and clean-up goals are achieved;

6. Implementability - is the technical and administrative feasibility of a remedy, including the availability of goods and services needed to implement the chosen solution;

7. Cost - includes capital and operation and maintenance costs;

8. Community acceptance - will be assessed in the Decision Document following review of the public comments received on the Remedial Investigation and Feasibility Study (RI/FS) report and the Preferred Plan.

5.2 Summary

The major components of Ohio EPA's selected remedy for the Shieldalloy Site include:

1. Excavate and remove contaminated sediments and soils from the Site;

2. Place excavated sediments and soils on top of the West Slag Pile;

3. Cap the West Slag Pile in accordance with state solid waste rules under Ohio Administrative Code Chapter 3745-27;

4. Ensure long term care of the West Slag Pile and;

5. For the East Slag Pile:

   a. if feasible, sell and remove East Slag Pile materials, expeditiously; and

   b. if the foregoing is not feasible, then cap the East Slag Pile in accordance with state solid waste rules under Ohio Administrative Code Chapter 3745-27 and ensure long term care.

Ohio EPA would periodically review the remedy at the Site to ensure that the remedy will protect human health and the environment.

5.3 Contaminated Sediments and Soils at the Site

5.3.1 Excavate to meet Performance Standards

The selected remedy includes excavating and removing contaminated sediments and soils from onsite drainage channels, sedimentation deltas, wetland soils, and Chapman Run. The sedimentation deltas lay to the north and south of the West Slag Pile. Removal of contaminated soils and sediments from these impacted areas would reduce the contaminants found in this media to levels that are protective of the residents, plants and animals. Removal of the sedimentation deltas would remedy the physical effects caused by erosion and sedimentation from the process areas and slag piles. The precise areas and volumes for the wetland soils and sediments will be determined during the remedial design phase.

5.3.2 Performance Standards for Cleanup of Soils and Sediments

This section discusses performance standards for excavation of contaminated soils and sediments. The results of the human health risk assessment prepared by Shieldalloy and Cyprus Foote indicate that remedial action is not required to address human health concerns for wetland soil, onsite sediment, or offsite sediment. At this time, the remedial action needed for those areas is based on protection of the environment. However, further radiological sampling of the wetland soils will be required to in order to confirm that no remedial action is required in this area for protection of human health. In any event, the selected remedy must remain protective of human health and the environment.

For purposes of this report, area and volume estimates for wetland soil removal are based on a conservative vanadium concentration of 700 mg/kg (USEPA's screening value for human ingestion of vanadium pentoxide for a residential soil ingestion scenario). The area and volume estimates for onsite sediment and offsite sediment are based on a vanadium concentration of 1280 mg/kg per the Phase II Ecological Risk Assessment. Further sampling will be required in the remedial design phase in conjunction with the use of medium-specific remediation goals and consideration of other factors (e.g., short-term environmental effects) to refine cleanup concentrations and volumes for wetland soil. Specific volumes and areas were not calculated for surface water because the combination of source control (i.e., implementation of the storm water pollution prevention plan) and sediment remediation is expected to meet the preliminary remediation goal for surface water (87 ug/L for vanadium). For areas of concern for wetland soil, onsite sediment, and offsite sediment see Figures 5, 6, and 7. Please refer to table this section which outlines the clean up levels for each environmental media at the Site. The risk assessment performed by Shieldalloy and Cyprus Foote indicates that upland (process area) soils did not pose a risk to workers or modeled fauna.

The goal of the excavation and removal of contaminated soils and sediments is to protect human health and the environment. Cleanup levels for vanadium (the most common heavy metal contaminant found at the Site) are listed below. The cleanup level for wetland soils will be refined during the remedial design phase. Final cleanup levels for vanadium in wetland soils must be protective of ecological receptors expected to occur at the site, including birds, mammals, amphibians, and benthic communities (risk assessment to benthic communities will include amphipod bioassay techniques).

Consistent with USEPA's National Contingency Plan, an acceptable cleanup goal for radionuclides in soils, sediment, groundwater, and surface water achieves a risk range of $1x\ 10^{-6}$ - $1x10^{-4}$ excess lifetime cancer risk, with $1x10^{-6}$ as the point of departure (i.e. goal). During the remedial investigation, the major radionuclide detected in most media above background was Th-230. In order to ensure accuracy during the remedial investigation, the State of Ohio retained an independent consultant to evaluate and validate radiological data collected at the Site. The results of the data validation indicated that the radionuclides Pa-231m and Ac-227 are present in soils at levels at least slightly above background. Thus, the State intends that future analysis for soils during the remedial design/remedial action phase be analyzed for Pa-231m and Ac-227.

MEDIA	VANADIUM CLEAN-UP LEVEL
SOILS	
Wetland Soils *	700 mg/kg
SEDIMENTS	
Onsite	1280 mg/kg
Offsite	1280 mg/kg
SURFACE WATER	
Onsite	87 ug/l
Offsite	87 ug/l

* During the remedial design, additional studies will be conducted to further derive an exact clean-up number for wetland soil. For the purposes of the decision document, the clean-up level is shown above.

5.3.3 Place Excavated Sediments and Soils on the West Slag Pile

Ohio EPA's selected remedy is to place the excavated sediments and soils on top of the West Slag Pile prior to capping of this pile. This pile already received excavated sediments and soils in the partial decommissioning of 1989-1990.

5.4 West Slag Pile

5.4.1 Capping of the West Slag Pile

Ohio EPA's selected remedy for the West Slag Pile consists of a cap system designed in accordance with Ohio's solid waste regulations under Ohio Administrative Code Chapter 3745-27. The objective of a cap is to contain the waste and minimize infiltration of water into the waste. Ohio EPA considers the solid waste cap alternative to be the most suitable alternative for remediating the West Slag Pile. This alternative best meets the eight selection criteria described above.

The cap is a recompacted low permeability cap. The cap, commonly referred to as a solid waste cap, is currently used to cap landfills in the State of Ohio. The cap would cover not only the West Slag Pile, but also contaminated soils from the wetland soils, and onsite/offsite sediment. The remedy also controls stormwater discharges to levels that are protective of human health and the environment.

The cap system would apply to contaminated sediments, sediment/soil from sedimentation deltas, wetland soils and Chapman Run sediments that would be placed on the West Slag Pile prior to capping (refer to Figures 5, 6, 7 for onsite/offsite sediments and wetland soil areas of concern). The material would be placed on top of the West Slag Pile so as to minimize the footprint of the pile wherever feasible. Should it be impractical to place all such material on the West Slag Pile, the remaining material would be placed against the side of the West Slag Pile prior to capping. The cap system would guard against any additional surface water contamination from the Site in the future. Capping the slag piles guards against chemical and radiological releases from the piles.

An important consideration during evaluation of remediation alternatives is identification of "Applicable or Relevant and Appropriate Requirements" ("ARAR"s). Disposal of the solid and/or chemical waste materials currently found in the West Slag Pile would require disposal in either solid waste landfills or hazardous waste facilities. A permitted landfill operated today would be required to install a cap per solid or hazardous waste regulations. (These and other ARARs are set forth in the Complaint filed by the State of Ohio in *State of Ohio, ex rel Montgomery v. Shieldalloy Metallurgical Company and Cyprus Foote Mineral Company,* Case No. 95CV242, Guernsey County Court of Common Pleas.)

5.4.2 Performance Standards for the Cap

The goal of the cap system is to protect human health and the environment. The performance standards for the cap should meet the standards described in this Decision Document, including applicable requirements for solid waste caps under Ohio Administrative Code Chapter 3745-27. Further, the cap should provide sufficient shielding such that any external radiation exposure from the pile does not exceed background levels.

5.4.3 Long Term Care

There is a need for long term care of any radioactive material left at the Site. The design of the cap for the West Slag Pile would include long term care and an Operation and Maintenance (O&M) program of 1000 years. To better ensure that a cap would meet performance standards for this time period, Shieldalloy and Cyprus Foote would need to evaluate and present a mechanism for long term care of the Site (referred to as operation and maintenance).

Conceptually, Shieldalloy and Cyprus Foote would need to provide financial instruments that would pay out funds over time to pay for the long term operation and maintenance of the Site. There would need to be sufficient funds to address any failure of the cap system. Moneys would need to be available for cap repairs and other operation and maintenance for a period of 1000 years.

5.4.4 Alternatives Considered

Ohio EPA evaluated the remediation alternatives using the above eight criteria. Ohio EPA considered the "decommissioning cap" alternative, but this alternative does not adequately protect

human health and the environment. For example, the Chemfix material, which would purportedly serve as the "impermeable layer," would not provide a proven long-term barrier to weathering and infiltration, and would not meet solid waste capping criteria under Ohio Administrative Code Rule 3745-27-11. The Chemfix material itself also contains heavy metal contaminants.

Ohio EPA also considered removal of all slag material from the Site and disposal of it elsewhere. Disposal of this waste following removal from the Site would require transportation and disposal at the Envirocare facility in Utah. This alternative was determined to be cost prohibitive, in that it would cost $169 million. Another factor was that excavation and removal of slag may increase exposure risks to workers and the public during field work and transportation.

5.5 East Slag Pile

5.5.1 Sale and Removal

The selected remedy includes a six-month period for Shieldalloy to evaluate and submit a report on the marketability of the slag found in the East Slag Pile. The slag is potentially usable as a "slag conditioner" in the manufacture of steel, and may be marketable as such. If it is feasible to market and remove this slag material, Shieldalloy would need to submit an acceptable plan and schedule to Ohio EPA for accomplishing this option. Shieldalloy would need to ensure that all license requirements for both generators and users of the material would be met and that worker protection methods would be employed.

5.5.2 Capping and Long Term Care

If the East Slag Pile material may not be expeditiously sold and removed, then Ohio EPA's selected remedy is to cap the East Slag Pile and ensure long term care in the manner discussed for the West Slag Pile. The cap for the East Slag Pile would be required to meet the same design criteria as the West Slag Pile (i.e., a low permeability cap designed in accordance with Ohio solid waste rules).

5.5.3 Performance Standards for the East Slag Pile Cap

The goal of the cap system is to protect human health and the environment. The performance standards for the cap should meet the standards described in this plan, including applicable requirements for solid waste caps under Ohio Administrative Code Chapter 3745-27. Further, the cap should provide sufficient shielding such that any external radiation exposure from the pile does not exceed background levels.

5.6 Stormwater Controls for the Site

Shieldalloy has applied for a Stormwater Discharge Permit from Ohio EPA under RC Chapter 6111. The permit would establish limits on discharges of stormwater runoff from the Site. The permit

Actual or threatened releases of hazardous substances from the Site, if not addressed by implementing the remedy selected in this Decision Document, may endanger public health, welfare or the environment. This Decision Document does not preclude Ohio EPA from seeking other remediation at the Site in the future in a manner not inconsistent with the U.S. Environmental Protection Agency's National Contingency Plan (NCP) at Title 40 of the Code of Federal Regulations, Part 300. Procedures under the NCP call for periodic review to ensure that the remedy will protect human health and the environment. This Decision Document does not address remediation of Cambridge area locations away from the Site where radioactive slag from the facility was used as fill material.

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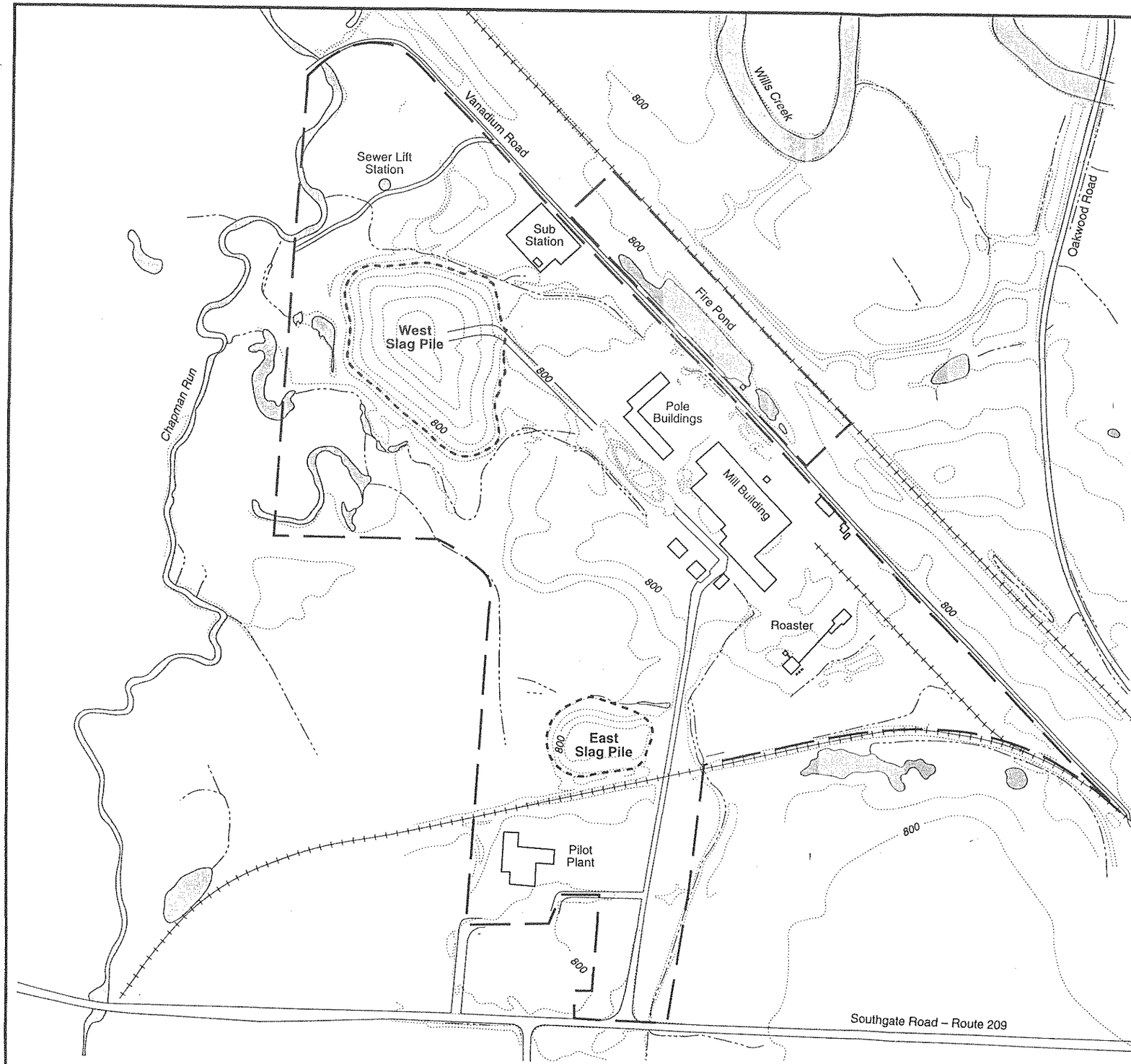


LEGEND

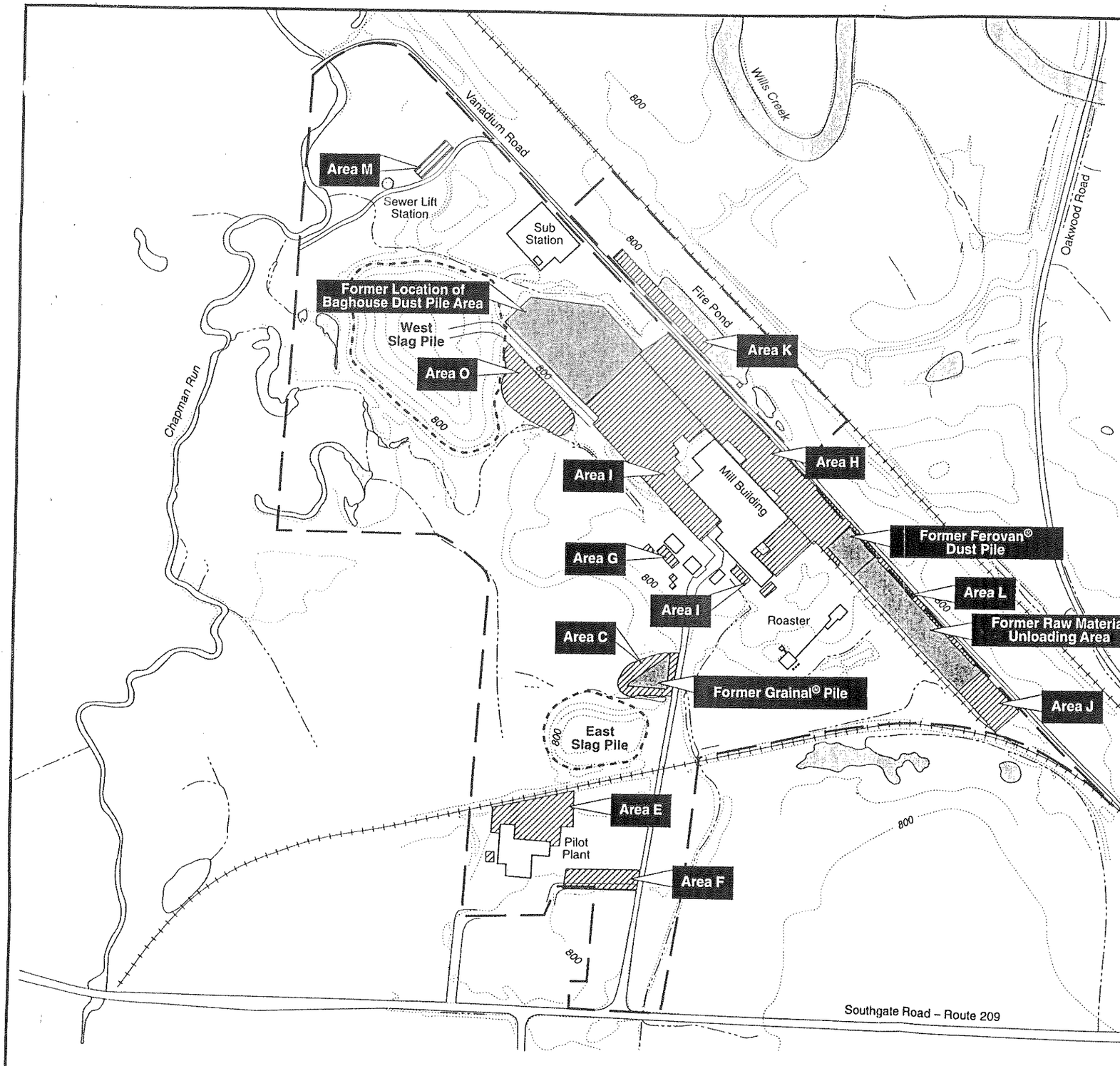
- Slag pile area
- Creeks and ponds
- Roads
- Buildings
- Approximate property boundary
- Contours

Source: Topographic features provided by Continental Aerial Surveys, Inc., December 1994

0 400 800 feet

Contours in feet

Figure 1. SMC facility.



LEGEND

- Slag pile area
- Creeks and ponds
- Roads
- Buildings
- Approximate property boundary
- Contours

- Extent of soils excavated during 1989 facility decontamination. Locations are approximate based on site decontamination report.
- Other potential historical source areas

Source: Topographic features provided by Continental Aerial Surveys, Inc., December 1994

0 400 800 feet

Contours in feet

Figure 3. Historical locations of potential source areas.

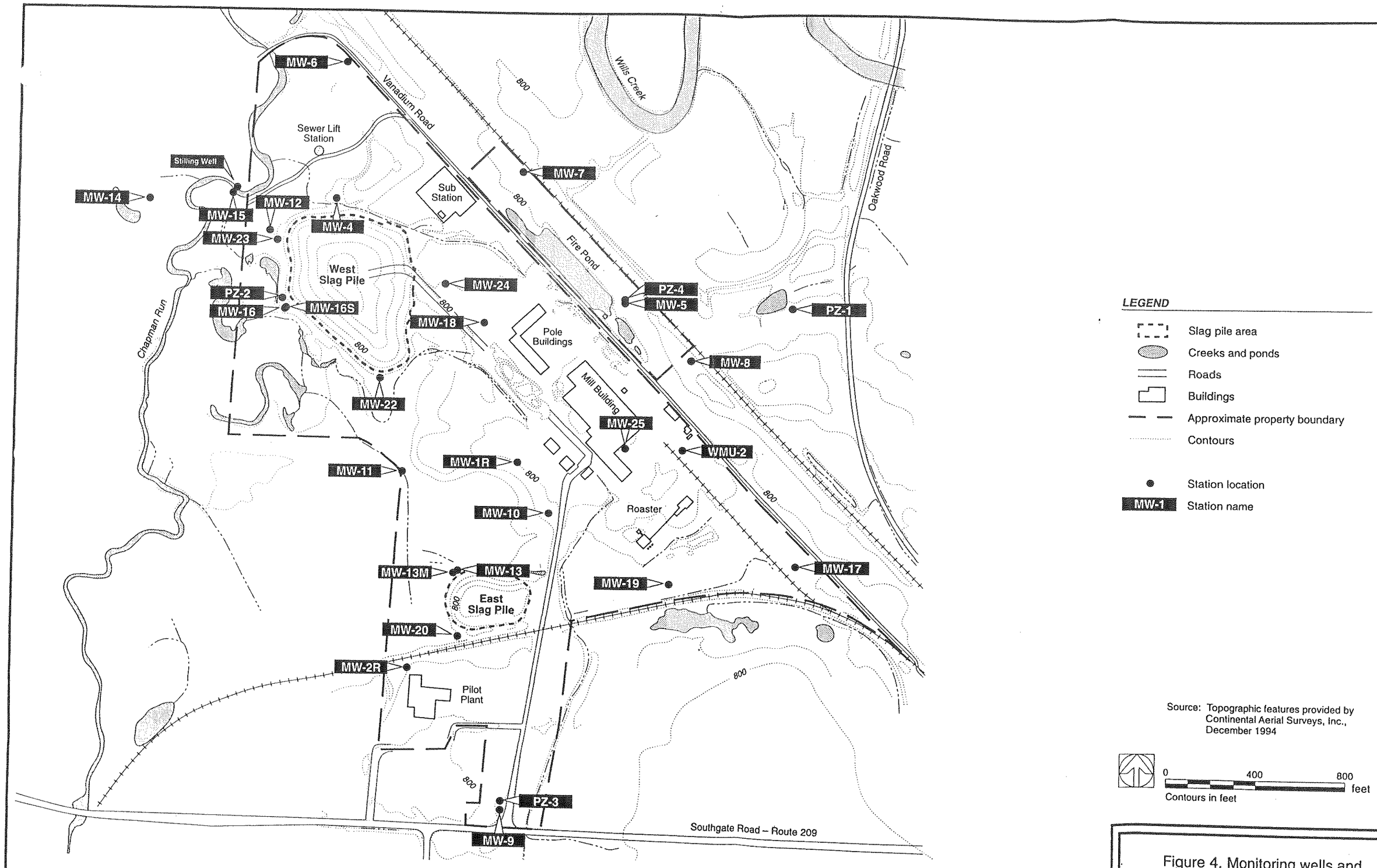
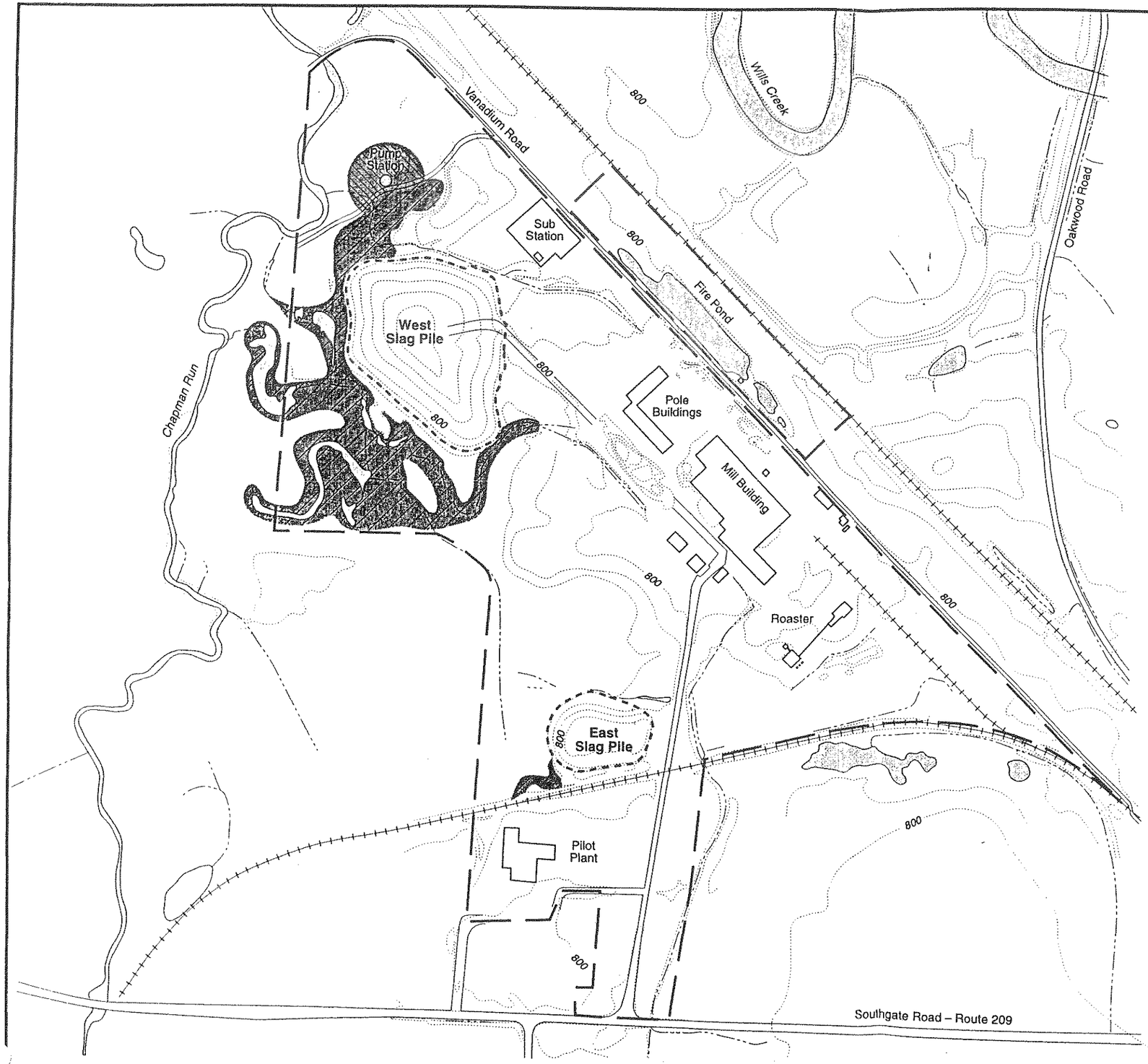


Figure 4. Monitoring wells and piezometer locations.



LEGEND

- Slag pile area
- Creeks and ponds
- Roads
- Buildings
- Approximate property boundary
- Contours
- Area of potential concern
- Area of potential concern previously disturbed during construction of new pump station

Note: These areas will be refined upon completion of additional ecological studies.

Source: Topographic features provided by Continental Aerial Surveys, Inc., December 1994

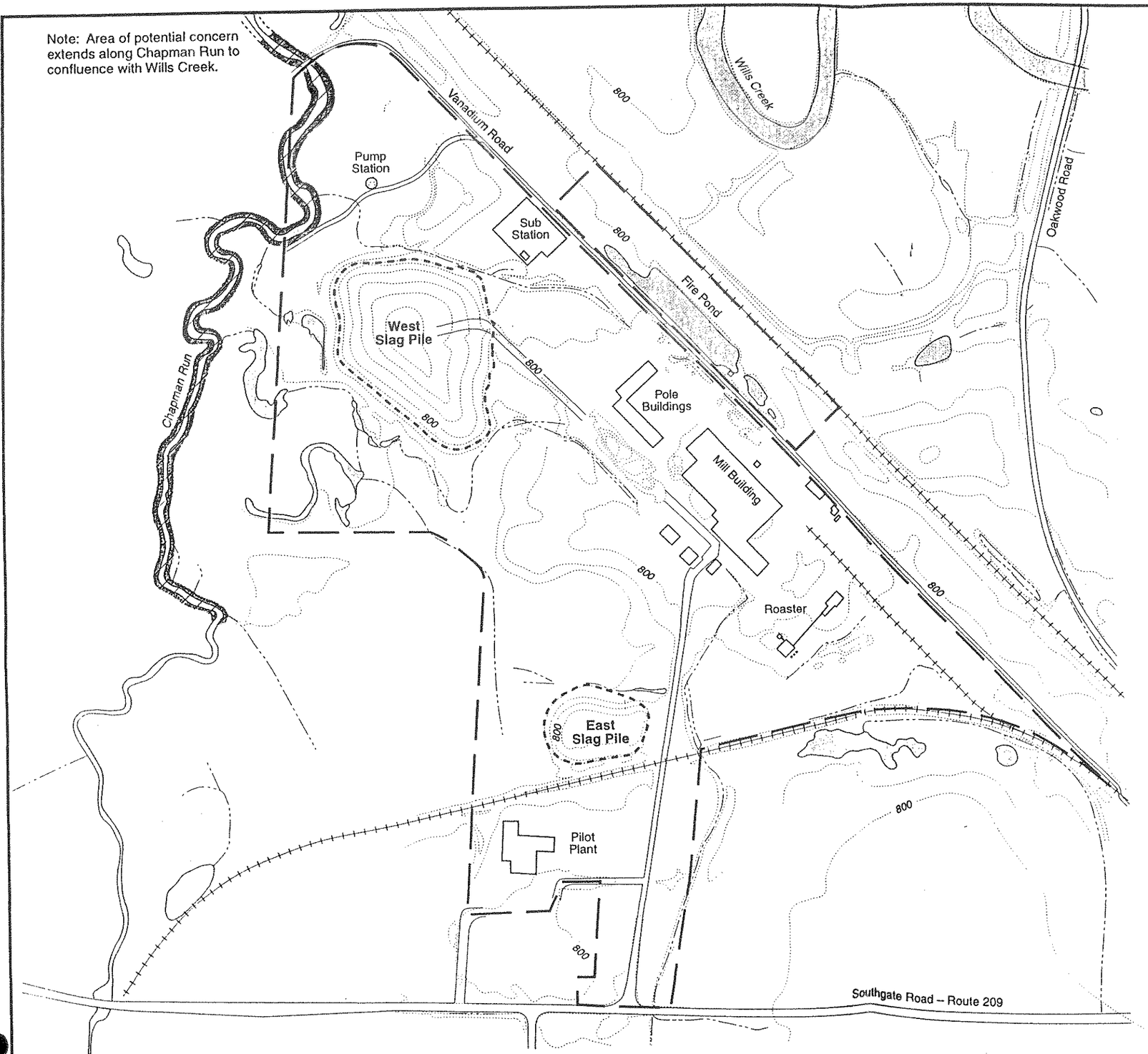
0 400 800 feet

Contours in feet

Figure 5. Preliminary area of potential concern for wetland soil.

CA38-08-01 09/

Note: Area of potential concern extends along Chapman Run to confluence with Wills Creek.



LEGEND

- Slag pile area
- Creeks and ponds
- Roads
- Buildings
- Approximate property boundary
- Contours
- Area of potential concern

Note: Areas of potential concern include in-channel sediments only. These areas will be refined through further sampling in the remedial design phase in conjunction with the use of the PRG for sediments and the consideration of other factors (e.g., short term environmental effects).

Source: Topographic features provided by Continental Aerial Surveys, Inc., December 1994

0 400 800 feet

Contours in feet

Figure 7. Preliminary area of potential concern for offsite sediment.

CA38-08-01 09/11/96

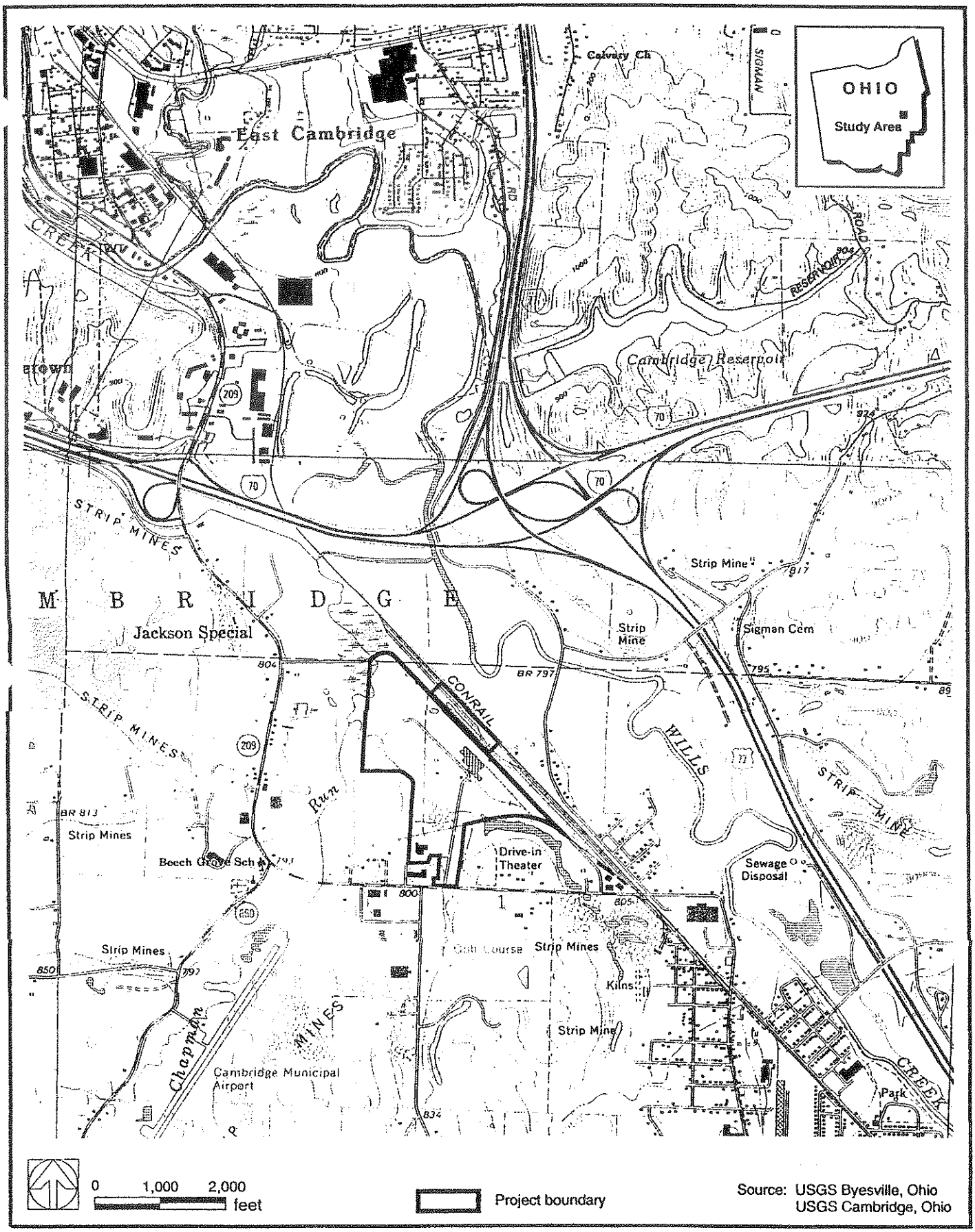
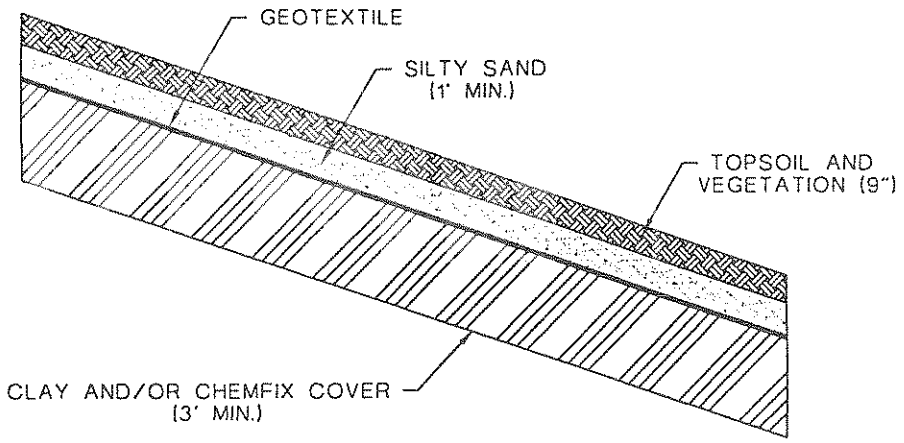
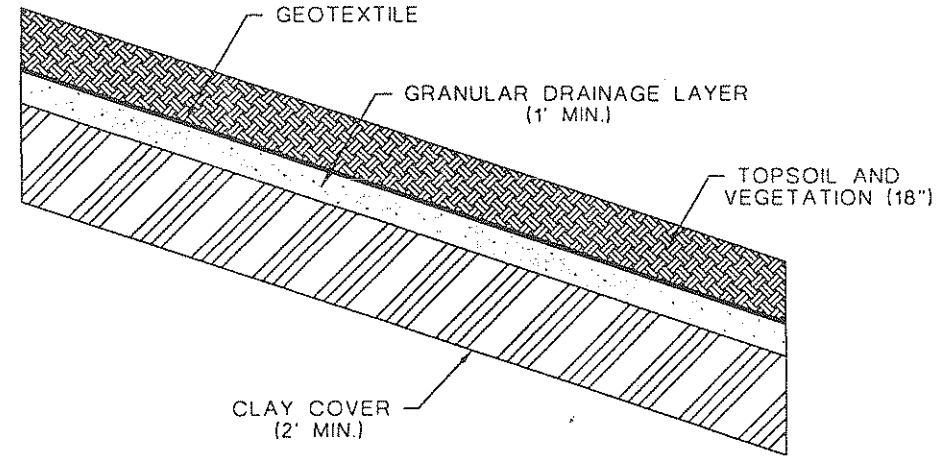


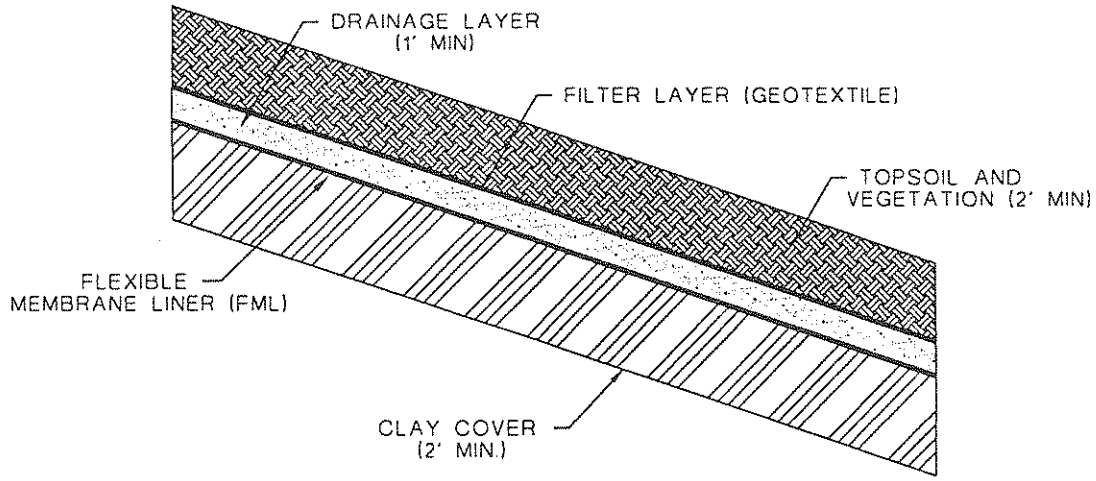
Figure 2. Location of Shieldalloy Metallurgical Corporation, Cambridge, Ohio.



CAP FOR DECOMMISSIONING OF WEST SLAG PILE

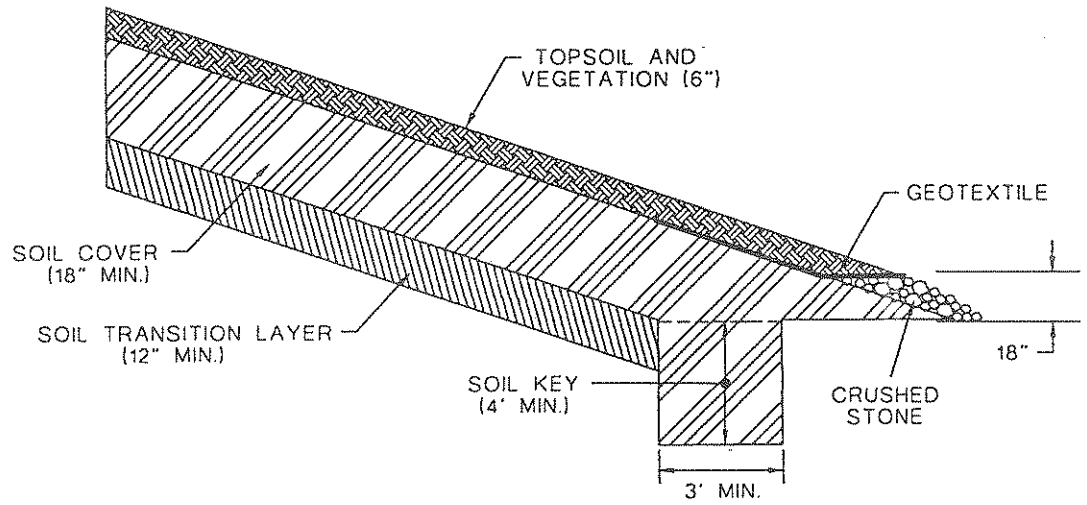


CAP FOR SOLID WASTE LANDFILL

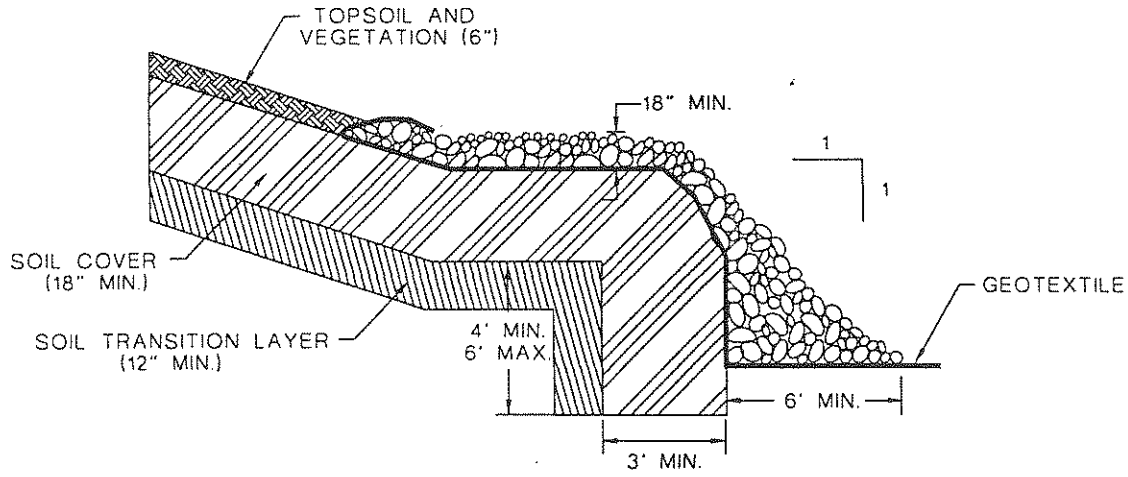


CAP FOR HAZARDOUS WASTE LANDFILL

Figure 8. Cross sections of caps.



CONCEPTUAL CAP DESIGN
(OUTSIDE OF FLOODPLAIN)



PLACEMENT OF RIP RAP FOR EROSION PROTECTION
(INSIDE FLOODPLAIN)

Figure 9. East slag pile - Cap and erosion control.

OHIO ENVIRONMENTAL PROTECTION AGENCY

RESPONSIVENESS SUMMARY
FOR THE

SHIELDALLOY METALLURGICAL CORP. SITE
CAMBRIDGE, OHIO

RESPONSIVENESS SUMMARY

The purpose of this Responsiveness Summary is to summarize and to provide a brief response to comments made during the public comment period for the Shieldalloy Metallurgical Corporation Site, Cambridge, Ohio ("the Site"). This Responsiveness Summary applies to both written and oral comments. This Responsiveness Summary does not necessarily provide the basis for the Decision Document. In the event of any variance between this Responsiveness Summary and the Decision Document, the Decision Document controls.

This Responsiveness Summary is organized in four parts:

I. Comments from Shieldalloy and Cyprus Foote Mineral
II. Comments from U.S. Nuclear Regulatory Commission
III. Comments from Public Meeting
IV. Other Written Comments

In general, for more information on the topics raised in the comments, see the Decision Document and the RI/FS report.

I. COMMENTS FROM SHIELDALLOY AND CYPRUS FOOTE MINERAL

A. GENERAL COMMENTS

1. A solid waste cap, per OAC Chapter 3745-27, is unnecessary for the West and East Slag Piles.

   Ohio EPA response: Ohio EPA does not agree with the Shieldalloy Metallurgical Corporation (SMC) and Cyprus Foote Mineral (CFM) position that a solid waste cap is unnecessary for the Site. Ohio EPA believes that a solid waste cap is needed to provide long-term protection for the West Slag Pile and, if necessary, the East Slag Pile.

2. The excavated sediments and soils should be placed adjacent to the West Slag Pile, rather than on top of the pile.

   Ohio EPA response: Disagree. The placement of soils and sediments atop the West Slag Pile will maximize the area available for placement of offsite slag returned to the Site, if this is allowed in the future.

3. Reconcile cost provisions projections.

Ohio EPA response: The cost revisions presented in the final Feasibility Study will be reflected in the Decision Document.

4. Ohio EPA should affirmatively provide for return of off-site slag onto the Site and placement of it adjacent to the West Slag Pile. SMC and CFM continue to note that Ohio EPA's deferral with respect to this matter is not necessary or appropriate and that issues that do not relate to the on-site placement of this material are outside the scope of the Preferred Plan and Decision Document and do not need to be addressed in them.

Ohio EPA response: Disagree. As noted in the Decision Document, Ohio EPA's selected remedy is to evaluate this issue further if firm plans are expeditiously developed for removal of the radioactively contaminated slag from the offsite locations.

5. Revise the description of radioactive slag. Throughout the document, Ohio EPA refers to ferrocolumbium, ferrovanadium, and Grainal slags as "radioactive," which is not accurate. The slags should be identified as containing "elevated levels of naturally occurring radioactivity." Moreover, the Plan incorrectly refers to all Grainal, ferrovanadium, and ferrocolumbium slags as radioactive. These materials were at different times made with ores and raw materials from different sources that exhibited varying concentrations of radionuclides.

Ohio EPA response: The Decision Document will not be revised; however, the inclusion of this comment in the comment section serves to clarify SMC/CFM position on the terminology noted.

B. SPECIFIC COMMENTS

1. Comment: 1.0 Introduction, page 4, line 8: SMC and CFM commented that this section of the Plan states that the two slag piles cover a combined area of 14 acres. Area calculations performed during and reported in the RI/FS, which were based on digitized aerial photographs and confirmed by a land survey, show the total area of the two slag piles to be less than 11 acres. This acreage should be reflected in the Decision Document.

Ohio EPA response: Concur. The references to 14 acres in the Preferred Plan will be revised to 11 acres in the Decision Document.

2. Comment: 3.3 Metal Alloy Production, page 10, lines 1 and 2: SMC and CFM note that this section of the Plan states: "...the facility manufactured about six other alloy products (e.g., Grainal®, ferrotitanium, and small amounts of ferrocolumbium)." While this is generally accurate, it does not provide context for the reader to determine the relevant quantities of these alloy products vis-a-vis the various alloys that are discussed in the

preceding sentence. Thus, we suggest that the Decision Document state that "the facility manufactured lesser quantities of Grainal®, Solvan®, ferrotitanium, ferroboron, and ferrocolumbium alloys."

Ohio EPA response: Concur. Ohio EPA will include this language in the Decision Document.

3. Comment: 3.4 Metal Alloy Production, page 10, lines 3 and 4. SMC and CFM comment that this section of the Plan states: "The facility used naturally occurring radioactive ores and other raw materials to produce ferrovanadium, Grainal®, and ferrocolumbium alloys." More precisely, "The facility used ores or other raw materials containing low levels of naturally occurring radioactivity in the production of some alloys." SMC and Cyprus Foote suggest that Ohio EPA use this latter more precise description.

Ohio EPA response: The sentence will be revised.

4. Comment: 3.4 License for Ferrocolumbium Slag under the Atomic Energy Act, page 10, lines 14 and 15L: SMC and CFM note that the Preferred Plan states that Shieldalloy received a license from NRC in 1987. This sentence should be clarified to state that the license was only for possession of the slag. SMC did not produce ferrocolumbium and did not generate ferrocolumbium slag.

Ohio EPA response: Concur. The sentence will be revised.

5. Comment: 3.5 Slag and Other Wastes, page 10, lines 20 through 22: SMC and CFM note that this section states that the facility manufactured three types of radioactive slag (ferrocolumbium, ferrovanadium, and Grainal®). This statement is misleading; not all ferrovanadium and Grainal® slags are the same because of the various raw material sources used. Furthermore, not all ferrovanadium and Grainal® slags contain elevated concentrations of radionuclides.

Ohio EPA response: The purpose of the sentence is merely to identify the slags that are the primary contributors to the radiation in the slag piles.

6. Comment: 3.5 Slag and Other Wastes, page 10, lines 24 and 25: SMC and CFM note that this section of the Plan states that the facility disposed of most of its waste slags and other wastes in various areas across the Site until the late 1980s. This statement is inaccurate. While slag was placed in piles on site, only small amounts of other materials may have been placed on the piles. Further, no evidence has been found during any of the environmental investigations that chemical or hazardous wastes were placed in the slag piles.

Ohio EPA response: Disagree. During operation of the facility, slags were placed on the East and West Slag Piles. Other wastes were stored in various locations (e.g. Former Baghouse Dust Pile, empty drum accumulation area, former Grainal Slag Pile). In addition to the slags, solid waste was placed on the West Slag Pile and East Slag Pile, including baghouse dusts, scrap barrels, spent carbon anodes, etc.

7. Comment: 3.5 Slag and Other Wastes, page 10, lines 28 and 29: SMC and CFM note that this section states that the Grainal® Pile contained only radioactive Grainal® slag. This statement is incorrect. Only Grainal® made from zircon sands contained elevated concentrations of radionuclides.

Ohio EPA response: Concur. The Decision Document will be revised.

8. Comment: 3.6.1, Partial Decommissioning under the Atomic Energy Act, page 11, lines 4 and 5: SMC and CFM note that this section of the Preferred Plan states "Shieldalloy excavated approximately 140,000 tons of soil and slag, contaminated with chemical and radiological wastes...". The word "chemical" should be removed. Soil from the operational area was excavated on the basis of radiological characteristics only.

Ohio EPA response: The word "chemical" is retained because data from the Remedial Investigation show that soils in operational areas have chemical levels that are higher than background. However, the Decision Document will clarify that soil from the operational area was excavated on the basis of radiological characteristics only.

9. Comment: 3.6.1, Partial Decommissioning under the Atomic Energy Act, page 11, line 17: SMC and CFM note that this section of the Preferred Plan states that "...after adding baghouse dust, Shieldalloy covered the West Slag Pile with geotextile cloth and nine inches of sand." This statement is inaccurate. While the cap material does include baghouse dust, that dust was treated by a proprietary process to reduce the hexavalent chrome and to solidify the material. The resultant Chemfix® material was placed on the West Slag Pile and covered with a geotextile cloth and 12 inches of sand. The Decision Document should be clarified accordingly.

Ohio EPA response: The sentence will be revised to indicate that treated (Chemfix) and untreated baghouse dusts were placed on the West Slag Pile.

10. Comment: 3.6.1 Partial Decommissioning under the Atomic Energy Act, page 11, line 19:

SMC and CFM note that the Plan states that the total area of the West Slag Pile after decommissioning was 11.8 acres. Area calculations performed and reported in the RI/FS, which were based on digitized aerial photographs and confirmed by land surveys, establish the total area of the West Slag Pile as approximately 8.2 acres.

Ohio EPA response: Concur. The revision will be reflected in the Decision Document.

11. Comment: 3.6.1, Partial Decommissioning under the Atomic Energy Act, page 11, lines 21 through 24: SMC and CFM note that this section states that Shieldalloy installed a fence around the East Slag Pile to limit human exposure to radiation consistent with NRC requirements. While Shieldalloy did install a fence around the East Slag Pile in 1992, the purpose was to secure licensed material from unauthorized removal.

Ohio EPA response: The sentence will be revised as follows:

> " In 1992, Shieldalloy installed a fence around the East Slag Pile consistent with NRC requirements. A purpose of the fence is to secure licensed material from unauthorized removal."

12. Comment: 4.1, Hydrogeology and Groundwater, page 15, lines 25 and 26: SMC and CFM note that the Plan states that past investigations have "typically entailed the installation and sampling of monitoring wells to monitor the shallow groundwater at the Site." The word "shallow" should be removed from this sentence because it incorrectly implies that only shallow monitoring wells have been installed at the Site. In fact, deep wells and piezometer have also been utilized at the Site. (See page 2-3 of the final Remedial Investigation report.)

Ohio EPA response: Concur. The word "shallow" will be deleted from the text.

13. Comment: 4.1, Groundwater Quality, page 16, lines 20 and 23: SMC and CFM note that this section lists the number of groundwater monitoring wells sampled during each phase of the Remedial Investigation. These sentences should be corrected to state that 24 (not 23) wells were sampled in the first round and 7 wells (not 9) were sampled during the second round.

Ohio EPA response: Concur. Text will be revised to reflect the changes.

14. Comment: 4.2, Onsite Soils, page 17, lines 19 through 22: SMC and CFM note that the Plan states "Soil samples from the perimeter of the slag piles did not have elevated concentrations of metal contaminants, with the exception of soils from 0 to 5 foot depth collected next to the slag piles." In fact, only one sample collected at depths of 0-5 ft. near the slag piles was found to contain elevated concentrations of metals (see page ES-12 of the final Remedial Investigation report). Accordingly, the Plan should be revised to read "...with the exception of a single soil sample collected from the 0-5 ft. depth interval at MW-20 located next to the East Slag Pile."

Ohio EPA response: The comment appears to contradict Figure 43 of the Remedial Investigation which shows elevated vanadium in perimeter soils. The text in the Decision Document will remain unrevised.

15. Comment: 4.2, Onsite Soils, page 17, line 24: SMC and CFM note that this Section states that "Samples at the West Slag Pile contained calcium and magnesium at elevated levels." The words "at the" should be replaced with "collected from beneath...".

Ohio EPA response: Concur. The sentence will read as follows:

> "Samples collected from beneath West Slag Pile contained calcium and magnesium at elevated levels."

16. Comment: 4.2, Onsite Soils, page 17, lines 32 through 34: SMC and CFM note that the plan states "The Remedial Investigation detected above-background levels of the radionuclides thorium-230, actinium-227, and radium-228 in samples from the sedimentation delta on the south side of the West Slag Pile...". This statement is not accurate.

Actinium-227 is not present at elevated concentrations in soil. Further, it does not appear that radium-228 is present in such concentrations.

The final Remedial Investigation report states that only thorium-230 was detected in this area. Actinium-227 was discussed in the correspondence in Appendix R of the RI/FS in order to address the presence of elevated levels of actinium-227 in certain slag. However, actinium-227 was never detected in above-background concentrations at the Site. Further, although statistical testing for radium-228 presented in Appendix R showed positive results (i.e., significant with respect to background), the most likely cause was that the background assumed from the thorium decay series (the average for the state of Ohio was used) was too low.

Ohio EPA response: Disagree. Ohio EPA, the Ohio Department of Health (ODH) and SMC/CFM discussed the issue of the presence of Actinium-227 and Radium-228 in soil through several correspondences. In the SMC/CFM's June 26, 1996 letter to ODH, SMC/CFM clearly stated that "For soils, three radionuclides were identified as being significantly greater than background in the Wilcoxon Rank Sum test: actinium-227, radium-224, and radium-228." Although Ra-224 was dropped from the consideration, Ac-227 and Ra-228 were definitely identified as chemicals of potential concern. The background level of Ra-228 was agreed upon by Ohio EPA, SMC and CFM.

17. Comment: 4.4, Transport and Fate of Contaminants, page 18, line 38: SMC and CFM note that this heading appears to be a major subject heading, not a subheading under 4.4 Sediments and Wetland Soil.

Ohio EPA response: Concur. Text will be revised.

18. Comment: 4.7, Atmospheric Transport, page 19, lines 25 and 26: SMC and CFM note that this section states that modeling was conducted to determine concentrations of contaminants in air. However, it fails to report the conclusion of that monitoring. To address this, SMC and Cypress Foote suggest that the following sentence from the final Remedial Investigation report should be added to this section: "The conservative modeling, which included emissions and dispersion calculations, demonstrates that air quality does not pose a risk at the Site."

Ohio EPA response: The above passage from the Remedial Investigation will be revised.

19. Comment: 4.8.1, Human Health Risk Assessment, page 20, lines 7 through 11: SMC and CFM note that this paragraph presents Ohio EPA's radiological risk assessment results. This section should be clarified by adding the following text to the sentence that ends with "October 16, 1996": "...and using conservative assumptions about the presence of actinium-227 and its daughter products." This paragraph should also state that EPA's acceptable risk range is $1x10^{-4}$ to $1x10^{-6}$.

Ohio EPA response: The text will be revised.

20. Comment: 4.8.2, Phase I Ecological Assessment, page 21, lines 27 through 31: SMC and CFM note that this section states that certain areas were found to contain metal concentrations in soils which exceed USEPA benchmark values for plant toxicity. It fails to report, however, that subsequent study by a regional expert (Dr. Barbara Andreas of Miami University) found no evidence of phytotoxic effects in vegetation. See page ES-20 of the Remedial Investigation report.

Ohio EPA response: An examination of the noted report by Dr. Andreas reveals that an evaluation of phytotoxicity was not an objective of her study. In addition, significant areas at the Site are devoid of vegetation. The noted observations of Dr. Andreas do not refute USEPA's benchmark values for plant toxicity.

21. Comment: 4.8.2, Phase I Ecological Assessment, page 21, line 43 through page 22, line 5: SMC and CFM note that this paragraph describes the macroinvertebrate communities as being fair to poor and attributes marginal habitat conditions downstream of SMC as being the result of pervasive silt loading. To more accurately describe the conditions encountered, this paragraph should be replaced with the following text: "The macroinvertebrate communities at all stations in Chapman Run were in the fair range, except at river mile 0.9, downstream from the Site, which fell in the poor range. Habitat conditions were marginal at all locations with the worst conditions being downstream of the Site where the substrate is predominantly fine silt. Ohio EPA has concluded that the

macroinvertebrate community at river mile 0.9 is below what would be expected given the habitat conditions."

Ohio EPA response: The above referenced text, as presented in the Preferred Plan, summarizes the conclusions of Ohio EPA's evaluation of Chapman Run and the associated wetlands.

22. Comment: 4.8.3, Phase II Ecological Risk Assessment, page 23, lines 25 and 26: SMC and CFM note that this section of the Plan discusses contaminants present in Chapman Run and the possible sources of these contaminants. The corresponding discussion in the final Remedial Investigation report includes the following statement that was omitted from the Plan:

> "The specific contribution of Site chemicals of potential concern to these effects cannot be determined from the available data."

This statement should be added to the Plan.

Ohio EPA response: Regardless of whether of not the Ohio EPA can apportion harm to individual aquatic species in Chapman Run and adjoining wetlands, the overall level of chemicals of potential concern pose risk to the aquatic community in these affected areas.

23. Comment: 5.0, Summary of the Feasibility Study, page 25, line 11, and page 26, line 10: SMC and CFM note that the text "Develop and screen" on page 25, line 11, should be replaced with "Identify and screen."

On page 26, under the heading of Offsite Sediment on line 10, "recanalization" should be replaced with "rechannelization" (and throughout the Plan).

Ohio EPA response: Concur. Both corrections will be included in the Decision Document.

24. Comment: 5.1, West Slag Pile, page 26, lines 29 through 31. SMC and CFM note that the section states that the total area of the West Slag Pile is 11.8 acres. See comment regarding 3.6.1, above, and conform.

This section also states that the West Slag Pile contains "most types of radioactive and nonradioactive slag." This statement should be clarified with the addition of the following language: "that have been historically produced at the SMC Cambridge facility." The unit "tons" should be inserted following the estimated weight of the slag (532,150). Also, the estimated volume should be changed from 222,700 yd^3 to 220,663 yd^3 to be consistent with the Remedial Investigation report.

Ohio EPA response: The sentence will read as follows:

> "The West Slag Pile covers approximately 8.2 acres as shown in Figure 1. It includes most types of radioactive and nonradioactive slag that have been generated at the SMC Cambridge facility. The West Slag Pile has an estimated weight of 532,150 tons, and an estimated volume of 220, 663 yd^3."

25. Comment: 5.1.2, Capping in Place, page 27, lines 26 through 27 and 30: SMC and CFM note that the reference to "RC Chapter 3734" on line 30 is inconsistent with the reference on page 28, line 21.

Ohio EPA response: Concur. The text will be revised.

26. Comment: 5.1.2, Decommissioning Cap, page 27, lines 39 through 41: SMC and CFM note that this paragraph inaccurately describes the completion of the decommissioning cap. First, the words "baghouse dust" should be deleted from this sentence because this material was converted into Chemfix®, which then was used for the existing decommissioning cap. Second, line 41 should be replaced with "the new clay layer that extends from the Chemfix® layer down to ground surface, followed with 12 inches of top soil placed over the entire pile. (See Figure 8)."

Ohio EPA response: The paragraph will read as follows:

> "Completing the decommissioning cap would first require placing clay around the perimeter of the West Slag Pile. The new clay layer would have a thickness of 3 feet with a permeability 10^{-6} to 10^{-8} cm/sec and would extend from the edge of the Chemfix/baghouse dust layer down to ground surface, followed with 12 inches of silty sand and geotextile fabric. Upon completion of the capping of the perimeter, 9 inches of top soil would be placed over the entire West Slag Pile. (See Figure 8)"

27. Comment: 5.1.2, Hazardous Waste Cap, page 28, line 29: SMC and CFM note that the permeability specification for the 1 foot thick drainage layer should be revised to specify permeability equal to $1x10^{-2}$ cm/s or greater, not less, as specified in the Plan.

Ohio EPA response: Concur. The text will be revised.

28. Comment: 5.1.2, Cost Estimates for Capping, page 28, line 41 through page 29, line 11: SMC and CFM note that the cost estimates presented in the Plan generally show the difference among the different types of caps but are not fully consistent with the final Feasibility Study report. These costs should be revised to be consistent with the final feasibility study report, or an explanation for the difference should be provided.

Ohio EPA response: The cost estimates presented in the Decision Document will be revised to be consistent with the final Feasibility Study.

29. Comment: 5.1.4, Removal and Offsite Disposal, page 30, line 37: SMC and CFM note that the acreage for the West Slag Pile is incorrect. Revise from 11.8 to 8.2.

Ohio EPA response: Concur. The text will be revised.

30. Comment: 5.1.4, Removal and Offsite Disposal, page 31, line 34: this section states that 5,934 rail cars would be required for offsite disposal. The number of rail cars specified in the final Feasibility Study report is 4,865. The Plan should be revised to agree with the final feasibility study report, or an explanation should be provided for the difference.

Ohio EPA response: Concur. The text will be revised to reflect the number of railcars needed as 4,865 which will be consistent with the final Feasibility Study report.

31. Comment: 5.2.2, Capping in Place, page 33, item 3, line 20: SMC and CFM note that this item states that the cap would reduce the flux of radon from the radioactivity in the matrix. A parenthetical sentence should be added that states: "(There is no measurable radon flux from the East Slag Pile, so the cap design includes no consideration of radon flux reduction.)".

Ohio EPA response: Disagree. The text will not be revised.

32. Comment: 5.2.2, Hazardous Waste Cap, page 35, line 7: SMC and CFM note that the permeability specification for the 1 foot thick drainage layer should be revised to specify permeability equal to $1x10^{-2}$ cm/s or greater, not less, as specified in the Plan.

Ohio EPA response: Concur. The text will be revised.

33. Comments: 5.2.4, Removal and Sale of the Slag, page 37, lines 37 and 38: SMC and CFM note that this section describes the process for crushing and sorting the slag for sale. The sentence stating that it may be possible to separate very large chunks of slag exhibiting radioactivity for offsite disposal should be deleted. There are no plans to segregate any slag from this option based on radioactivity.

Ohio EPA response: Disagree. Although there are no plans as such, it remains possible to separate large slag buttons if it is necessary to do so.

34. Comment: 5.2.4, Cost Estimates, page 38, lines 15 and 16: SMC and CFM note that this section states that the cost to remediate the East Slag Pile may result in a profit; thus, cost estimates were not generated for this alternative. To maintain consistency with the feasibility study report, these lines should be replaced with the following language:

"Because the feasibility of selling the slag in the East Slag Pile has not yet been established, there are no means by which to prepare cost data on it. Once the ongoing evaluation of the feasibility of the sale has been completed, a cost estimate for the sale will be prepared if the evaluation indicates that selling the slag is technically, legally, and economically feasible."

Ohio EPA response: The above sentence will be revised in the Decision Document.

35. Comment: 5.4.3, Recanalization, page 41, line 24: SMC and CFM note that the subject heading should be revised to read "Rechannelization."

Ohio EPA response: Concur. Decision Document will be revised to be consistent with the final Feasibility Study.

36. Comment: 6.1, Selection Criteria, page 48, item 2, lines 16 and 17: SMC and CFM note that the selection criteria listed include "Compliance with all state, federal and local laws and regulations." By law, the criteria include only those laws and regulations that are applicable or relevant and appropriate. The Plan should be revised to reflect this.

Ohio EPA response: The text will be revised as follows:

"Compliance with all State, Federal and Local laws and regulations - addresses whether or not a remedy will attain applicable, relevant and appropriate requirements under federal, state, and local environmental laws;".

37. Comment: 6.3.1, Excavate to Meet Performance Standards, page 49, lines 27 through 33: SMC and CFM note that the need for wetland soil and sediment remediation and the areas and volumes to be remediated will be determined during the Remedial Design phase of the project.

Ohio EPA response: The Decision Document will note that the areas and volumes for the wetland soils and sediments will be determined during the Remedial Design phase. However, the Decision Document will note that the wetland soils and sediment will need to be remediated. Data presented in the feasibility study and the Remedial Investigation (Ecological Risk Assessment Phases I and II) shows that risk exists to potential ecological receptors in these areas. The question of whether or not these areas need remediation was answered during the Remedial Investigation and Feasibility Study.

38. Comment: 6.3.2, Performance Standards for Cleanup of Soils and Sediments, page 50, lines 7 and 11 through 14: SMC and CFM note that this section specifies that the area and volume estimates for onsite sediment and offsite sediment are based on a vanadium concentration of 1,280 mg/kg. This section should be revised to state that the area and

volume estimates used in the Plan, including the figures, is based on a vanadium concentration of 700 mg/kg.

This section also states that a combination of source control and sediment remediation is expected to meet the preliminary remediation goal for surface water (87 μg/L for vanadium). Ohio EPA has not accurately stated the remediation goals for vanadium in surface water. Vanadium concentrations outside the mixing zone should be limited to a maximum of 190 μg/L according to the State's report *Biological, Sediment and Water Quality Study of Chapman Run and Associated Wetlands.* Furthermore, this number should not be applied to onsite intermittent drainage ditches.

Ohio EPA response: Section 5.0 of the Decision Document has a table that sets forth the following preliminary remediation goals (PRGs) for vanadium: 700 mg/kg for wetland soils; 1280 mg/kg for sediments; and 87 ug/l for surface water. The Feasibility Study used a PRG figure of 700 mg/kg to compute the approximate amount of contaminated wetland soils and sediments that would be excavated. The Remedial Design work would compute more precisely the areas and volumes of contaminated soils and sediments to be excavated.

39. Comment: 6.3.2, Performance Standards for Cleanup of Soils and Sediments, page 50, lines 15 and 16. SMC and CFM note that this section refers to a table in Section 6.11 which outlines the cleanup levels for each medium at the Site. There is no Section 6.11 in the Plan.

Ohio EPA response: The reference to Section 6.11 will be deleted from the Decision Document. The sentence will now read: "Please refer to the table in this section..."

40. Comment: 6.3.2, Performance Standards for Cleanup of Soils and Sediments, page 50, lines 30 and 31: SMC and CFM note that this section states that the major radionuclide detected in most media during the Remedial Investigation was thorium-230 (Th-230). This section should be corrected to state that thorium-230 was detected only in soils. Thorium-230 was not detected in surface water or groundwater in concentrations above background.

Ohio EPA response: For soils, please see the comments on Question 4.2 (Onsite Soils, page 17, line 32 through 34). Th-230 was not the only radionuclide identified in the RI/FS report. For groundwater, PTI clearly stated that "The data on radionuclide concentrations in wells MW-09 and MW-19 were used to define background concentrations. Thorium-230 is the only radionuclide that occurs above background concentrations in two of the wells (MW-12 and MW-13)." Therefore, Th-230 was detected in groundwater in concentrations slightly above background at least at MW-12.

41. Comment: 6.3.2, Performance Standards for Cleanup of Soils and Sediments, page 50, lines 33 through 35: SMC and CFM note that this section discusses the results of Ohio EPA's independent data validation, which identifies protactinium-231m and actinium-227 as present in Site soils at levels at least slightly above background. Based on this finding, the Plan presents the recommendation that samples collected during the Remedial Design phase be analyzed for protactinium-231m and actinium-227. The statement regarding the presence of these radionuclides at concentrations above background is incorrect. The statistical comparisons for soil between background and site locations indicated that neither protactinium-231m nor actinium-227 were present in elevated concentrations. (See Appendix R of the Remedial Investigation report.) At the State's request, these two radionuclides and their progeny were included in the risk assessment because they existed in elevated concentrations in the slag.

Ohio EPA response: Please refer to comments on Question 4.2 (Onsite Soils, page 17, line 32 through 34). Pa-231 with a half-life of 3.2E4 years is the parent of Ac-227 with a half-life of 21.6 years. The presence of Ac-227 above background strongly indicates the presence of Pa-231. The state still intends that future analysis for soils during the RI/FS phase be analyzed for Pa-231 and Ac-227.

42. Comment: 6.3.2, Performance Standards for Cleanup of Soils and Sediments, page 51, lines 3 through 15: SMC and CFM note that this section presents a table with vanadium cleanup levels for each medium. The vanadium cleanup level for wetland soils is listed as 700 mg/kg. For consistency with the Remedial Investigation report, this value should be listed as 1,280 mg/kg with a footnote explaining that this value will be refined during the Remedial Design phase.

Ohio EPA response: Please refer to comment 38.

43. Comment: 6.4.1, Capping of the West Slag Pile, page 52, lines 15 through 19: SMC and CFM note that this section states that "Disposal of the solid and/or chemical waste materials currently found in the West Slag Pile would require disposal in either solid waste landfills or hazardous waste facilities." There is no documentation in the Remedial Investigation report that solid wastes or hazardous wastes are present at the Site that would require disposal offsite in a solid waste or hazardous waste facility.

Ohio EPA response: Disagree. The sentence will not be revised.

44. Comment: 6.5, East Slag Pile, page 53, lines 18 through 24 and lines 28 through 32. SMC and CFM note that this section proposes a six-month period for Shieldalloy to evaluate the marketability of the slag found in the East Slag Pile. At this point, it is not possible to commit to a schedule for the evaluation of marketability of the East Slag Pile. In addition, assessing marketability must be coordinated with the NRC. A more appropriate approach for this issue would be to request a plan for the preparation of a

marketing study, which could be updated periodically to report on progress.

Ohio EPA response: Ohio EPA can consider any request to modify the schedule when it reviews SMC and CFM's work plan for the Remedial Design and Remedial Action.

45. Comment: 6.7.2 Controls for Former Process Areas, page 55, lines 17 through 22: SMC and CFM note that this section states that levels of vanadium in the former vanadium pentoxide drum accumulation area would result in unacceptable risks through inhalation of vanadium. Hence, the Plan recommends that future use of this area be controlled through institutional controls and revegetation or removal of contaminated soils. The assertion of unacceptable risks through inhalation of vanadium is not supported by the studies that were conducted at the Site. Indeed, the Remedial Investigation ruled out the inhalation pathways as a potential risk for vanadium (and for any other nonradiological compound). Accordingly, the Plan recommendation for controls in this area is unfounded and unnecessary.

Ohio EPA response: The Decision Document will be revised.

46. Comment: 6.7.2, Controls for Former Process Areas, page 55, lines 24 through 29: SMC and CFM note that this section presents requirements for the proper disposal of radioactive slag that may be present beneath buildings at the Site. The Plan should be revised to note that the final disposition of this material is addressed in the previously prepared Decontamination Report (ENSR Jan. 1990) for the facility.

Ohio EPA response: SMC/CFM comment is noted. No response necessary.

II. COMMENTS FROM U.S. NUCLEAR REGULATORY COMMISSION

1. Comment: The NRC asked that additional consideration be given to the potential adverse impacts to the ecosystem that could occur from excavating the soil and sediments from the wetlands, ditches, and stream channels. These impacts could include the loss of wetlands, short-term or long-term impairment of wetlands, or loss of Chapman Run habitats. The potential impacts of digging up the wetland soils, on-site sediments, and off-site sediments should be documented, discussed, and considered in the Preferred Plan.

   Ohio EPA response: The potential impacts of soil and sediment removal from the affected areas are not specifically discussed in the Preferred Plan, but are documented and discussed in the Feasibility Study, Section 5.3.3, 5.3.4, and 5.3.4. A sentence will be included in the Decision Document that states the following:

   > "For a more detailed analysis of all the alternatives please refer to the Feasibility Study."

2. Comment: The NRC notes that some of the considered alternatives do not appear to be biologically sound alternatives (e.g., rechannelization, capping the sediments and soils with gravel or top soil, etc.). A rationale as to why these were considered and why they were eliminated would be helpful in the document.

   Ohio EPA response: The alternatives were evaluated to provide a broad base from which to choose. Initially, the alternatives were not eliminated from further analysis because it appeared that they had some potential for remediation of the areas of concern. Ohio EPA eliminated these alternatives from further consideration in the Preferred Plan. When evaluated against the nine criteria presented in Section 6.1 of the Preferred Plan, it was determined that they provided only limited benefits.

3. Comment: Page 41 - "Natural Recovery" is misnamed. This alternative involves the introduction of sand into the ecosystem. It is recommended that a true natural recovery alternative be added to the Preferred Plan for the wetland soils, on-site sediments, and off-site sediments. This alternative would assume that the sources of contaminants would be controlled and that the wetland soils, onsite sediments, and offsite sediments would be allowed to naturally recover over time. Periodic monitoring of the site would take place to evaluate the success of the recovery.

   Ohio EPA response: The Natural Recovery Alternative for onsite and offsite sediments is given some consideration in the no action alternative. The no action alternative presented for both the onsite and offsite sediment considers taking no action to remove or reduce the contaminants through treatment or removal from the affected areas. Sources of any future contaminants would be controlled through engineering controls and a stormwater

discharge permit would be issued by Ohio EPA. This alternative is discussed in Section 6.6 of the Preferred Plan. See, also, Section 5.4.2 of the Preferred Plan.

4. Comment: The basis of all the costs in the Preferred Plan are not referenced. Costs that are documented in the FS should be referenced as such. A basis or a reference to the basis of all costs that are not from the FS should also be provided.

Ohio EPA response: A new sentence will follow the costs presented in Section 6.9 to clarify the source of the information. The sentence will read as follows:

> "The costs presented above were obtained from the Feasibility Study. For a detailed breakdown on the costs, please refer to Appendix C of the Feasibility Study."

See, also, Section 5.0 of the Preferred Plan.

5. Comment: The NRC notes that it appears that the conclusions of the Preferred Plan are inconsistent with the Feasibility Study for the Cambridge facility. The Preferred Plan states on page 49 that, "The preferred alternative includes the excavation and removal of contaminated sediments and soils from on-site drainage channels, sedimentation deltas, wetland soils, and Chapman Run." This is different from the FS, page 602. The FS states that an alternative for wetlands soils could be a combination of focused sediment removal and no action for the remaining areas. Please provide the rationale for these differences.

Ohio EPA response: The Feasibility Study states that a combination of removal and "no-action" may have potential to meet the remedial action objectives for some wetlands soils. This matter would be further studied and addressed during the Remedial Design stage.

6. Comment: The NRC recommends that a different approach be considered for the Preferred Plan. Why not control the sources of the contaminants (i.e., the active slag pile operations) and then allow the natural processes (i.e., wetland bioattenuation, natural sedimentation, and natural biodegradation) to restore the area? This is similar to the approach mentioned on page 6-2 of the FS for wetland soils but would also apply to the on-site sediments and off-site sediments. The natural processes may help the site to recover to the point that the risk becomes acceptable to ecological receptors in the streams and wetlands. If, however (in the future after the west slag pile was capped, as part of the periodic monitoring) it was found necessary to dig up soils and/or sediments and place them on the west slag pile; a new cell could be accommodated easily on top of the pile. By taking this phased approach to the remediation of soil and sediment contamination, wetlands may be preserved and unwanted resuspension of metals could be avoided.

Ohio EPA response: The process of removing contaminated sediments and soil from affected areas will cause disruption; however, the disruption is short term. The disturbed areas can then be allowed to naturally recover and should no longer be impacted by contamination.

7. Comment: Page 50, first paragraph - The NRC requests that a map be included in the Preferred Plan which depicts the expected area of on-site and off-site sediments that would be removed using the 1280 mg/kg criteria.

Ohio EPA response: The figures (Figures 6 and 7) which were attached to the Preferred Plan will be included in the Decision Document. A note will be included following the first sentence on page 50 which refers to the Figures 6 and 7 and the clean up criteria of 1280 mg/kg.

III. COMMENTS FROM PUBLIC MEETING

1. Comment: Mr. Bauman states that the State of Ohio will receive civil penalties but the local community will get nothing.

   Ohio EPA Response: This comment does not apply to the Preferred Plan. Remediation of the Site is for the benefit of the community and state. Civil penalties that would be collected under the proposed consent order would be distributed as required by state law, including Ohio Revised Code Sections 6111.09(B) and 3734.28. RC Section 6111.09 (B) provides for civil penalties to go into (1) the environmental education fund, which was created to develop, implement, and administer a program to enhance public awareness and understanding of issues affecting environmental quality; and (2) the water pollution control administration fund, which supplements other moneys available for the administration and enforcement of Ohio EPA's water pollution control program. R.C. Section 3734.28 allocates some civil penalties to the hazardous waste clean-up fund.

   In addition, the proposed Consent Order includes a wetlands project that calls for the enhancement and/or restoration, and preservation, of approximately 40 to 45 acres of wetlands in the vicinity of the Shieldalloy facility, if available, or in the Cambridge, Ohio area. Shieldalloy and Cyprus Foote would expend up to $276,000 on this project. It is generally recognized that wetlands are one of our most important ecosystems. They are known to cleanse polluted waters, prevent floods, recharge ground water aquifers, and provide unique habitats for a variety of flora and fauna. The community around the Shieldalloy site would receive environmental benefits from the wetlands enhancement/restoration/preservation project that would be undertaken by Cyprus Foote and Shieldalloy.

2. Comment: Mr. Bauman inquired as to lost property values around Shieldalloy.

   Ohio EPA Response: Mr. Bauman raises a concern about lost property values caused by the proposed remedy. No documentation has been submitted that demonstrates that property values have actually decreased, or will decrease in the future, due to the preferred remedy. The East and West Slag Piles have been located at the Shieldalloy facility for several decades. The remedy is designed to ensure protection of human health and the environment at the Site and surrounding areas.

3. Comment: Mr. Bauman noted that no health studies on the consumption of wildlife from Shieldalloy property and Chapman Run has been conducted. Wildlife includes cray fish.

   Ohio EPA Response: As part of the RI/FS process, health studies were conducted for ingestion of fish caught in Wills Creek/Chapman Run near the Shieldalloy facility. Although no human health risk assessment was specifically conducted for the ingestion

of crayfish, an equivalent assessment was conducted for carp, which is a sediment feeding fish. As summarized in Table 107 of Remedial Investigation report of September 1996, none of the carcinogenic chemicals of concern for off-site water and sediments were detected in fish tissue. The noncancer hazard index is 0.05, which is far below the USEPA human health protection criterion of 1.0. Radiological tissue analyses from fish collected by the Ohio EPA in Wills Creek indicated that thorium and uranium were not detectable in fish tissue.

4. Comment: Mr. Bauman asked why is the State allowing Shieldalloy to place contaminated sediments and soils, following excavation, atop the West Slag Pile, and not requiring disposal in a solid waste facility?

   Ohio EPA response: The existing contamination in the onsite/offsite sediments and wetland soils are the result of historical plant operations. Placing contaminated soils and sediments atop the West Slag Pile, and capping both, improves protection of human health and the environment at the Site. The cap would have to be inspected regularly and repaired if needed.

5. Comment: Mr. Bauman requested clarification on the risks from inhalation of dusts during removal of the slag from the Site.

   Ohio EPA response: An important pathway for public exposure to radiation is through inhalation of suspended radioactive particulate in the air. The mechanical disturbance involved in removing the slag from the Site, including heavy digging operations, would generate higher emissions of dust particles. Therefore, higher particulate concentrations in the air would result. In general, the Particulate Emission Factor with construction activity can be *one thousand times* higher than without such activity.

6. Comment: Mr. Bauman stated that the State has affected the citizens of Guernsey County's ability to recoup losses by the Covenant Not to Sue in the Consent Order and the omission of a recitation of violations of Ohio laws, rules or regulations.

   Ohio EPA response: This comment does not address the Preferred Plan. The proposed Consent Order does not apply to any individual rights of citizens.

7. Comment: Mr. Bauman asked why the community will not be afforded the protection of a 450 acre buffer around the slag piles. The buffer will be a requirement for the proposed low level radioactive waste disposal site to be sited in Ohio.

   Ohio EPA response: A buffer is not a requirement for remediation of existing contaminated sites. Ohio EPA notes that the proposed Consent Order would potentially require the purchase of wetlands in the areas surrounding the Site.

8. Comment: Mr. Bauman asked why the community will not be reimbursed for the loss of property values as will those who will be affected by the proposed low level radioactive disposal site.

Ohio EPA response: Please refer to comments two and six.

9. Comment: Mr. Bauman requested that the comment period be extended 60 days from the deadline of January 29, 1997.

Ohio EPA response: Upon receiving requests for an extension of the comment period, Ohio EPA granted a 30-day extension until February 28, 1997 to stay consistent with the court schedule in SMC's bankruptcy case.

10. Comment: Mr. Bauman states that the risk scenarios presented in the Preferred Plan are incorrect and improper. Specifically, the farm family scenario improperly places the family's farm well not atop the east or west slag pile or even atop the sediments pile, but instead places it in a safe zone between the two piles away from any and all contaminants and radioactive materials.

Ohio EPA response: The comment appears to refer the Environmental Impact Study (EIS) being prepared by the U.S. Nuclear Regulatory Commission. The farm family risk assessment as described above was unnecessary for RI/FS Report due to the absence of ground water contamination.

11. Comment: Mr. Bauman stated that the radiological risks to the hypothetical farm family are incorrect and do not accurately estimate the risks for this scenario. The exposure to a farm family would be in excess of 6,000 millirems per year.

Ohio EPA response: See comment ten. A dose assessment for the radionuclides contained in the West Slag Pile was conducted and documented in the RI/FS report. The calculation modeled the migration of radionuclides through multiple environmental media, including groundwater, over time and calculated the impact of this migration on a family living on the site. The calculated maximum dose occurred 1,000 years after completion of the remediation. That dose was about 1.196E-5 mrem/year, which is far below many guidelines. The capped slag pile would be under institutional control. No wells would be allowed to be installed through the capped pile.

12. Comment: Mr. Bauman states that Ohio EPA data shows that groundwater surrounding the East Slag Pile fails to meet state and federal safe drinking water standards. Mr. Bauman asks how, based on this information, will the State approve insitu disposal of the slags.

Ohio EPA response: The parameters of concern at this site (e.g. vanadium, chromium, radiological parameters) were not found at concentrations that would indicate that a release to ground water from the East or West Slag Piles had occurred. This was based upon two separate sampling events of the monitoring network at the site. The presence of sodium, magnesium and alkalinity in the one well near the East Pile was used as justification for implementing measures to protect ground water, even though the ground water monitoring results had indicated that the site had not impacted ground water for the parameters of concern.

13. Comment: Mr. Bauman expressed concern that Ohio EPA is prepared to select the remedy of capping even though the Remedial Investigation/Feasibility Study shows that the cap will fail in the future.

Ohio EPA response: According to the Remedial Investigation and the Feasibility Study, the solid waste cap has an estimated life of over 1000 years, provided that long-term maintenance is conducted. Long-term maintenance and management of the Site would be assured through the use of a financial assurance mechanism.

Please refer to Appendix E of the Feasibility Study for more information.

14. Comment: Mr. Bauman questioned why Ohio EPA's Preferred Plan does not evaluate an alternative which includes the removal of the Chemfix material. The commentor stated that Chemfix contains hazardous wastes (i.e. chromium, vanadium) which is leaching from this material.

Ohio EPA response: The material would be protected from weathering once capped with a solid waste cap. Once the Chemfix material is capped onsite, it would receive a similar degree of protection as if it had been removed and disposed of in a solid waste landfill.

15. Comment: Mr. Bauman requested that the Ohio EPA require a hazardous waste cap for the West Slag Pile and East Slag Pile.

Ohio EPA response: The results of the Feasibility Study show that, in this case, the additional components in a hazardous waste cap would not be necessary in order to protect human health and the environment. A solid waste cap provides the needed protection.

16. Comment: Mr. Bauman requested that any and all documents be released to members of the community.

Ohio EPA response: Under Section 149.43 of the Ohio Revised Code, the State of Ohio has the responsibility to make available to any person all public records that pertain to a particular matter of interest. All public records related to the Shieldalloy site can be made

promptly available to any person desiring to see them by making arrangements with Ohio EPA's Southeast District Office, (614) 385-8501.

17. Comment: Mr. Bauman asked why Senate Bill 130 does not apply to the Shieldalloy site.

Ohio EPA response: Whether or not radioactive waste at the Site may be classified as "low-level radioactive waste," the acts of disposal and commingling at the Site took place prior to enactment of Senate Bill 130.

18. Comment: Randi Pokladnik requested an extension of the comment period due to inaccessibility of the material. All the material is located at the Byesville Public Library, which limits the number of copies one can make to twenty.

Ohio EPA response: Please refer to comment number nine above.

19. Comment: Randi Pokladnik asked if abandoned mines below the slag piles could subside creating a ground and surface water contamination problem.

Ohio EPA response: During the Remedial Investigation, mining maps for the Shieldalloy site and vicinity were obtained from the Ohio Department of Natural Resources (ODNR), Division of Reclamation. The maps for this area show that the area directly below was not deep mined, shallow mined or stripped mined. Figure 17 of the Remedial Investigation shows the location of mining activities in and around Shieldalloy.

Additionally, borings were obtained during the installation of monitoring wells and piezometer. The borings show that no voids were found which would indicate that abandoned mines exist within close proximity of the slag piles. Section 5.2.2 of the Remedial Investigation discusses site geology.

20. Comment: Randi Pokladnik stated that data from the remedial investigation shows that in addition to radioactive contaminants, PCB is present. She expressed concern with the onsite incineration of PCB.

Ohio EPA response: During the Remedial Investigation, soil samples were collected and analyzed for chemical and radiological contaminants. PCB was a potential chemical of concern, initially, but the data shows no unacceptable risks. From these results it was determined that remediation of PCBs is not required.

21. Comment: Randi Pokladnik asked if the human health risk assessment evaluates risks to children.

Ohio EPA response: Risks to children were evaluated as part of the human health risk assessment. Risk was calculated for children who could potentially ingest soil, sediment,

and wetland soils from the site. Hypothetical risk was calculated for children with a dermal exposure to sediments, wetland soils, and surface water. For more information, please refer to Section 6 of the Remedial Investigation. The calculations and exposure assumptions for each scenario is presented in Tables 94 - 100.

In addition to the chemical risk assessments noted above, hypothetical radiological risks to children were calculated. Table 119, Remedial Investigation, is a summary of exposure estimates for the consumption of vegetables, meat and milk from the Shieldalloy property. In sum, the remedy accounts for and addresses risk to children.

22. Comment: The cost of the caps are incorrectly estimated. The cost of the caps are closer to $20 - $25 million, not $8 million as presented in the Preferred Plan and public meeting.

Ohio EPA response: The cost estimates presented in the Preferred Plan are based upon information presented in the Feasibility Study (Appendix C and E). The cost estimates for a solid waste cap for both the East and West Slag Piles were evaluated by the Ohio EPA's Division of Solid and Infectious Waste Management (DSIWM). The DSIWM determined that the costs presented in the Feasibility Study, and thus the Preferred Plan, are consistent with municipal solid waste landfills currently operating in the area.

For a detailed overview of all capping costs please refer to Appendix C and E of the Feasibility Study.

IV. OTHER WRITTEN COMMENTS

1. Comment: The commentor noted that a more "immediate action" should be taken to close the Site, thus protecting the community and environment in a more timely manner.

   Ohio EPA response: The timeframe of 3 to 5 years as presented by Ohio EPA during the public meeting is a conservative estimate which the Agency considers realistic to complete remediation activities at the Site.

2. Comment: A commentor noted that an alternative should be evaluated which looks at excavating on-site slag and moving it to an abandoned strip mine or other location.

   Ohio EPA response: Moving the material to a strip mine would increase risks compared to onsite containment. Furthermore, there is no provision in Ohio's coal mining law that would allow for such disposal in this instance.

3. Comment: One commentor asked if there was any danger of radioactive contaminants in the air from the Shieldalloy site.

   Ohio EPA response: During the investigation of the Shieldalloy site, the air pathway was evaluated. It was determined that the slag, as it currently exists in the East and West Slag Piles, is not easily disturbed with air movement. Due to the hardness of the slag, large amounts of dust are not released. The remedy includes capping, which would further reduce dust emissions in the long term. The remaining areas of the Site and adjacent wetlands are covered by vegetation or water. Currently there is not appreciable risk from dust from the Site.

4. Comment: One commentor questions the threat to human health the slag poses and the need to address any of the environmental concerns at the Site. Additionally, the commentor notes that the State should leave the Site alone, not hold public meetings to inform the public of the results of the studies, and not require Shieldalloy and Cyprus Foote Mineral to spend money to remediate the Site.

   Ohio EPA response: The results of the human health risk assessment, as conducted during the remedial investigation, identified the following media as presenting potential risks to human health or the environment:

   - East and West Slag Piles
   - Offsite slag (included for the purpose of evaluating site remedial alternatives: offsite slag is not otherwise evaluated in the feasibility study)
   - Wetland soil

- Onsite sediment
- Offsite sediment (Chapman Run)
- Surface water

As demonstrated in the Feasibility Study, the Site poses risks to human health and the environment. The Decision Document sets out Ohio EPA's selected remedy to protect human health and the environment in a cost effective manner.

5. Comment: Several commentors expressed concern regarding slag from past Shieldalloy/ Cyprus Foote Mineral operations which had been transported offsite to private properties.

Ohio EPA response: If firm plans are expeditiously developed for the remediation of this slag, Ohio EPA will evaluate whether to provide for return of the slag to the Site.