United States Environmental Protection Agency

Office of Emergency and Remedial Response

EPA/ROD/R03-92/152
July 1992

EPA

Superfund Record of Decision:

Eastern Diversified Metals, PA

NOTICE

The appendices listed in the index that are not found in this document have been removed at the request of the issuing agency. They contain material which supplement, but adds no further applicable information to the content of the document. All supplemental material is, however, contained in the administrative record for this site.

50272-101

REPORT DOCUMENTATION PAGE	1. REPORT NO. EPA/ROD/R03-92/152	2.	3. Recipient's Accession No.

4. Title and Subtitle	5. Report Date
SUPERFUND RECORD OF DECISION Eastern Diversified Metals, PA Second Remedial Action - Subsequent to follow	07/02/92
	6.
7. Author(s)	8. Performing Organization Rept. No.
9. Performing Orgainization Name and Address	10. Project/Task/Work Unit No.
	11. Contract(C) or Grant(G) No. (C) (G)
12. Sponsoring Organization Name and Address U.S. Environmental Protection Agency 401 M Street, S.W. Washington, D.C. 20460	13. Type of Report & Period Covered 800/000
	14.

15. Supplementary Notes

PB93-963914

16. Abstract (Limit: 200 words)

The 25-acre Eastern Diversified Metals site is a former metal processing plant located in a sparsely populated area in Rush Township, Schuylkill County, Pennsylvania. Land use in the area is predominantly open land with mixed residential, commercial, and industrial use. From 1966 to 1977, Eastern Diversified Metals operated a processing plant that reclaimed copper and aluminum from wire and cable. An estimated 150 million pounds of waste insulation material, or fluff, was disposed onsite in a swale behind the plant. This fluff, which contains polyvinyl chloride, polyethylene insulation chips, fibrous material, paper, soil, and metals, is contained in a 7.5-acre pile onsite. In 1971, in response to an application for an industrial landfill permit, a state inspection revealed leachate from the waste pile flowing to the Little Schuylkill River. In 1974, a leachate collection and treatment system was installed onsite. In 1979 and 1980, residents complained of odors and expressed health concerns over conditions at the site. In 1985, an investigation detected PCBs and lead in the waste pile and metals in a downgradient monitoring well. In 1987, a security fence was installed around the property. A previous ROD addressed areas of

(See Attached Page)

17. Document Analysis a. Descriptors

Record of Decision - Eastern Diversified Metals
Second Remedial Action - Subsequent to follow
Contaminated Medium: Debris
Key Contaminants: Organics (Dioxins, PCBs), and metals (Lead)

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report) None	21. No. of Pages 84
	20. Security Class (This Page) None	22. Price

(See ANSI-Z39.18) *See Instructions on Reverse* OPTIONAL FORM 272 (4-77) (Formerly NTIS-35) Department of Commerce

Abstract (Continued)

fluff, soil, sediment, and ground water contaminated with PCBs, dioxin, and metals. This ROD addresses a final remedy for the remainder of the fluff onsite. Future RODs will address soil contamination following analysis of soil samples taken as part of this remedy and deep ground water contamination. The primary contaminants of concern for leaching from the fluff are organics, including dioxin and PCBs; and metals, including lead.

The selected remedial action for this site includes onsite recycling of fluff into one of two forms--a "Final Product" that requires no further offsite processing, or a "Non-Final Product," such as plastic pellets, which will undergo further offsite processing; testing recycling residuals for RCRA hazardous waste characteristics, with offsite disposal of non-RCRA wastes and onsite treatment of RCRA wastes using a technology to be determined based on a treatability study; disposing of the treated wastes offsite; testing soil underlying the fluff; and implementing erosion and sedimentation controls. The estimated total present worth cost for this remedial action ranges from $13,100,000 to $21,900,000, which includes a total O&M cost of $6,900,000.

PERFORMANCE STANDARDS OR GOALS: There are no specific performance standards for any of the contaminants. The recycling products and the residuals will be tested for RCRA hazardous waste characteristics prior to use of the product or disposal of non-recyclable residuals.

RECORD OF DECISION
EASTERN DIVERSIFIED METALS SITE

Operable Unit Three

DECLARATION

SITE NAME AND LOCATION

Eastern Diversified Metals Site
Hometown, Schuylkill County, Pennsylvania

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Third Operable Unit (OU3) at the Eastern Diversified Metals Site located in Hometown, Schuylkill County, Pennsylvania (Site), which was chosen in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (CERCLA) and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R. Part 300. This decision document explains the factual and legal bases for selecting the remedy for this Site and is based on the Administrative Record for this Site.

The Commonwealth of Pennsylvania concurs with the selected remedy.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances, pollutants, or contaminants from this Site, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF THE REMEDY

The Site to date has been divided into three operable units (OUs) in order to effectively address the complex contamination problems present in the various environmental media. The divisions are as follows:

OU1 • "Hotspot" areas: those areas of fluff and soils contaminated with PCBs and dioxin above target levels
• Sediments and soils contaminated with metals above target levels
• Miscellaneous debris

OU2 • Ground water

OU3 • Remainder of the fluff at the Site

A remedy for the first and second operable units was selected in the Record of Decision of March 1991. The selected remedy in this Record of Decision for Operable Unit 3 includes the following actions:

1. All fluff at the Site (waste insulation material consisting primarily of polyvinyl chloride and polyethylene chips; fibrous material; and paper, soil, and metal on the surface of the Site other than that to be remediated pursuant to the March 1991 ROD) will be recycled onsite within fifteen (15) years of the date EPA issues this Record of Decision and in accordance with the following:

   (a) Recycling of the fluff into a form that will be used without further processing ("Final Product") offsite (e.g., floor mats, plastic lumber, or bumpers) shall ensure that the hazardous substances, pollutants, and contaminants within the Final Product are inseparable from the Final Product by physical forces attending ordinary use of the Final Product; or

   (b) Recycling of the fluff into a form that will undergo further processing offsite in order to produce a usable product ("Non-Final Product") (e.g., plastic pellets) shall ensure that (1) the Non-Final Product does not exhibit RCRA hazardous characteristics, and (2) the hazardous substances, pollutants, and contaminants within any Final Product produced therefrom are inseparable from the Final Product by physical forces attending ordinary use of the Final Product.

2. Recycling residuals including, but not limited to, debris within the fluff, will be tested to determine whether such residuals exhibit RCRA hazardous characteristics. Recycling

residuals that do not exhibit RCRA hazardous characteristics will be disposed of in an offsite landfill.

3. Treatability tests shall be performed on recycling residuals that do exhibit RCRA hazardous characteristics so that EPA can determine the most appropriate method of treatment prior to disposal. These materials will then be treated so that such materials no longer exhibit RCRA hazardous characteristics and will be disposed of in an offsite landfill.

4. Soils underlying the fluff shall be sampled and analyzed as approved by EPA to determine the nature and extent of contamination of such soils by hazardous substances, pollutants, and contaminants.

5. Erosion and sedimentation controls approved by EPA shall be implemented to control drainage and minimize erosion of exposed soils at the Site.

Response actions to address soil contamination, if any, will be selected by EPA in a subsequent Record of Decision following analysis of the soil samples taken as part of this remedy.

STATUTORY DETERMINATIONS

The selected remedy for Operable Unit 3 is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. This remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable, and satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as their principal element.

Edwin B. Erickson
Regional Administrator
Region III

7/2/92
Date

Figure 1
Site Location and Regional Topographic Map
Eastern Diversified Metals Site

Source: USGS Topographic Quadrangles: Delano, PA and Tamaqua, PA

DECISION SUMMARY

Operable Unit 3
EASTERN DIVERSIFIED METALS SITE

I. SITE NAME, LOCATION, AND DESCRIPTION

The Eastern Diversified Metals (EDM) Superfund Site (Site) is located in Rush Township, Schuylkill County, Pennsylvania, approximately one mile northwest of the intersection of Routes 54 and 309 in the town of Hometown (Figure 1). The Site covers approximately twenty-five acres of partially forested land, in a deep east to west trending topographic valley. East-west oriented railroad tracks border the Site on the north valley ridge. The Little Schuylkill River flows in a south-southeasterly direction 250 feet west of the property. A shallow stream flows westerly along the southern border of the Site in the valley bottom, discharging into the Little Schuylkill River.

Waste insulation material, referred to as "fluff," is scattered about the Site. Most of the fluff is contained within a 7.5 acre pile which is approximately 250 feet wide by 1,500 feet long by 40-60 feet high (main pile)(see Figure 2). The fluff, which consists of polyvinyl chloride and polyethylene insulation chips, and fibrous material, paper, soil, and metal, is residual material from the recycling of copper and aluminum communication and power wire and cable. An estimated 150 million pounds of fluff are onsite.

Ground water at the Site occurs in shallow perched zones, the overburden, joints, fractures, and in weathered zones in the bedrock. Ground water in the overburden flows both vertically and laterally; vertical downward flow recharges the upper bedrock and lateral flow is directed southwestward across the Site towards the intermittent stream and the Little Schuylkill River. Ground water in the shallow bedrock zone flows similarly in direction and gradient to the lateral overburden flow, i.e., it flows toward the Little Schuylkill River, which is the only regional discharge point in the area.

II. SITE HISTORY, ENFORCEMENT ACTIVITIES, AND CURRENT USE

A. <u>History</u>

Prior to 1966, the Site property was owned by a manufacturing company engaged in the extrusion of aluminum for hospital furniture. Pre-1966 activities were confined to a single building on the property, with the remainder of the Site left vacant. The manufacturing company disposed of wooden wire reels, wooden pallets, and similar debris and trash onsite.

In or around September 1966, Greater Tamaqua Industrial Development Enterprises conveyed the Site property to Eastern Diversified

Metals Corporation (EDMC). EDMC operated at the Site, reclaiming copper and aluminum from wire and cable in a processing building on Lincoln Avenue, from approximately 1966 through 1977. The EDM plant received wire from numerous sources. Plastic insulation surrounding metal cable and wire was mechanically stripped and separated from the metal using gravitational separation techniques. This process involved chopping the wire, stripping the plastic coating from the wire with steel blades, and separating the wire from the plastic coverings through the use of air and water clarifiers.

The metal reclaimed by EDMC was either sold or returned to the sources. EDM disposed of the waste insulation material on the ground in the topographic swale area behind the plant at the Site. The fluff which currently exists is a direct result of this disposal practice.

B. Enforcement Activities and History of Regulatory Involvement

In 1971, EDMC submitted an application to the Pennsylvania Department of Health (DOH) for a permit to operate a 25 acre industrial landfill. DOH inspected the EDM Site in February 1972, and noted that EDMC was in violation of the Pennsylvania Clean Streams Law because the waste pile was creating leachate that flowed into the Little Schuylkill River via a small intermittent tributary running through the EDM Site.

In February 1973, the Pennsylvania Department of Environmental Resources (PADER) inspected the Site. PADER's inspection report noted that there were two separate but adjacent disposal areas on the EDM Site; mixed waste was disposed on the extreme western portion, while shredded insulation material was dumped in the north central portion. The "mixed waste" consisted of cardboard, paper, wooden pallets and reels, steel wire and general waste. The report also noted that scrap metal and 55-gallon steel drums were stored onsite.

In December 1973, the Pennsylvania Division of Solid Waste Management determined that EDMC would have to provide a permitted leachate collection and treatment system and a groundwater monitoring system before a landfill disposal permit could be issued.

In 1974, EDMC submitted an application for a Water Quality Management Permit. Pursuant to a consent order with PADER, Theodore Sall, Inc. (Sall) installed a leachate collection and treatment system onsite in order to monitor, collect, and treat leachate emanating from the fluff pile. Due to the high BOD concentrations in the leachate at that time, Sall designed and installed a secondary treatment system which is currently operational. The secondary treatment plant uses clarification, aeration, and activated sludge biological treatment to bring the

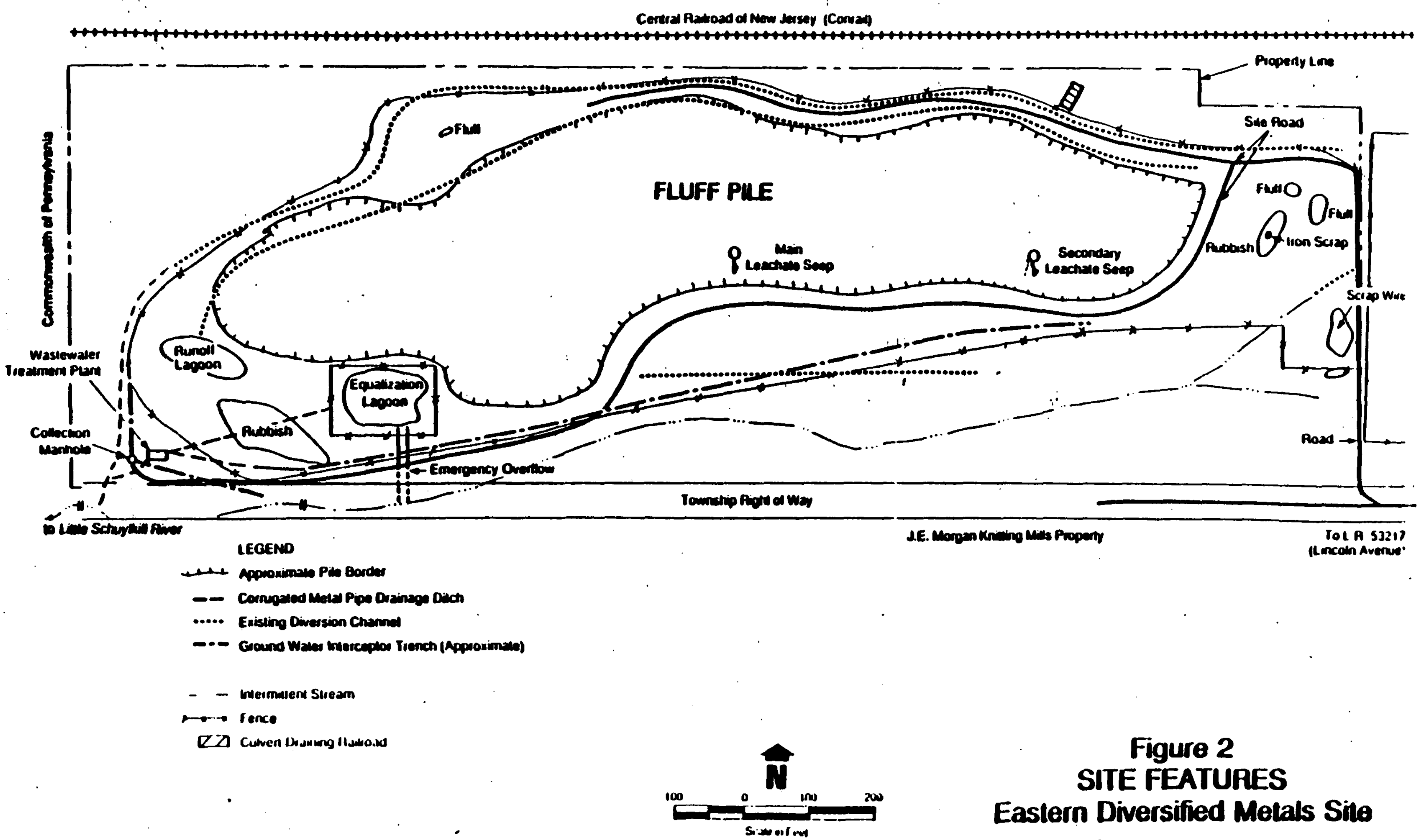


Figure 2
SITE FEATURES
Eastern Diversified Metals Site

effluent within the limits allowed by its PADER National Pollutant Discharge Elimination System (NPDES) permit. The effluent discharge enters the intermittent stream tributary to the Little Schuylkill River. Daily flows average approximately 3,000 gallons. The treatment plant is part of a leachate management system which also includes an equalization lagoon, erosion control measures, surface water diversion ditches, and two shallow ground water interceptor trenches which convey some shallow leachate to the leachate treatment plant.

The equalization lagoon is located approximately 300 feet to the northeast of the treatment plant, at the base of the main fluff pile. The lagoon is lined with 30 mil polyvinyl chloride and feeds leachate influent to the treatment plant.

The leachate diversion ditches at the Site parallel the northern and southern boundaries of the main fluff pile. The southern diversion ditch conveys leachate to the treatment plant via an equalization lagoon. The northern (interior) diversion ditch terminates at the runoff lagoon, where runoff either evaporates or infiltrates to shallow ground water. Some of this ground water is intercepted by the secondary ground water collection trench and pumped to the treatment plant.

The main ground water interceptor trench is located along almost the full east-west length of the main fluff pile, between the southern leachate diversion ditch and the intermittent stream. At the southwest end of the main fluff pile, a secondary collection trench runs approximately north-south to collect shallow subsurface leachate at the western edge of the pile. The trenches are approximately six to ten feet deep. The leachate from the main trench discharges into the wastewater treatment plant; the leachate from the secondary trench is conveyed to a sump just southwest of the treatment plant, from which it is pumped directly to the plant for treatment.

In or around 1977, EDMC terminated operations at the Site and, subsequently, transferred ownership of the Site to Theodore Sall, Inc. ["Sall"]. In June and November, 1979, the Hometown Fire Company responded to reports of fires at the Site; the fires were extinguished with fire retardant and water. The area where smoldering fires were noted is limited to a portion of the main fluff pile in the vicinity of the secondary leachate seep (southeast side of the pile). Sall excavated the burned areas in an effort to ensure that the fire was extinguished and installed temperature sensors to detect elevated temperatures within the pile. Laboratory testing estimated that a critical temperature of approximately 290° Fahrenheit may cause this material to smolder. Sall reports that temperature monitoring conducted since that time has shown that temperatures do not approach those which would be required for the material to smolder.

In 1979 and 1980, the Rush Township Board of Supervisors wrote letters to Diversified Industries, Inc., EDMC and Sall's parent company, on behalf of area residents, complaining of odors from the EDM Site and expressing health concerns. In 1983 and 1984, PADER conducted chemical and aquatic biological investigations of the Little Schuylkill River (LSR) and all of its tributaries and point source discharges. These studies included sampling of the intermittent stream at the EDM Site and the effluent from the leachate treatment plant. PADER stated that under the acid-impacted conditions found in the LSR, "the confirmed complete absence of any aquatic macrobenthic community is expected." This report concluded that an evaluation of the effects of the EDM Site on the LSR could not be made due to the prevailing acid mine drainage degradation in this section of the LSR.

In 1985, Todd Giddings and Associates, Inc. completed a Site evaluation report for Sall. This evaluation included sampling and analysis of surface water, leachate, ground water, fluff, and sediment. These investigations determined that the fluff contained polychlorinated biphenyls (PCBs) and failed the Extraction Procedure Toxicity test for lead. Additionally, various metals were detected in the downgradient monitoring well.

In 1985, EPA sampled the Site's surface soil, surface water, stream sediment, leachate, leachate runoff path sediment, and ground water to provide data in order to further assess the Site. EPA proposed the Site for inclusion on the CERCLA National Priorities List (NPL) in June, 1986. EPA finalized the Site on the NPL in October, 1989 (see 54 Fed. Reg. 41036 (Oct. 4, 1989)).

In August 1987, EPA issued an administrative order pursuant to section 106(a) of CERCLA, 42 U.S.C. § 9606(a), to Diversified Industries, Inc. and Sall directing those entities to install a security fence around the Site. The fence was subsequently installed by those parties.

In October 1987, Sall and AT&T Nassau Metals Corporation signed an administrative order on consent with EPA for the performance of a Remedial Investigation/Feasibility Study (RI/FS) at the Site. The purpose of the RI/FS was to determine the nature and extent of contamination and to evaluate remedial alternatives for implementation at the Site. Samples were collected and analyzed from fluff, air, soils, sediments, ground water, and surface water. A majority of these samples were taken in and around the fluff pile area.

On March 29, 1991, EPA issued a Record of Decision selecting a final remedy for OU1 and an interim remedy for OU2. The Commonwealth of Pennsylvania concurred on that ROD. The Remedial Action selected by EPA for OU1 and OU2 calls for, among other things, the following actions to be undertaken:

OU1
- Excavate and incinerate, either onsite or offsite, fluff and soils containing dioxins and PCBs in concentrations exceeding target levels.
- Treat (if necessary) and dispose of incinerator residuals, miscellaneous debris, and soils/sediments contaminated with metals above target levels.

OU2
- Enhance the existing or construct a new shallow ground water collection and treatment system.
- Study further the practicability of deep ground water restoration.

In September 1991, AT&T petitioned EPA to reopen the March 1991 ROD, claiming that PCB analytical results reported and relied on in the RI/FS were inaccurate. Attached to the petition were recent analytical data showing that PCBs were present at much lower concentrations in the hotspot area than indicated by the original analyses (see AT&T petition in the Administrative Record for this ROD). In December 1991, EPA sampled the fluff material and is currently analyzing the samples using analytical techniques which were unavailable at the time the original analyses were conducted. The current analyses will more precisely define the types of contaminants and the concentrations at which they are present in the hotspot area. Once the analytical results are received, EPA will evaluate the data and determine whether a hotspot exists and, if so, whether the remedy component selected to address the hotspot in the March 1991 ROD (incineration) is still appropriate.

In September 1991, EPA issued a Unilateral Administrative Order (Order) to AT&T Nassau Metals Corporation and Sall to implement portions of the remedy described in the March 1991 ROD which did not pertain to the remedy for the hotspot area. The Order directed AT&T and Sall, among other things, to remove the miscellaneous debris from the Site, repair the fence surrounding the Site, and conduct additional ground water studies. A Remedial Design Work Plan has been reviewed and approved by EPA and a Remedial Action Work Plan and Design Report is currently undergoing EPA review. Miscellaneous debris is expected to be removed from the site during Fall 1992. Ground water studies are scheduled for completion by the end of 1992. A final decision regarding the need for ground water remediation is expected in late 1993.

C. <u>Current Site Use</u>

Presently, the Site is unused. The wastewater treatment plant continues to be operated by Sall under its NPDES permit from the PADER Bureau of Water Quality. The property is overseen by a Sall employee who is responsible for the daily operation and general maintenance of the wastewater treatment plant, recording temperatures from the pile sensors, and general security. The caretaker is present onsite for approximately half of the day for five days each week.

III. COMMUNITY PARTICIPATION

In accordance with Sections 113 (k)(2) and 117 of CERCLA, 42 U.S.C. Sections 9613(k)(2) and 9617, on April 16, 1992, EPA placed a quarter page advertisement in the Lehighton Times News announcing the 30-day comment period on the Proposed Plan for the third operable unit of the Eastern Diversified Metals Site. Also announced was the availability of the Proposed Plan and RI/FS reports as part of the Administrative Record in the Site information repository at the Rush Township Municipal Building.

The public comment period began April 16, 1992 and ended May 16, 1992. A public meeting was conducted on April 30, 1992 in order to facilitate receiving the public's comments and concerns regarding the proposed action for the third operable unit at the Site. Local citizens comments centered on potential health impacts to workers and the surrounding community from an onsite recycling facility. Specific comments and concerns raised by the local community are addressed in the Responsiveness Summary attached to this Record of Decision.

IV. SCOPE AND ROLE OF OPERABLE UNITS

As described above, EPA divided the Eastern Diversified Metals Site into operable units, or site components, in order to effectively address the complex contamination problems present in the various environmental media. The divisions to date are as follows:

OU1
- "Hotspot" areas (those areas of fluff and soils contaminated with PCBs and dioxin above target levels)
- Sediments and Soils contaminated with metals above target levels
- Miscellaneous Debris

OU2
- Ground Water

OU3
- Remainder of the fluff

In March, 1991, EPA signed a Record of Decision which documented the selection of a final remedy for OU1 and an interim remedy for OU2, as described above. EPA will advise the public if that portion of the OU1 remedy currently being reviewed as a result of AT&T's petition changes in any significant or fundamental way.

This Record of Decision selects a remedy for OU3, the remainder of the fluff at the Site. This ROD does not, however, address remediation of soils underlying the fluff at the Site. EPA will announce whether, and to what extent, further response actions are necessary in this regard in a subsequent Record of Decision following analyses of soil samples performed as part of this response action.

V. SUMMARY OF SITE CHARACTERISTICS

A. Environmental Setting and Climate

The Site is located in a sparsely populated rural area in Hometown, Schuylkill County, Pennsylvania. Nearby towns include Tamaqua, which is approximately 2.5 miles to the southeast. Land use surrounding the Site includes open and residential lands to the north, west, and south/southeast, and several business and industrial facilities to the east. Specifically, the Site is bordered by a residence and privately-owned forest land to the north. Adjacent to the eastern border of the Site is the Lincoln Avenue building which was used to process the EDM fluff. This building is presently partially occupied by a trailer home assembly operation. Other commercial operations near the site along Lincoln Avenue include a shipping facility (United Parcel Service), an auto parts/junkyard operation, a heavy freight depot (Yellow Freight), and a pigments manufacturer (Siberline Company). State Game Lands are located to the west along the banks of the Little Schuylkill River.

Land use in Schuylkill County is primarily agricultural (82.7 percent). Approximately 5.3 percent of the area is residential, 4.5 percent is used for manufacturing, commercial, or mining applications, and the remaining 7.5 percent is undeveloped.

B. Regional Geology, Hydrogeology, Hydrology

1. Soils

Soils on the Site have formed in colluvium, along drainage ways and in depressed areas. The soils are deep, poor to moderately well-drained with slow to moderately slow permeability and medium runoff. The lower part of the subsoil layer (which begins approximately 20 to 40 inches from ground level) contains a firm and brittle fragipan that restricts vertical water flow and facilitates lateral flow of shallow subsurface waters. Depth to bedrock may be 60 to 96 inches or more from the ground surface.

2. Geology

Bedrock beneath the Site is the middle member of the Mississippian Age Mauch Chunk Formation. The Mauch Chunk is generally described as predominantly composed of grayish-red siltstones and shales, and grayish-red-purple sandstones. The Mauch Chunk Formation is overlain by the Pottsville Formation, and underlain by the Pocono Formation. Both contacts are considered to be transitional, and both the Pottsville and Pocono Formations are characterized by coarse-grained yellow and gray sandstone and conglomerate lithologies. Topographically, the Mauch Chunk tends to be a valley-former due to the greater resistance to erosion which typifies the more massive Pottsville and Pocono formations.

3. <u>Hydrogeology</u>

Water is transmitted through the Mauch Chunk primarily through fractures, joints, and along permeable bedding zones. The formation has low to moderate infiltration capacity and probably low to moderate aquifer potential. In general, the Mauch Chunk is described as yielding small to moderate supplies of good quality water. Mauch Chunk ground water in the Schuylkill River Basin area is reported to have a median pH value of 7.7 and a median specific conductance value of 120 micro mhos/cm.

Shallow ground water occurs in limited quantities under both perched and water table conditions in the overburden. Dynamics of ground water flow in the overburden are basically those of porous media flow, where primary permeability dominates and the system is assumed to be essentially homogeneous (despite the obvious presence of certain inhomogeneities). Perched water in the main fluff pile was encountered in the eastern pile piezometer. Perched flow occurs in some areas due to the presence of fragipans in the colluvial soil. This flow component carries leachate from the pile, some of which is intercepted by the existing interceptor trench system and conveyed to the leachate treatment plant.

Underlying the perched flow zone, a local ground water system is present in the overburden. The overburden is dry in some areas and saturated in others, with classical porous media flow possible only in the southwest section of the Site, near the headwaters of the intermittent stream. The ground water quality data collected in the RI indicates that the overburden flow system recharges the upper bedrock; thus vertical downward flow occurs, as well as lateral flow.

Horizontally, flow in the overburden is directed southwestward across the Site at approximately 0.11-0.13 feet per foot. However, it should be noted that much of the ground water which enters the overburden likely recharges the bedrock rather than flowing laterally, as evidenced by the extensive dry seasonal conditions above the bedrock. It appears that the only substantial lateral flow in the Site overburden may occur in the southwestern portion of the site, where wells MW-3/O and MW-6/O contain water year-around. Based on constructed piezometric surfaces, the overburden flow system recharges the intermittent stream along its lower length. Since the lower reach of the stream is known to flow year-round, it is evident that this flow is sustained by the shallow system in the southwest portion of the Site. This is consistent with the saturated conditions at MW-3/O and MW-6/O, verifying sustained lateral flow through the overburden in the southwest corner of the Site.

Most ground water at the Site occurs in joints, fractures, permeable interbeds, and weathered zones in the bedrock. Water was present in multiple thin zones separated by two to several tens of feet during the monitoring well installations. Commonly, ground water conditions in bedrock of this type are complex due to intricate localized lithological and structural controls. Thus, ground water may be under confined permeability, and possibly unconfined conditions in permeable vertical fractures or extensive near-surface weathered zones.

The vertical head conditions (varying from strong downward to slight upward) at the Site verify the complexity of ground water conditions. However, it can be observed that the water levels measured reflect the potential for hydraulic connection among the three aquifer zones monitored.

Flow in the shallow bedrock zone is similar in direction and gradient to the overburden. Water level elevation contours indicate that flow occurs below the elevation of the intermittent stream bed, in a direction towards the Little Schuylkill River. Thus the direct discharge point for the shallow bedrock ground water flow appears to be the Little Schuylkill River, which is the only regional discharge point in the area. The lateral hydraulic gradient in the intermediate bedrock aquifer also indicates flow toward the Little Schuylkill River.

An inventory of ground water usage was completed for the EDM site vicinity. Figure 3 shows the locations of water wells identified during the RI. All of the wells identified are topographically upgradient of the Site. Well depths range from 90 feet to 600 feet. A number of residents have reported flowing artesian conditions, indicating a possible recharge area to the north, i.e., the Still Creek Reservoir Area. Water quality was reported to be good in most cases, although some wells had taste, odor, and sediment problems unrelated to the Site.

4. <u>Hydrology</u>

This part of the Schuylkill River Basin receives an annual average rainfall of 45 inches. Basin maxima for runoff (30 inches) and rainfall (49 inches) occur near Tamaqua and decrease from north to south. Peak runoff occurs during the period from February to April. The runoff low point is generally during August to October, although at Tamaqua, low runoff typically occurs in July.

Surface runoff from the Site flows predominantly in a west-southwesterly direction, to the small unnamed intermittent stream which flows west along the southern border of the Site and drains into the Little Schuylkill River.

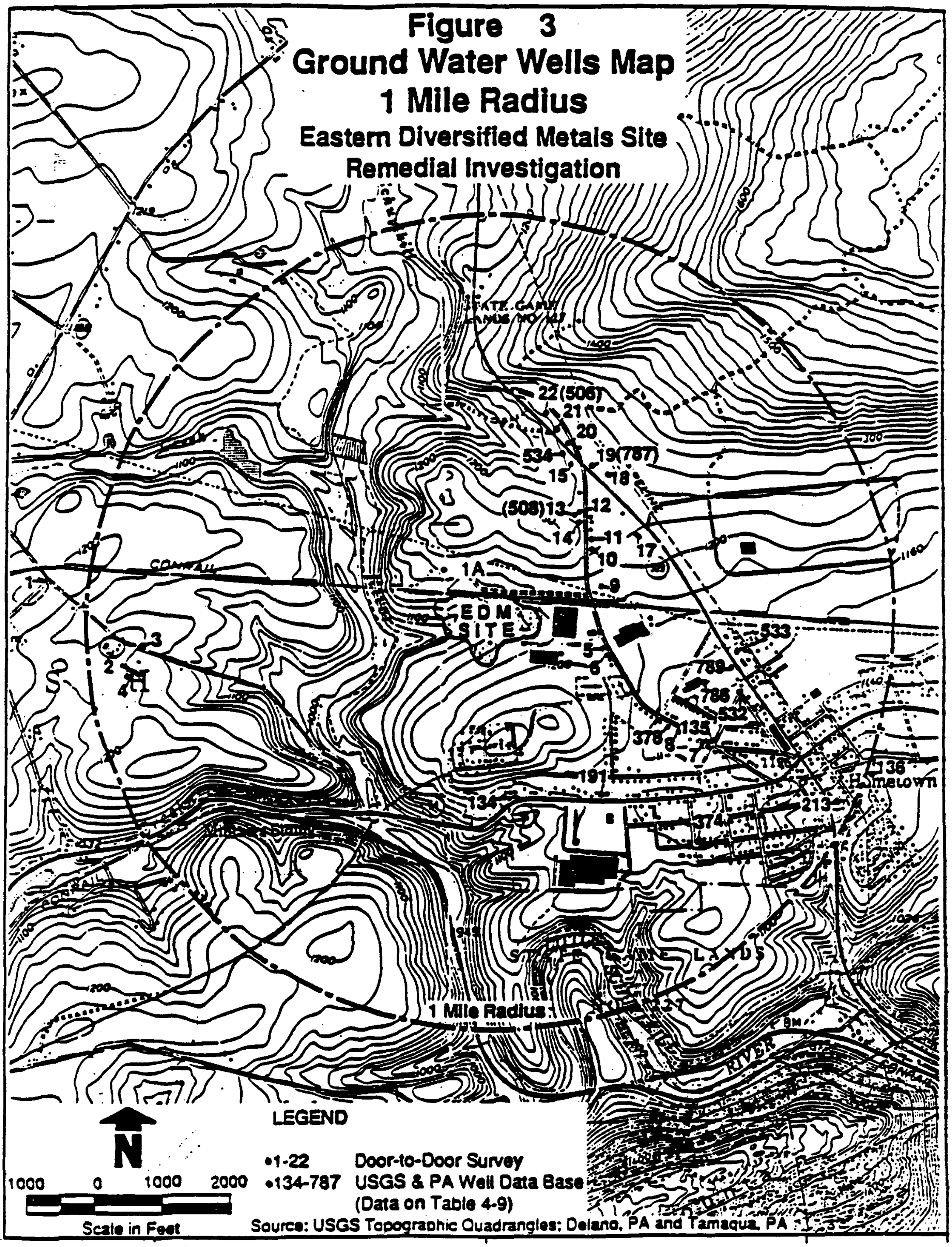


Figure 3
Ground Water Wells Map
1 Mile Radius
Eastern Diversified Metals Site
Remedial Investigation

VI. NATURE AND EXTENT OF CONTAMINATION

A. Remedial Investigation (RI)

The RI field activities and analytical program were designed to define the extent of environmental contamination, identify migration pathways, and provide data to support a Feasibility Study of potential remedial actions. The scope of the RI included sampling and analysis as necessary to fill data gaps in the historical database. Leachate/seeps, surface soils, subsurface soils, surface waters, stream bed sediments, bioassays, air, and ground water sampling were conducted to characterize the quality of these media (sampling locations are shown in Figures 4 through 9). In addition to sampling and analyses, limited studies of the hydrogeology and hydrology of the Site were conducted through field mapping and aquifer testing.

B. Summary of RI Findings

A summary of the results from previous investigations and from the RI sampling program are shown below.

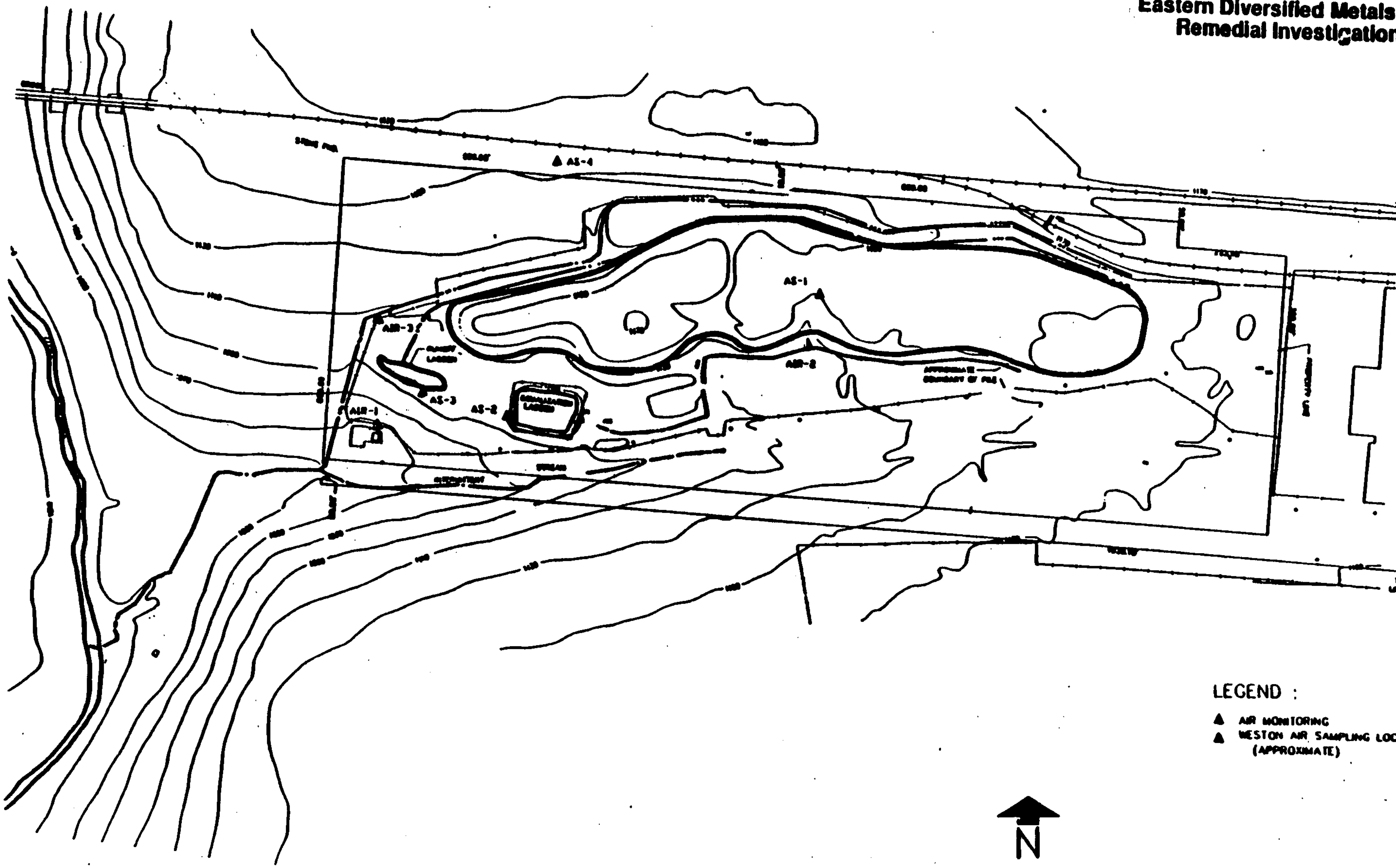
1. Fluff

a) PCB concentrations ranged from 1.7 to 5560 milligrams per kilogram (mg/kg). The highest concentration was T-10 from the vicinity of the Main Leachate Seep. In order to further delineate this area of elevated PCB concentrations, an additional six samples were subsequently collected in the vicinity of T-10. The T-10 sample cluster (T-10, T-10R, T-10SW, T-10SE, T-10NE, T-10NW, T-10RC) as shown on Figure 8, is defined as the PCB "hotspot" area of the fluff pile. This area represents approximately five percent of the pile and has an estimated volume of 4,740 cubic yards. Slightly elevated PCB concentrations of 40 mg/kg were also found at T-26. Mean PCB concentrations in the fluff were 15.7 mg/kg, excluding the three highest values from the hotspot area.

b) Total lead concentrations ranged from 1490 mg/kg to greater than 40,000 mg/kg throughout the fluff. The mean concentration was 11,450 mg/kg. Borehole results indicate that lead concentrations are fairly consistent with depth. Lead was a probable constituent of insulation fillers in the form of lead phthalate.

c) Concentrations of dioxin and dibenzofurans with a calculated Toxicity Equivalence (TE) to 2,3,7,8-tetrachloro-p-dibenzodioxin of 18.5 micrograms per kilogram (ug/kg) resulted from analysis of a composite sample of fluff from the area where fires had occurred previously. This area is on the southern rim of the main pile between the secondary leachate seep and the main leachate seep; the sampling location is shown as SFD-1 on Figure 8. This area is referred to as the dioxin "hotspot" area and EPA suspects that this sample represents conditions in only a very limited area of the

Figure 4
Air Sampling Locations
Eastern Diversified Metals Site
Remedial Investigation



THE PROPERTY LINE SHOWN ON THIS PLAN WAS TAKEN FROM OTHER PLANS AND DOES NOT REPRESENT A BOUNDARY SURVEY.

DATE OF PHOTOGRAPHY - APRIL 19, 1989

Figure 5
Soil Sampling and Investigation Locations
Eastern Diversified Metals Site Remedial Investigation

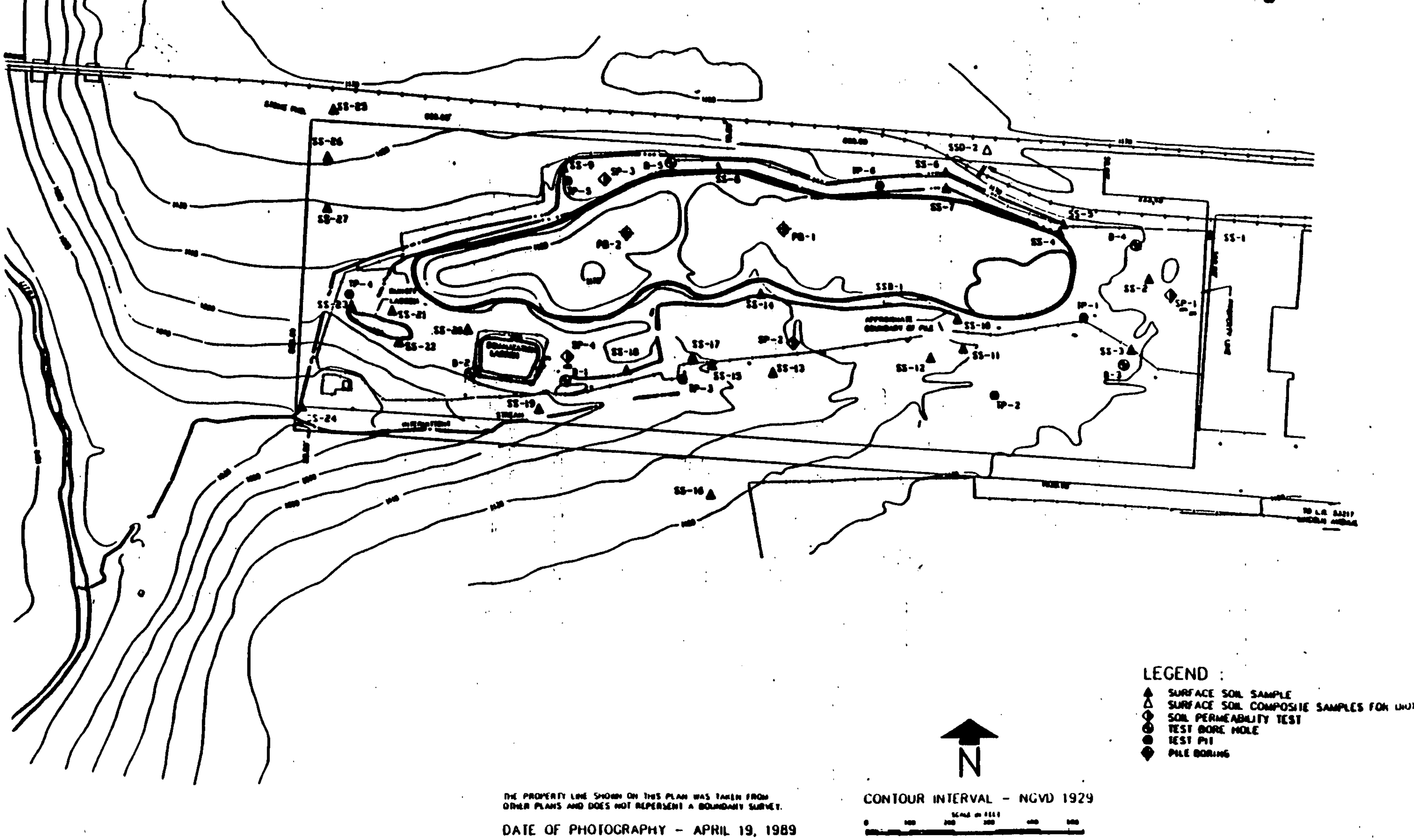


Figure 6
Surface Water, Bioassay, Stream Bed Sediment, and Leachate/Seep Locations Flow Measurement Locations
Eastern Diversified Metals Site
Remedial Investigation

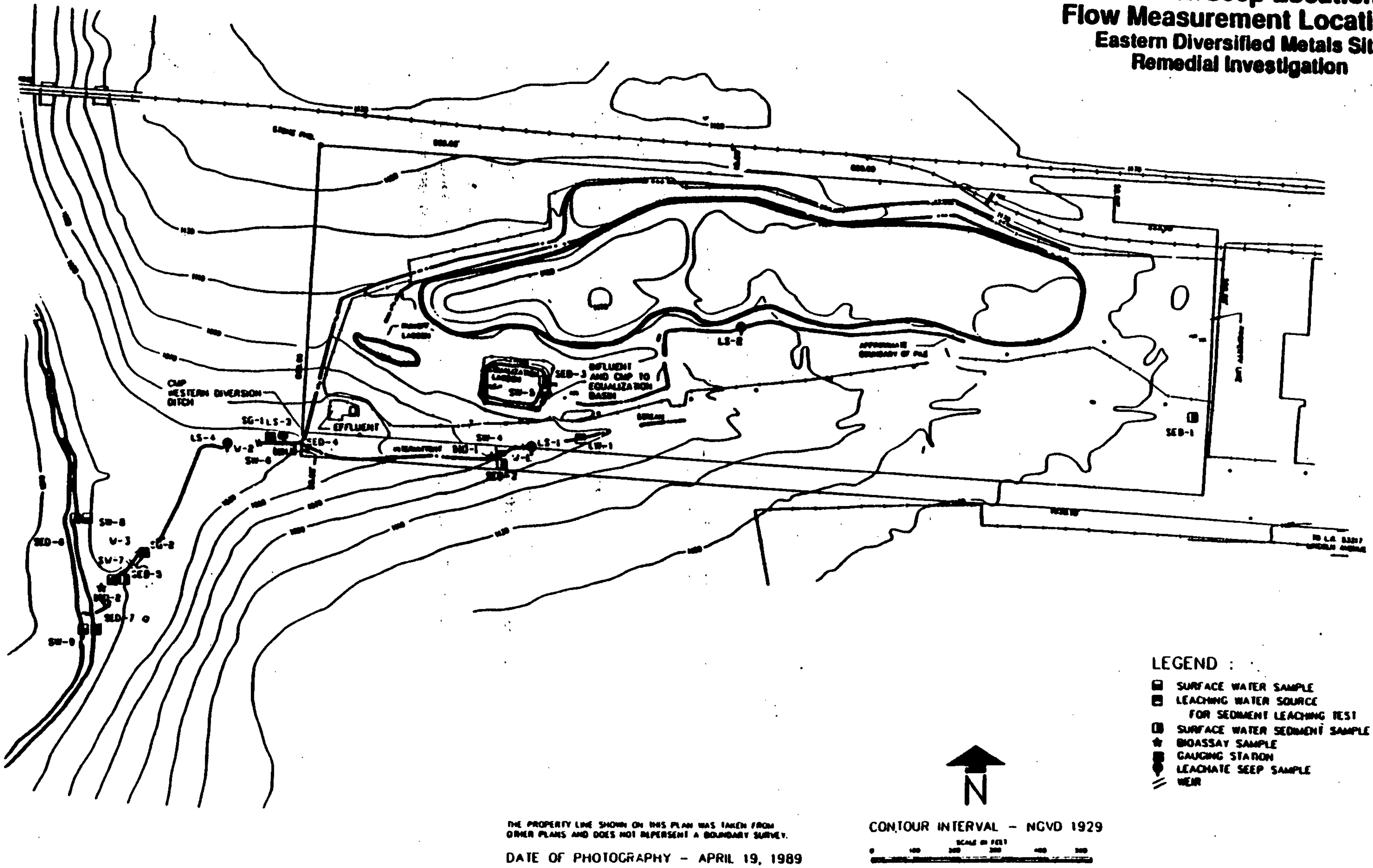


Figure 7
Location of Little Schuylkill River Fluff Survey Stations
Eastern Diversified Metals Site
Remedial Investigation

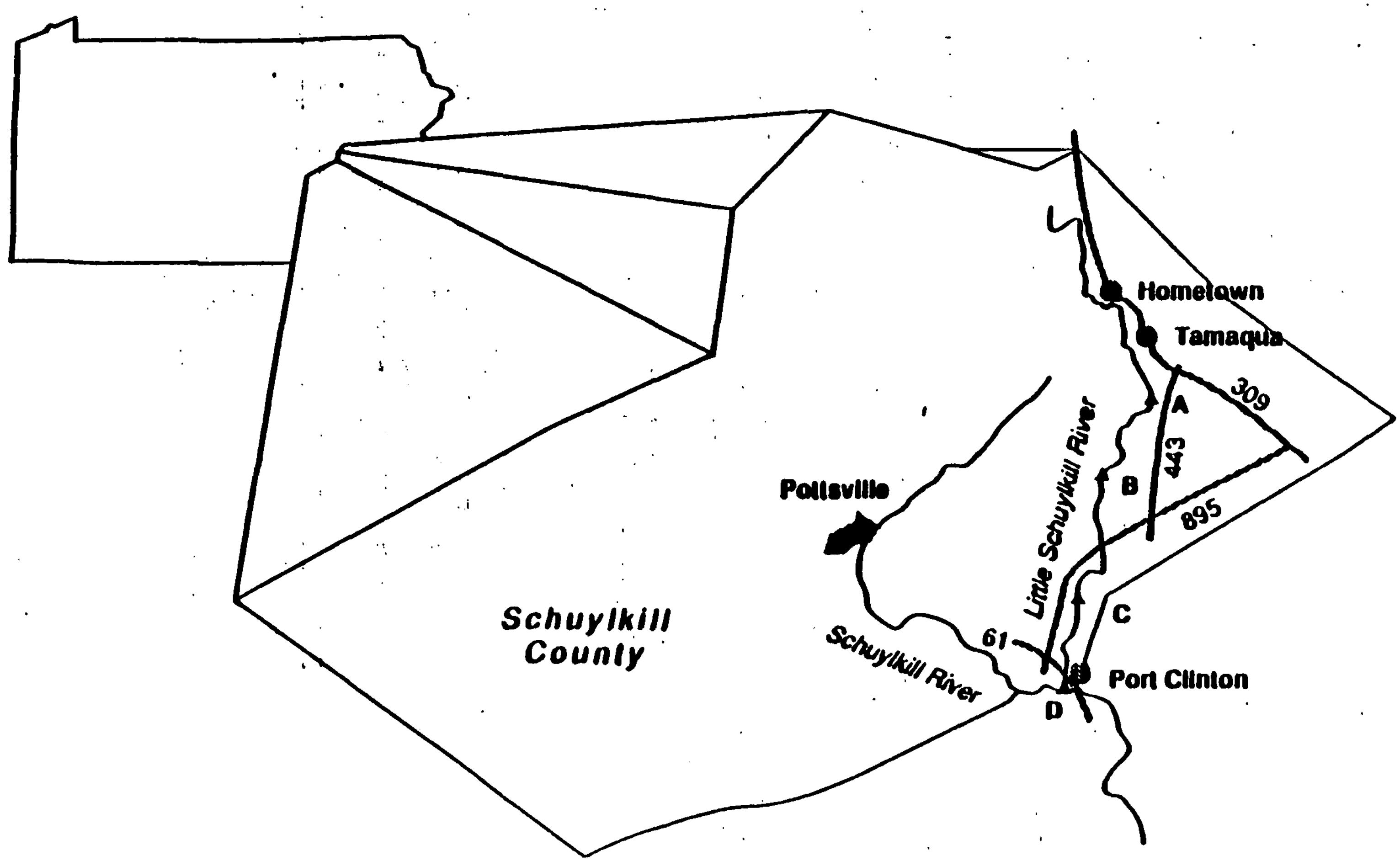
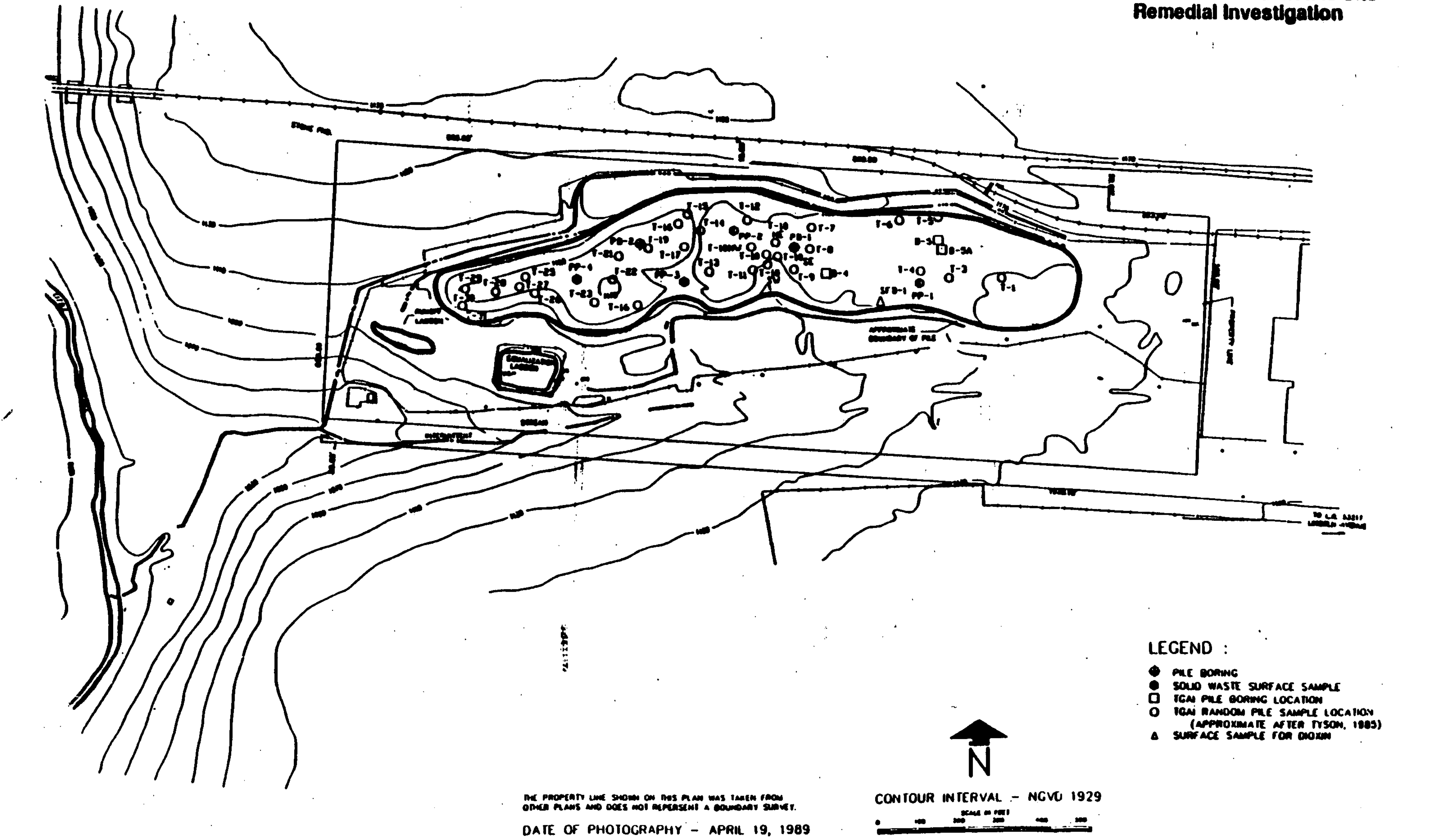


Figure 8
Fluff Sampling and Investigation Locations
Eastern Diversified Metals Site
Remedial Investigation



fluff where these fires occurred. The volume of dioxin-contaminated fluff is estimated at 500 cubic yards.

d) Volume estimates for the hotspot areas of the fluff, with the exception of two pile borings and four backhoe pits, are based on sampling which was limited to a depth of three feet.

2. Leachate

a) The stream bank seeps issue from unconsolidated overburden material. Seeps at the base of the main pile are related to the saturated zones from within the pile, above the overburden.

b) TCE was detected at 44 micrograms per liter (ug/l) at LS-1, a seep in the north bank of the intermittent stream adjacent to the equalization lagoon (reference Figure 6). Bis(2-ethylhexyl) phthalate (DEHP) at 140 ug/l and di-n-octylphthalate (DNOP) at 27 ug/l were detected in LS-2, the main leachate seep. PCBs at 2.6 ug/l and 6.0 ug/l were detected in LS-2 and LS-4, respectively.

c) Copper, lead, zinc, iron, and manganese were present at elevated levels in all seeps. Maximum levels detected were 6,390 ug/l copper; 1,080 ug/l lead; and 8,050 ug/l zinc in LS-2, the main leachate seep; 93,600 ug/l iron in LS-3; and 12,400 ug/l manganese in LS-4. Both LS-3 and LS-4 are downgradient of the waste water treatment facility.

3. Soils

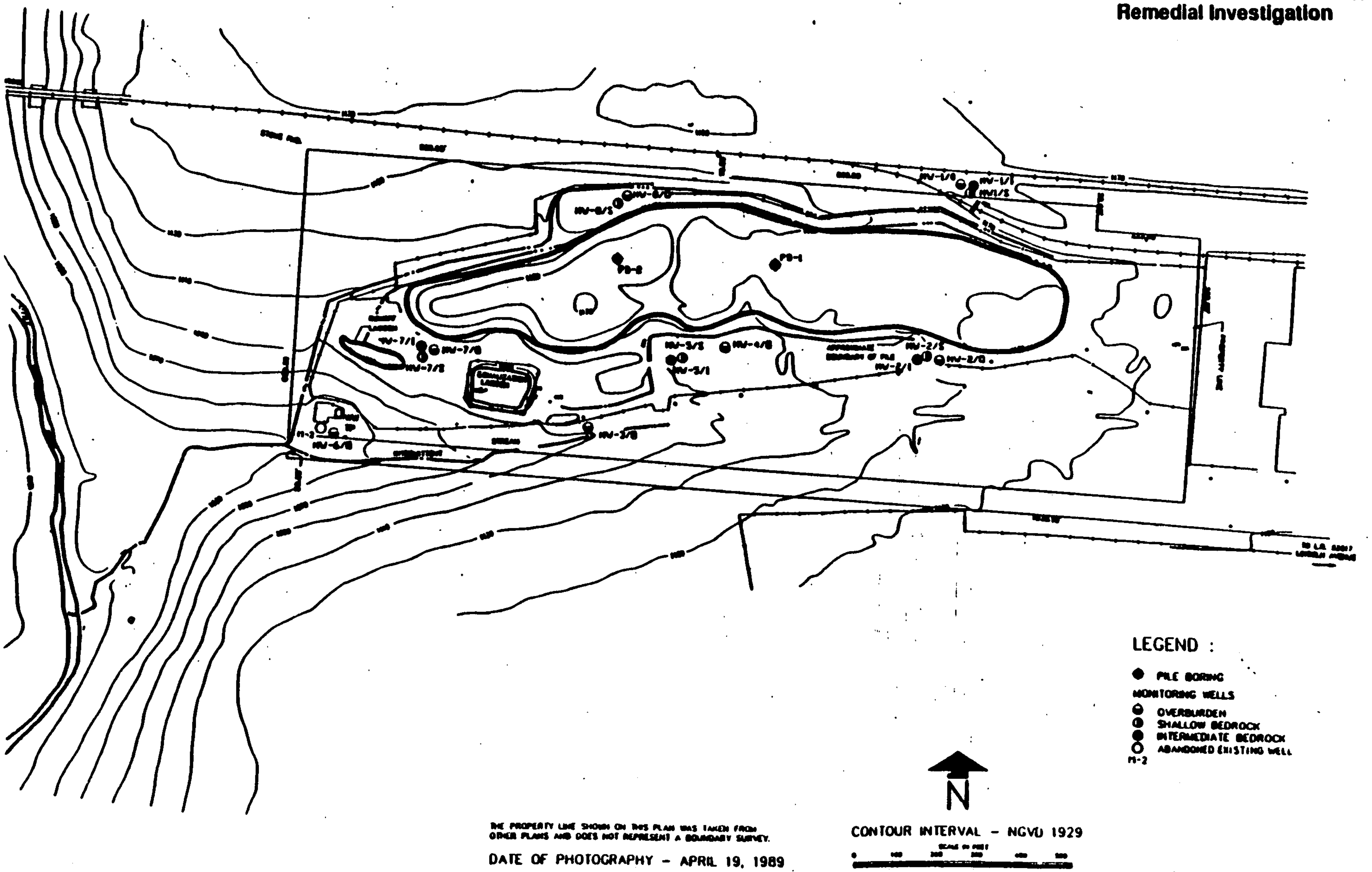
a) Bis (2-ethylhexyl) phthalate (DEHP) at 1,100-3,300 mg/kg and Di-n-octyl phthalate (DNOP) at 190-720 mg/kg were detected in surface soil samples.

b) PCBs were detected in 21 of 27 samples, with an average concentration of 20 mg/kg. The northwestern side of the main pile along the northern drainage ways (reference Figures 2 and 5) showed the highest concentrations at 63-240 mg/kg. The volume of soils contaminated with PCBs above target levels is approximately 420 cubic yards. The source of the high level PCBs may be due to migration from the "hotspot" found in the center of the fluff pile.

c) Composite surface soil samples for dioxin and dibenzofuran analysis had a Toxicity Equivalence (TE) of 0.003 ug/kg for the sample obtained adjacent to the past fire area and 7.1 ug/kg TE for the downwind sample. The results indicated that offsite transport of dioxins by wind-aided transport of particles is not of concern at the Site.

d) Maximum concentrations for Site-related metals detected were 108,000 mg/kg for copper and 1,920 mg/kg for lead. The highest levels are associated with the northern drainage ways (reference Figures 2 and 5). The volume of soils contaminated with lead above

Figure 9
Ground Water
Monitoring Well Locations
Eastern Diversified Metals Site
Remedial Investigation



target levels is approximately 480 cubic yards. Concentrations of zinc and cadmium at 1,230 mg/kg and 7 mg/kg, respectively, were elevated above background levels of 70 mg/kg for zinc and the detection limit for cadmium.

4. Subsurface Soils

a) DEHP, DNOP, and PCBs were detected at lower concentrations than in surface soil samples with maximum concentrations of 620 mg/kg, 200 mg/kg, and 7 mg/kg, respectively. Copper and lead were present at 650 and 266 mg/kg, respectively, at less than 12 foot depths.

5. Surface Water

a) Equalization lagoon samples totaled 15,700 ug/l of phenols, the only semi-volatile compounds detected in surface water. Maximum concentrations of copper at 38 ug/l, lead at 4.5 ug/l, iron at 776 ug/l, manganese at 2,780 ug/l, and zinc at 369 ug/l were elevated above standards of 4 ug/l for copper, 0.6 ug/l for lead, 300 ug/l for iron, 50 ug/l for manganese, and 36 ug/l for zinc.

b) Samples downgradient of the junction of the intermittent stream and the north-south drainage ditch (location SW-6, post-treatment), reflect iron (776 ug/l) and manganese (1,050 ug/l) levels which are ten times greater than those in the intermittent stream upgradient of the wastewater treatment facility (reference Figure 6). Lead and zinc at this point were present at 2.2 ug/l and 369 ug/l, respectively.

6. Sediment

a) Small quantities of fluff particles were seen in sediments 23 miles downstream of the Site. DEHP at 24-4,000 mg/kg and DNOP were the only organic compounds detected. Highest concentrations were in the equalization lagoon with generally diminishing results downstream (reference Figures 2 and 5).

b) PCBs at 0.51-8.4 mg/kg were detected in the intermittent stream but not the Little Schuylkill River.

c) Copper at 3,090 mg/kg; lead at 1,300 mg/kg; zinc at 7,850 mg/kg; iron at 54,800 mg/kg; and aluminum at 30,500 mg/kg concentrations were present in sediments. The volume of metals contaminated sediments above target levels requiring remediation is approximately 120 cubic yards.

7. Ground Water

a) Specific conductance readings indicate that the main pathway for leachate migration from the fluff occurs in the western portion of the Site, where the overburden sustains a ground water flow system.

b) The same suite of volatile compounds were identified in the analyses from both rounds of ground water sampling. The prevalent compounds were 1,1,1-trichloroethane and trichloroethene (TCE). The highest individual compound concentration reported was 91 ug/l of TCE in MW-3/O (reference Figure 9). Total concentrations of volatile organic compounds ranged from non-detected to 119 ug/l in MW-3/O. The samples with the highest levels of volatile organic compounds were from MW-3/O, MW-2/I, MW-2/S, MW-5/S. All four wells are located along the southern perimeter of the main fluff pile, on the downgradient edge of the Site.

c) Calcium, magnesium, and manganese were elevated above background downgradient of the main pile. These results suggest the leaching of major ionic species from the main pile, and possibly the mobilization of natural manganese under slight reducing conditions in the fluff leachate.

8. Air

a) Neither the volatile nor phenolic air analyses performed detected any organic compounds.

9. Miscellaneous Debris

a) In general, the fluff is a homogeneous mixture of the chopped insulation. However, some debris piles, including some select areas within the main fluff pile, contain other miscellaneous rubble, such as unstripped wire and cable, metals, and wooden cable spools totaling approximately 14,000 cubic yards. This total is roughly estimated to be comprised of 30% fluff; 30% wire and cable; 30% wood, soil, and miscellaneous materials; and 10% fine-grained iron. Locations of the miscellaneous debris piles are shown on Figure 10.

10. Summary

A number of elements and compounds related to the presence of the fluff were detected in each of the Site media, including:

a) Bis-(2-ethylhexyl) phthalate (DEHP) - present in surface soils, subsurface soils, stream bed sediment and leachate, but not in ground water or surface water.

b) Polychlorinated biphenyls (PCBs or Aroclors) - detected in the fluff, surface soils, subsurface soils, sediments, and leachate but virtually absent in surface water samples.

c) Trichloroethene (TCE) - in ground water monitoring wells and one ground water seep from the Site overburden.

d) Dioxin and dibenzofurans - detected at low levels in fluff and soils adjacent to a burned area of the main fluff pile.

e) Copper, lead, zinc, iron and calcium were elevated above background concentrations in all solid and aqueous media.

f) Manganese in ground water monitoring wells.

C. <u>Principal Conclusions</u>

1. Due to the low solubility of phthalates, it is possible that the detection of these compounds is a result of the inclusion of fluff particles in soil samples rather than phthalates transported from the fluff to the soil in water. This conclusion is supported by the fact that phthalates were found only in solid, not aqueous, media.

2. PCBs, like phthalates, are also low solubility compounds which would be expected to adhere to soil particles or remain in the plastic matrix. It is suspected that PCBs were used as plasticizers or additives to plastics in the past.

3. Like phthalates and PCBs, lead is probably bound in large part in the fluff material, although it fails TCLP. Lead was used as a stabilizer in the form of lead salts and in insulation fillers in the form of lead phthalate. These were added during the plastics manufacturing process.

4. The principal conclusions regarding the dynamics and extent of migration of Site-related constituents are as follows:

a) The main mechanism of migration at the Site is physical transport by runoff and erosion. Particulate fluff material is eroded from the main pile, and deposited in onsite surface soils and offsite in stream bed sediments.

b) Metals accumulated in the intermittent stream sediments may dissolve in the stream water to levels which are toxic to aquatic life.

c) A secondary mechanism of migration at the Site is seepage and overland runoff of leachate during wet periods, where the leachate diversion ditches may be insufficient to carry all of the flow. These leachate discharges enter the stream directly by overland runoff.

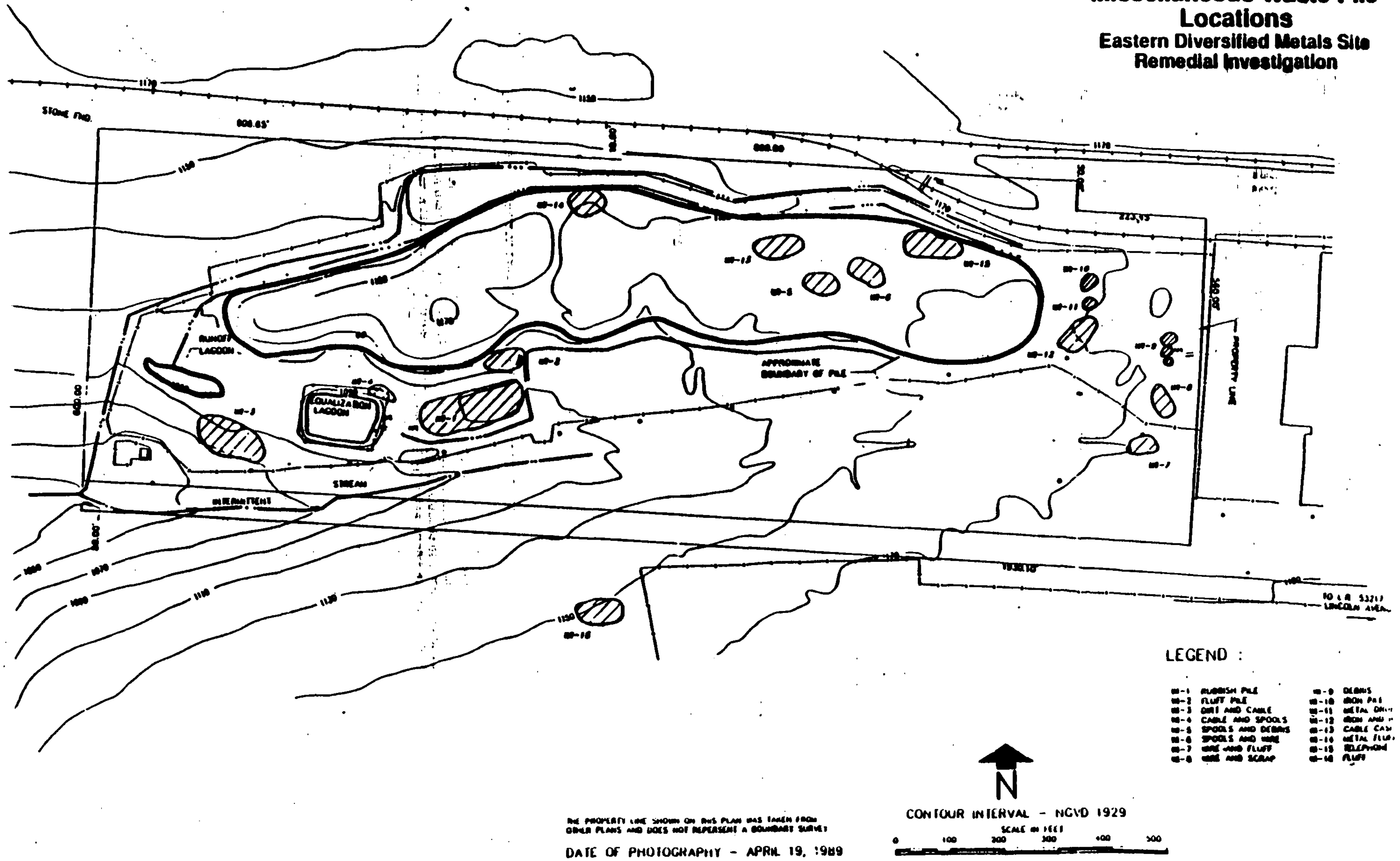
d) Transport of contaminated ground water is a potential migration route.

e) Another secondary mechanism of migration at the Site is wind erosion, as the finer particulates are carried during strong winds and deposited in onsite and offsite surface soils.

Figure 10

Miscellaneous Waste Pile Locations

Eastern Diversified Metals Site
Remedial Investigation



VII. SUMMARY OF SITE RISKS

A. Exposure Assessment Summary

The goal of the exposure assessment is to determine the type and magnitude of human and environmental exposure to the contaminants present at, and migrating from, the Eastern Diversified Metals Site. The exposure assessment was conducted to estimate the risk imposed by the Site if no remedial action was taken.

To determine if human and environmental exposure to the contaminants of concern might occur in the absence of remedial action, an exposure pathway analysis was performed. An exposure pathway is comprised of four necessary elements:

1) a source and mechanism of chemical release;
2) an environmental transport medium;
3) a human or environmental exposure point; and
4) a feasible human or environmental exposure route at the point of exposure.

The potential for completion of exposure pathways at the Eastern Diversified Metals Site is described in the following sections.

1. Exposure Points

The potential points of exposure to compounds associated with the EDM site are described below:

- Air exposure to fugitive dust from the fluff in the Site vicinity (no volatile compounds were found in air testing done at the Site);
- Ground water exposure from a hypothetical potable well near the Site boundary;
- Sediment exposure in the intermittent stream;
- Surface water exposure at the leachate seeps onsite, the intermittent stream, and/or the Little Schuylkill River;
- Exposure to the fluff and to the soils around the fluff at the Site.
- Exposure to contaminants in edible fish tissue.

2. Potentially Exposed Human Populations

The potential population categories evaluated were children ages 2-6; children ages 6-12; and adults, including onsite maintenance workers, offsite residents, offsite workers, and hunters and fishermen. It is important to note that the dermal contact and ingestion exposures with leachate, fluff, and soil for children are calculated according to a "fence down" scenario which assumes that there is no fence to restrict Site access. It is also important to point out that risk estimates were based on continuous (or chronic) lifetime exposure to the Site. The calculated risk for each population was based on contact with the exposure point concentrations in the various media during the entire time an individual within an age group falls within that age range (i.e. 4 years for Age 2-6, 6 years for Age 6-12, and 58 years for Adults - total lifetime assumed to be 70 years). It is unlikely that any one individual will be exposed to the Site in all of the ways that are assumed here for his or her entire lifetime. A summary of the potential Site-related exposures to affected populations analyzed in this assessment is shown in Table 1.

3. Exposure Point Concentrations

The Site-related exposure point concentrations were determined once the exposure scenarios and potentially affected populations were identified. If the transport of compounds associated with a site is under steady-state conditions, monitoring data are adequate to determine potential exposure concentrations. If no data are available or if conditions are transient (such as fugitive dust in air or a migrating plume in ground water), models are used to predict concentrations. In lieu of an established trend in historical data indicating the contrary, the EDM site was considered to be in steady-state with its surroundings.

The only pathway for which modeling was considered appropriate was the fugitive dust pathway. Receptors for the surface water and sediment contact pathways were either expected to be present, although infrequently, in the area in which samples were taken or the concentrations found during the RI were used as a deliberately conservative estimate of potential concentrations downstream. Thus, all exposures, except via the air pathway, were expected to be represented by the concentrations found in the samples taken on the Site.

To describe the air pathway, average and maximum concentrations of the indicators for which the fluff had been analyzed were used as input for a fugitive dust screening model. The models used were EPA's Industrial Source Complex Short Term (ISCST) and Industrial Source Complex Long Term (ISCLT) Dispersion Models. This was a conservative approach, as the airborne dust particles are likely to contain much lower levels of lead and PCBs than the larger size plastic fraction which makes up most of the fluff. Assumptions were made regarding meteorological and Site conditions based on established screening criteria and first-hand observation of Site conditions.

Exposures were estimated for the maximum and average concentrations for each indicator chemical in each medium at the Site. The air screening model output was used to develop similar data for the air exposure points. Dioxin Toxicity Equivalents (TEs) were used to describe the dioxin content of soil and fluff. When calculating the average concentration, half of the detection limit was used as the concentration in a given sample for indicators which were not detected in that sample. For ground water, only downgradient wells were used for the calculations, i.e., upgradient well MW-1 was omitted from the calculations. The measured and calculated values are presented in Table 2. The lead concentrations were omitted since these intakes were considered separately due to the absence of a Reference Dose (RfD). The major assumptions about exposure frequency and duration that were included in the exposure assessment are shown on Table 3.

B. <u>Toxicity Assessment Summary</u>

The toxicity evaluation of the indicator chemicals selected for the EDM site was conducted to identify relevant carcinogenic potency slopes and/or chronic reference doses against which exposure point intakes could be compared in the risk characterization of the Site. Indicator compounds are those which are the most toxic, prevalent, persistent, mobile, and which contribute the major potential risks at the Site. Indicator compounds selected for this Site classified as noncarcinogens are lead, copper, zinc, and manganese. Potentially carcinogenic indicator compounds selected for this Site are PCBs, trichloroethylene, bis (2-ethylhexyl) phthalate, and polychlorodibenzo-p-dioxin. A summary of toxicological information for the indicator chemicals is shown in Table 4. Important fate and transport processes for the indicator compounds are shown in Table 5.

In a CERCLA risk assessment, the potential exposure point concentrations are expressed only in terms of the indicator compound concentrations during the exposure assessment. Another acceptable approach is to use the concentrations of similar compounds to represent the effect of the entire chemical group, i.e., the total mass of a chemical group is used as the mass of the indicator compound representing that group. This conservative assumption allows for exposures to entire chemical families to be incorporated in the risk calculations. In the risk assessment, this approach was considered necessary only for dioxins because of the high toxicity attributed to this group of compounds. Multiple related cogeners of dioxins and the chemically similar furans were grouped together for evaluation. The concentration of each isomer was multiplied by a toxicity equivalency factor (TEF) which converts the concentration of the isomer to a concentration of 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) that is toxicologically equivalent. The total of all the concentration-TEF products was then used as if it were the concentration of 2,3,7,8-TCDD in intake and carcinogenic risk calculations.

Carcinogenic Potency Slopes (CPSs) have been developed by EPA's Carcinogen Risk Assessment Verification Endeavor (CRAVE) for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic chemicals. CPSs, which are expressed in units of (mg/kg-day)-1, are multiplied by the estimated intake of a potential carcinogen, in mg/kg-day, to provide an upper-bound

Table 1 EDM Site
Endangerment Assessment

Routes of Exposures Used to Calculate Potential Intakes

General Routes of Exposure

Potentially Exposed Population	Potential Routes of Exposure: Inhalation	Dermal	Ingestion
Adults	Fugitive Dust	Surface Water Contact Incidental Soil/Fluff Contact	Incidental Surface Water Incidental Soil/Fluff Bioaccumulation (Fish Ingestion)
Children age 6-12	Fugitive Dust	Surface Water Contact Incidental Soil/Fluff Contact	Incidental Surface Water Incidental Soil/Fluff Bioaccumulation (Fish Ingestion)
Children age 2-6	Fugitive Dust		Bioaccumulation (Fish Ingestion)

Routes of Exposures Related to Hypothetical Well

Potentially Exposed Population	Potential Routes of Exposure: Inhalation	Dermal	Ingestion
Adults	Bathing	Bathing	Drinking Water
Children age 6-12	Bathing	Bathing	Drinking Water
Children age 2-6	Bathing	Bathing	Drinking Water

Table 2 (continued)
EDM Site Endangerment Assessment
Exposure Point Concentrations

Potential Transport Medium	Source	Potential Exposure Point	Potential Exposure Route	Indicator Compound	Average Conc. (ppm)	Maximum Conc. (ppm)	Data Source
Surface water	Leachate	On-site	Dermal Contact	Manganese	6.23E+00	1.24E+01	ERM, 1989
				PCBs	2.72E-03	6.00E-03	ERM, 1989
				Trichloroethene	1.25E-02	4.40E-02	ERM, 1989
				Copper	1.79E+00	6.39E+00	ERM, 1989
				Zinc	4.15E+00	8.05E+00	ERM, 1989
				DEHP	1.40E-01	1.40E-01	ERM, 1989
	Ground water (&/or Sediment leaching)	Intermittent stream	Dermal contact	Manganese	9.55E-01	2.78E+00	ERM, 1989
				Copper	1.60E-02	3.80E-02	ERM, 1989
				Zinc	1.66E-01	3.60E-01	ERM, 1989
			Incidental ingestion	Manganese	9.55E-01	2.78E+00	ERM, 1989
				Copper	1.60E-02	3.80E-02	ERM, 1989
				Zinc	1.66E-01	3.60E-01	ERM, 1989
		Little Schuylkill R.	Dermal contact	Manganese	9.55E-01	2.78E+00	ERM, 1989
				Copper	1.60E-02	3.80E-02	ERM, 1989
				Zinc	1.66E-01	3.60E-01	ERM, 1989
			Incidental ingestion	Manganche	9.55E-01	2.78E+00	ERM, 1989
				Copper	1.60E-02	3.80E-02	ERM, 1989
				Zinc	1.66E-01	3.60E-01	ERM, 1989
			Bioaccumulation (Fish ingestion)	Manganese	9.55E-01	2.78E+00	ERM, 1989
				Copper	1.60E-02	3.80E-02	ERM, 1989
				Zinc	1.66E-01	3.60E-01	ERM, 1989
Soil	Fluff	On-site	Dermal Contact	PCBs	1.93E+02	5.56E+03	TGAI--9/84
				Dioxin	1.85E-02	1.85E-02	ERM, 1989
				Zinc	2.00E+03	2.26E+03	TGAI--9/84
			Incidental ingestion	Lead	1.18E+04	4.08E+04	TGAI--9/84
				PCBs	1.93E+02	5.56E+03	TGAI--9/84
				Dioxin	1.85E-02	1.85E-02	ERM, 1989
				Zinc	2.00E+03	2.26E+03	TGAI--9/84

Table 2
EDM Site Endangerment Assessment
Exposure Point Concentrations

Potential Transport Medium	Source	Potential Exposure Point	Potential Exposure Route	Indicator Compound	Average Conc. (ppm)	Maximum Conc. (ppm)	Data Source
Air	Fluff	On-site	Inhalation mg/m3	PCBs	1.27E-06	3.65E-06	TGAI--9/84*
				Dioxin	1.18E-10	1.18E-10	ERM, 1989*
				Zinc	1.31E-06	1.48E-06	TGAI--9/84*
		Off-site residents Hunters and Fishermen	Inhalation mg/m3	PCBs	3.53E-07	1.02E-06	TGAI--9/84*
				Dioxin	3.29E-11	3.29E-11	ERM, 1989*
				Zinc	3.66E-06	4.14E-06	TGAI--9/84*
		Off-site workers (Warehouse)	Inhalation mg/m3	PCBs	2.97E-07	8.56E-06	TGAI--9/84*
				Dioxin	2.77E-11	2.77E-11	ERM 1989*
				Zinc	3.08E-06	3.48E-06	TGAI--9/84*
Ground Water	Fluff Pile	Hypothetical well @ site boundary for Potable water	Ingestion	Manganese	4.18E+00	1.97E+01	ERM, 1989
				Trichloroethene	2.41E-02	9.10E-02	ERM, 1989
				Copper	8.00E-03	4.00E-02	ERM, 1989
				Zinc	4.26E-02	1.69E-01	ERM, 1989
			Dermal contact (Bathing)	Manganese	4.18E+00	1.97E+01	ERM, 1989
				Trichloroethene	2.41E-02	9.10E-02	ERM, 1989
				Copper	8.00E-03	4.00E-02	ERM, 1989
				Zinc	4.26E-02	1.69E-01	ERM, 1989
			Inhalation While Bathing	Manganese	4.18E+00	1.97E+01	ERM, 1989
				Trichloroethene	2.41E-02	9.10E-02	ERM, 1989
				Copper	8.00E-03	4.00E-02	ERM, 1989
				Zinc	4.26E-02	1.69E-01	ERM, 1989
Sediment	Fluff (mixed with sediment)	Off-site (stream)	Dermal contact	Manganese	8.17E+02	3.32E+03	ERM, 1989
				PCBs	2.67E+00	8.40E+00	ERM, 1989
				Copper	5.97E+02	2.22E+03	ERM, 1989
				Zinc	1.59E+02	3.01E+02	ERM, 1989
				DEHP	2.26E+02	7.50E+02	ERM, 1989
			Incidental ingestion	Manganese	8.17E+02	3.32E+03	ERM, 1989
				PCBs	2.67E+00	8.40E+00	ERM, 1989
				Copper	5.97E+02	2.22E+03	ERM, 1989
				Zinc	1.59E+02	3.01E+02	ERM, 1989
				DEHP	2.26E+02	7.50E+02	ERM, 1989

* Data used as input to screening model; modeling information is included as an appendix (Appendix C).

TABLE 3
EDM SITE SPECIFIC PARAMETERS FOR CALCULATION OF DOSAGE AND INTAKE

		Adult	Child Age 6-12	Child Age 2-6
PHYSICAL CHARACTERISTICS				
Average Body Weight	(a)	70 kg	29 kg	16 kg
Average Skin Surface Area	(a)	18,150 cm2	10,470 cm2	6980 cm2
Average Lifetime	(g)	70 yrs		
Average Number of Years Exposure in Lifetime	(d)	58 yrs	6 yrs	4 yrs
ACTIVITY CHARACTERISTICS				
Inhalation Rate	(f,d)	0.83 m3/hr	0.46 m3/hr	0.25 m3/hr
Retention Rate of Inhaled Air	(f)	75%	75%	75%
Absorption Rate of Inhaled Air	(d)	100%	100%	100%
Frequency of Fugitive Dust Inhalation				
- On-site maintenance workers	(d)	156 days/yr	—	---
- Off-site residents	(d)	365 days/yr	365 days/yr	365 days/yr
- Off-site workers	(d)	260 days/yr	—	---
- Hunters and Fisherman	(d)	14 days/yr	—	---
- Casual Trespassers	(d)	—	26 days/yr	---
Duration of Fugitive Dust Inhalation				
- On-site maintenance workers	(d)	2 hrs/day	—	---
- Off-site residents	(d)	24 hrs/day	24 hrs/day	24 hrs/day
- Off-site workers	(d)	8 hrs/day	—	---
- Hunters and Fisherman	(d)	4 hrs/day	—	---
- Casual Trespassers	(d)	—	1 hr/day	---
Amount of Water Ingested Daily	(f)	2 liters	2 liters	2 liters
Percent of Drinking Water From Home Source	(d)	75%	75%	75%
Length of Time Spent Showering/Bathing	(b)	20 min.	20 min.	20 min.
Percentage of Skin Surface Area Immersed While Showering/Bathing	(g)	100%	100%	100%
Volume of Water Used While Showering/Bathing	(b)	200 liters	200 liters	200 liters
Volume of Showerstall	(b)	3 m3	3 m3	3 m3
Length of Time Spent in Bathroom After Showering/Bathing	(b)	10 min.	10 min.	10 min.
Volume of Bathroom	(b)	10 m3	10 m3	10 m3
Amount of Sediment Ingested Incidentally	(f)	—	100 mg	---
Frequency of Sediment Contact				
-Casual trespassers	(d)	—	26 days/yr	---
Duration of Sediment Contact				
-Casual trespassers	(d)	—	1 hr/day	---
Percentage of Skin Area Contacted by Sediment	(d)	20%	20%	---
Skin Absorption Rate of Compounds in Sediment	(c)	0.06	0.12	---
Amount of Water Ingested Incidentally				
- Hunters and Fisherman	(g)	0.2 liters	—	---
- Children Playing	(g)	—	0.05 liters	---
Frequency of Surface Water Contact				
- Hunters and Fisherman	(d)	14 days/yr	—	---
- Children Playing	(d)	—	26 days/yr	---
Duration of Surface Water Contact				
- Hunters and Fisherman	(d)	4 hrs/day	—	---
- Children Playing	(d)	—	1 hr/day	---
Percentage of Skin Surface Area Immersed				
- Hunters and Fisherman	(d)	18%	—	---
- Children Playing	(d)	---	16%	---

Table 2 (continued)
EDM Site Endangerment Assessment
Exposure Point Concentrations

Potential Transport Medium	Source	Potential Exposure Point	Potential Exposure Route	Indicator Compound	Average Conc. (ppm)	Maximum Conc. (ppm)	Data Source
Soil (continued)	Surface soil	On-site	Dermal contact	Manganese	3.67E+02	8.98E+02	ERM, 1989
				PCBs	3.76E+01	2.40E +02	ERM, 1989
				Dioxin	3.57E-03	7.14E-03	ERM, 1989
				Copper	1.20E+01	1.08E+06	ERM, 1989
				Zinc	3.77E+02	1.23E+03	ERM, 1989
				DEHP	1.47E+03	3.30E+03	ERM, 1989
			Incidental ingestion	Manganese	3.67E+02	8.98E+02	ERM, 1989
				PCBs	3.76E+01	2.40E+02	ERM, 1989
				Dioxin	3.57E-03	7.14E-03	ERM, 1989
				Copper	1.20E+04	1.08E+06	ERM, 1989
				Zinc	3.77E+02	1.23E+03	ERM, 1989
				DEHP	1.47E+03	3.30E+03	ERM, 1989

Table 4
Summary of Toxicological Information
For the Indicator Chemicals
EDM Site

Indicator Chemical	Oral RfD* mg/kg/day	Inhalation RfD* mg/kg/day	Oral CPF** 1/mg/kg/day	Inhalation CPF** 1/mg/kg/day	EPA Carcinogen Classification	Reference
Copper	3.70E-02	1.00E-02	NA	NA	D	SPHEM
Lead	withdrawn	withdrawn	NA	NA	B2	IRIS
Manganese	2.00E-01	3.00E-04	NA	NA	D	SPHEM
Zinc	2.10E-01	1.00E-02	NA	NA	D	SPHEM
Dioxins	NA	NA	1.56E+05	1.56E+05	B2	SPHEM
Bis(2-ethylhexyl)phthalate	2.00E-02	NA	1.40E-02	NA +	B2	IRIS
Polychlorinated Biphenyls (PCBs)	NA	NA	7.70E+00	7.70E+00	B2	IRIS
Trichlorethene	NA	NA	1.10E-02	1.30E-02	B2	IRIS

*Noncarcinogenic effects
**Carcinogenic effects

+No inhalation pathway; therefore, use of Oral CPF for inhalation CPF is not needed.

RfD - Reference Dose
CPF - Carcinogenic Potency Factor

NA - Not Available

IRIS - EPA's On-Line Integrated Risk Information System accessed 7/89.
SPHEM - Superfund Public Health Evaluation Manual 10/86.

TABLE 3 (Continued)
EDM SITE SPECIFIC PARAMETERS FOR CALCULATION OF DOSAGE AND INTAKE

		Adult	Child Age 6-12	Child Age 2-6
ACTIVITY CHARACTERISTICS (Continued)				
Amount of Fish Consumed Daily	(g)	6.5 g/day	6.5 g/day	6.5 g/day
Amount of Soil Ingested Incidentally	(f)	50 mg	50 mg	---
Amount of Fluff Ingested Incidentally	(f)	50 mg	50 mg	---
Frequency of Soil/Fluff Contact				
-On-site maintenance workers	(d)	156 days/yr	---	---
-Casual trespassers	(d)	---	28 days/yr	---
Duration of Soil/Fluff Contact				
-On-site maintenance workers	(d)	2 hrs/day	---	---
-Casual trespassers	(d)	---	1 hr/day	---
Percentage of Skin Area Contacted by Soil/Fluff	(d)	20%	20%	---
Skin Absorption Rate of Compounds in Soil/Fluff	(c)	0.08	0.12	---
MATERIAL CHARACTERISTICS				
Dust Adherence, Soil	(e)	0.51 mg/cm2 *		
Dust Adherence, Fluff	(f)	1.45 mg/cm2 **		
Soil Matrix Effect	(c)	15%		
Mass Flux Rate (water-based)	(g)	0.5 mg/cm2/hr		
BIOCONCENTRATION FACTORS				
Lead	(i)	49 L/kg		
Manganese	(k)	100 L/kg		
Copper	(i)	200 L/kg		
Zinc	(i)	47 L/kg		
CHEMICAL SPECIFIC ABSORPTION FACTORS				
Dioxin (in fluff and soil: ingestion only)	(h)	0.3 ***		
PCBs (in sediment, fluff, and soil: ingestion only)	(h)	0.3 ***		
Lead (in sediment and soil: ingestion only)	(j)	0.3		
Lead (in fluff, based on absorbable fraction: inhalation of fugitive dust and ingestion only)	(App. I)	0.27 0.55	(most probable intake) (maximum intake)	
(All other absorption rates are assumed to be 100 %).				

a - Anderson, E., Browne, N., Duletsky, S., Warn, T., "Development of Statistical Distributions or Ranges of Standard Factors Used in Exposure Assessments", PB 85-242667/AS, US EPA, Office of Health and Environmental Assessment, 1984.
b - K.G. Symms, "An approximation of the inhalation exposure to volatile sythetic organic chemicals from showering with contaminated household water," paper presented at the symposium of the American College of Toxicologists, 15 November 1986.
c - J.K. Hawley, "Assessment of Health Risk from Exposure to Contaminated Soil", Risk Analysis, Vol. 5, No. 4, 1985
d - ERM Staff Professional Judgement
e - Lepow, M.L., Bruckmann, L., Gillette, M., Markowitz, S., Robino, R., Kapish, J., "Investigations into Sources of Lead in the Environment of Urban Children", Environmental Research 10:415-426, 1975, and
Lepow, M.L., Bruckmann, M., Robino, L., Markowitz, S., Gillette, R., Kapish, J., "Role of Airborne Lead in Increased Body Burden of Lead in Hartford Children", Environmental Health Perspectives 6:99-101, 1974
f - Superfund Public Health Evaluation Manual
g - Superfund Exposure Assessment Manual
h - Kimbrough R. Falk H. Stemr P. Fries G. 1984. "Health implications of 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) contamination of residential soil", Journal of Toxicology and Environmental Health 14:47-93.
i - Lipsky, D. 1989. Health Hazards Associated with PCDD and PCDF Emissions. Found in: The Risk Assessment of Environmental Hazards, D. J. Paustenbach, ed., New York: John Wiley and Sons, pp. 631 - 686.
j - Beck, B.D. S. Hala B.L. Murphy. 1989. Evaluation of Soil Ingestion Rates. Cambridge, MA: Gradient Corp.
k - U.S. EPA. "Health Assessment Document for Manganese", EPA 600/8-83-013F, 1984.
l-Human Health Evaluation Manual, July 1989.

*0.51 mg/cm2 was used to calculate dermal contact in soil, because the soil at the EDM site is the same general soil type as in the Lepow, et al research study (reference e). This dust adherence value was derived from the recovery rates and area of the skin dust collector used in the study.
**1.45 mg/cm2 was used to calculate dermal contact in the fluff due to lack of more specific results for dust adherence of fluff.
***30% intestinal absorption used as best estimate of exposure to PCBs and dioxin for most probable scenarios: 100% absorption used for calculation of exposure maxima.

POOR QUALITY ORIGINAL

estimate of the excess lifetime cancer risk associated with exposure at that intake level. The term "upper bound" reflects the conservative estimate of the risks calculated from the CPS. Use of this approach makes underestimation of the actual cancer risk highly unlikely. Cancer potency slopes are derived from the results of human epidemiological studies or chronic animal bioassays to which animal-to-human extrapolation and uncertainty factors have been applied.

Reference doses (RfDs) have been developed by EPA for indicating the potential for adverse health effects from exposure to chemicals exhibiting noncarcinogenic effects. RfDs, which are expressed in units of mg/kg-day, are estimates of lifetime daily exposure levels for humans, including sensitive individuals that are likely to be without an appreciable risk of adverse health effects. Estimated intakes of chemicals from environmental media (e.g., the amount of a chemical ingested from contaminated drinking water) can be compared to the RfD. RfDs are derived from human epidemiological studies or animal studies to which uncertainty factors have been applied (e.g., to account for the use of animal data to predict effects on humans). These uncertainty factors help ensure that the RfDs will not underestimate the potential for adverse noncarcinogenic effects to occur.

C. Risk Characterization Summary

The National Contingency Plan (NCP) directs hazardous substance response and establishes acceptable levels of carcinogenic risk for Superfund sites at between 1 in 10,000 and 1 in 1,000,000 additional cancer cases if no cleanup actions are taken at a site. Expressed using scientific notation, this translates to an acceptable risk range of between 1×10^{-4} and 1×10^{-6}. This means that one additional person per ten thousand or one additional person in one million, respectively, could develop cancer given a lifetime (70 years) of exposure to contaminants at a site.

In addition to carcinogenic risks, the baseline RA calculates risks to humans of contracting other, non-carcinogenic health effects from substances associated with a site. The calculation is made by dividing the "worst case" human exposure estimates associated with a site by exposure levels that are determined by EPA to be acceptable. The ratios are added to represent exposures to multiple contaminants. Any result of this calculation (known as the Hazard Index) which is greater than 1.0 is considered to present an unacceptable risk.

When reviewing the quantitative information presented in the tables in this section, values greater than 1×10^{-4} to 1×10^{-6} for carcinogenic risk, and chronic hazard index values greater than 1.0 for noncarcinogenic risk, indicate the potential for adverse health impacts.

Table 5 EDM Site Endangerment Assessment Important Fate and Transport Processes for Indicator Compounds	
Indicator Compound	Major Fate and Transport Processes *
Lead	Sorption Bioaccumulation Chemical speciation Biotransformation
Manganese	Sorption Complexation Oxidation Bioaccumulation
Polychlorinated Biphenyls (PCBs)	Photolysis Hydrolysis Sorption Bioaccumulation Biotransformation (<4 chlorine per molecule) Volatilization
Dioxins	Sorption Bioaccumulation Photochemical transformation
Trichloroethene (TCE)	Biotransformation/degradation Volatilization Bioaccumulation Oxidation
Copper	Sorption Bioaccumulation Complex formation
Zinc	Sorption Bioaccumulation
Bis-(2-Ethylhexyl)phthalate (DEHP)	Sorption Biodegradation Bioaccumulation

Table 6
EDM Site Endangerment Assessment
Calculation of Noncarcinogenic Hazard Indices
(Adult Population)

Potential Transport Medium	Source	Potential Exposure Point	Potential Exposure Route	Indicator Compound	Calculated Most Probable Hypothetical Intake	Calculated Maximum Hypothetical Intake	Reference Dose	Most Probable Hazard Index	Maximum Hazard Index
Air	Fluff	On-site Maintenance Workers	Inhalation	PCBs	9.65E-09	2.77E-07	NA	NA	NA
				Dioxin	8.97E-13	8.97E-13	NA	NA	NA
				Zinc	9.96E-08	1.13E-07	1.00E-02	9.96E-06	1.13E-06
				Total hazard, this exposure point:				9.96E-06	1.13E-06
		Off-site residents	Inhalation	PCBs	7.53E-08	2.18E-06	NA	NA	NA
				Dioxin	7.02E-12	7.02E-12	NA	NA	NA
				Zinc	7.81E-07	8.84E-07	1.00E-02	7.81E-05	8.84E-05
				Total hazard, this exposure point:				7.81E-05	8.84E-05
		Off-site workers (Warehouse)	Inhalation	PCBs	1.51E-08	4.34E-07	NA	NA	NA
				Dioxin	1.40E-12	1.40E-12	NA	NA	NA
				Zinc	1.56E-07	1.76E-07	1.00E-02	1.56E-05	1.76E-05
				Total hazard, this exposure point:				1.56E-05	1.76E-05
		Hunters and fishermen	Inhalation	PCBs	4.82E-10	1.39E-08	NA	NA	NA
				Dioxin	4.49E-14	4.49E-14	NA	NA	NA
				Zinc	4.99E-09	5.65E-09	1.00E-02	4.99E-07	5.65E-07
				Total hazard, this exposure point:				4.99E-07	5.65E-07
Ground Water	Fluff Pile	Hypothetical downgradient well	Ingestion	Manganese	8.95E-02	4.22E-01	2.00E-01	4.47E-01	2.11E+00
				Trichloroethene	5.16E-04	1.95E-03	NA	NA	NA
				Copper	1.71E-04	8.56E-04	3.70E-02	4.63E-03	2.31E-02
				Zinc	9.12E-04	3.62E-03	2.10E-01	4.34E-03	1.72E-02
			Dermal contact (Bathing)	Manganese	1.79E-04	8.43E-04	2.00E-01	8.95E-04	4.22E-03
				Trichloroethene	1.03E-06	3.89E-06	NA	NA	NA
				Copper	3.42E-07	1.71E-06	3.70E-02	9.25E-06	4.63E-05
				Zinc	1.82E-06	7.23E-06	2.10E-01	8.68E-06	3.44E-05
			Inhalation While Bathing (Volatile compounds only)	Manganese	---	---	NA	NA	NA
				Trichloroethene	4.10E-03	1.55E-02	NA	NA	NA
				Copper	---	---	NA	NA	NA
				Zinc	---	---	NA	NA	NA
				Total hazard, this exposure point:				4.57E-01	2.15E+00
Surface water	Ground water (&/or Sediment leaching)	Little Schuylkill R. Hunters and Fisherman	Dermal contact	Manganese	3.47E-06	1.01E-05	2.00E-01	1.73E-05	5.05E-05
				Copper	5.81E-08	1.38E-07	3.70E-02	1.57E-06	3.73E-06
				Zinc	6.04E-07	1.34E-06	2.10E-01	2.88E-06	6.38E-06
			Incidental Ingestion	Manganese	1.05E-04	3.05E-04	2.00E-01	5.23E-04	1.52E-03
				Copper	1.75E-06	4.16E-06	3.70E-02	4.74E-05	1.13E-04
				Zinc	1.82E-05	4.04E-05	2.10E-01	8.68E-05	1.93E-04
				Total hazard, this exposure point:				6.79E-04	1.89E-03

NA - Not Applicable

POOR QUALITY ORIGINAL

1. Noncarcinogenic Risk

The Hazard Index (HI) Method is used for assessing the overall potential for noncarcinogenic effects posed by the indicator compounds. Potential concern for noncarcinogenic effects of a single contaminant in a single medium is expressed as the hazard quotient (HQ) (or the ratio of the estimated intake derived from the contaminant concentration in a given medium to the contaminant's reference dose). By adding the HQs for all contaminants within a medium or across all media to which a given population may reasonably be exposed, the HI can be generated. The HI provides a useful reference point for gauging the potential significance of multiple contaminant exposures within a single medium or across media.

Tables 6-8 present the calculated hazard indices for each age group evaluated. These tables calculate the hazard indices associated with each of the exposure points, exposed populations, and routes of exposure identified previously. Most probable and maximum hazard indices have been calculated, using the most probable and maximum intakes calculated previously. Most probable intakes are calculated using average exposure point concentrations of the indicator chemical; maximum intakes are calculated using maximum exposure point concentrations. All other exposure parameters are identical in the calculation of the types of intakes.

Exposures to multiple sources of contamination through several routes of exposure may occur. Therefore, the sum of all hazard indices for each single age group and exposed population is given. Hazard indices were calculated separately for the three age groups. Both most probable and maximum lifetime hazard indices were calculated and are presented in Table 9.

Manganese in the ground water is the compound responsible for driving the hypothetical downgradient well exposure point over the hazard index of one. Onsite worker exposure to copper in surface soils also exceeds the hazard index of one.

Since the RfD for lead has been withdrawn, the hazard or risk associated with lead could not be estimated by standard risk assessment methods. For this reason, alternate methods were chosen and lead was not included on the tables showing the noncarcinogenic hazard estimates for the Site. An action level of 15 ppb for lead was used to screen Site data for ground and surface water for evidence of potential hazard due to lead. The action level was used directly as a guideline to assess ground water as a hypothetical source of drinking water while it was adjusted for intake volume for the surface water incidental ingestion scenario. Since the standard drinking water scenario assumes two liters of water is ingested daily but the incidental ingestion scenario assumes only 0.05 liters per hour of exposure, the action level was adjusted by the relative volume associated with each specific

Table 7
EDM Site Endangerment Assessment
Calculation of Noncarcinogenic Hazard Indices
(Child 6-12 Population)

Potential Transport Medium	Source	Potential Exposure Point	Potential Exposure Route	Indicator Compound	Calculated Most Probable Hypothetical Intake	Calculated Maximum Hypothetical Intake	Reference Dose	Most Probable Hazard Index	Maximum Hazard Index
Air	Fluff	On-site	Inhalation	PCBs	1.08E-09	3.09E-08	NA	NA	NA
				Dioxin	1.00E-13	1.00E-13	NA	NA	NA
				Zinc	1.11E-08	1.25E-08	1.00E-02	1.11E-06	1.25E-06
				Total hazard, this exposure point:				1.11E-06	1.25E-06
		Off-site residents	Inhalation	PCBs	1.01E-07	2.91E-06	NA	NA	NA
				Dioxin	9.39E-12	9.39E-12	NA	NA	NA
				Zinc	8.79E-07	9.94E-07	1.00E-02	8.79E-05	9.94E-05
				Total hazard, this exposure point:				8.79E-05	9.94E-05
Ground Water	Fluff Pile	Hypothetical downgradient well	Ingestion	Manganese	2.17E-01	1.02E+00	2.00E-01	1.09E+00	5.12E+00
				Trichloroethene	1.25E-03	4.73E-03	NA	NA	NA
				Copper	4.16E-04	2.08E-03	3.70E-02	1.12E-02	5.62E-02
				Zinc	2.22E-03	8.79E-03	2.10E-01	1.05E-02	4.18E-02
			Dermal contact (Bathing)	Manganese	2.51E-04	1.18E-03	2.00E-01	1.25E-03	5.91E-03
				Trichloroethene	1.45E-06	5.46E-06	NA	NA	NA
				Copper	4.80E-07	2.40E-06	3.70E-02	1.30E-05	6.49E-05
				Zinc	2.56E-06	1.01E-05	2.10E-01	1.22E-05	4.83E-05
			Inhalation While Bathing (Volatile compounds only)	Manganese	---	---	NA	NA	NA
				Trichloroethene	5.54E-03	2.09E-02	NA	NA	NA
				Copper	---	---	NA	NA	NA
				Zinc	---	---	NA	NA	NA
				Total hazard, this exposure point: (residential use of ground water)				1.11E+00	5.23E+00
Sediment	Fluff (mixed with sediment)	Off-site (stream)	Dermal contact	Manganese	3.82E-05	1.55E-04	2.00E-01	1.91E-04	7.77E-04
				PCBs	1.25E-07	3.93E-07	NA	NA	NA
				Copper	2.79E-05	1.04E-04	3.70E-02	7.55E-04	2.81E-03
				Zinc	7.44E-06	1.41E-05	2.10E-01	3.54E-05	6.71E-05
				DEHP	1.06E-05	3.51E-05	2.00E-02	5.28E-04	1.76E-03
			Incidental ingestion	Manganese	2.01E-04	8.15E-04	2.00E-01	1.00E-03	4.08E-03
				PCBs	1.96E-07	6.19E-07	NA	NA	NA
				Copper	1.47E-04	5.45E-04	3.70E-02	3.96E-03	1.47E-02
				Zinc	3.91E-05	7.39E-05	2.10E-01	1.86E-04	3.52E-04
				DEHP	5.54E-05	1.84E-04	2.00E-02	2.77E-03	9.21E-03
				Total hazard, sediment, this exposure point:				9.43E-03	3.30E-02
Surface water	Leachate	On-site	Dermal Contact	Manganese	1.28E-05	2.55E-05	2.00E-01	6.41E-05	1.28E-04
				PCBs	5.60E-09	1.23E-08	NA	NA	NA
				Trichloroethene	2.57E-08	9.05E-08	NA	NA	NA
				Copper	3.68E-06	1.31E-05	3.70E-02	9.95E-05	3.55E-04
				Zinc	8.54E-06	1.66E-05	2.10E-01	4.07E-05	7.89E-05
				DEHP	2.88E-07	2.88E-07	2.00E-02	1.44E-05	1.44E-05
				Total hazard, leachate, this exposure point:				2.19E-04	5.76E-04

NA - Not Applicable

Table 6 (continued)
EDM Site Endangerment Assessment
Calculation of Noncarcinogenic Hazard Indices
(Adult Population)

Potential Transport Medium	Source	Potential Exposure Point	Potential Exposure Route	Indicator Compound	Calculated Most Probable Hypothetical Intake	Calculated Maximum Hypothetical Intake	Reference Dose	Most Probable Hazard Index	Maximum Hazard Index
Surface water continued...	Ground water (&/or Sediment leaching)	Little Schuylkill R.	Bioaccumulation (Fish ingestion)	Manganese	8.87E-03	2.58E-02	2.00E-01	4.43E-02	1.29E-01
				Copper	2.97E-04	7.08E-04	3.70E-02	8.03E-03	1.91E-02
				Zinc	7.26E-04	1.61E-03	2.10E-01	3.46E-03	7.67E-03
				Total hazard, this exposure point:				5.58E-02	1.56E-01
Soil	Fluff	On-site Maintenance Workers	Dermal Contact	PCBs	1.12E-04	3.22E-03	NA	NA	NA
				Dioxin	1.07E-08	1.07E-08	NA	NA	NA
				Zinc	1.16E-03	1.30E-03	2.10E-01	5.52E-03	6.19E-03
			Incidental Ingestion	PCBs	1.76E-05	1.02E-03	NA	NA	NA
				Dioxin	1.09E-09	3.36E-09	NA	NA	NA
				Zinc	6.10E-04	4.13E-04	2.10E-01	2.90E-03	1.97E-03
				Total hazard, this exposure point:				8.42E-03	8.16E-03
	Surface soil	On-site Maintenance Workers	Dermal contact	Manganese	7.48E-05	1.83E-04	2.00E-01	3.74E-04	9.15E-04
				PCBs	7.66E-08	4.89E-06	NA	NA	NA
				Dioxin	7.29E-10	1.46E-09	NA	NA	NA
				Copper	2.45E-06	2.20E-02	3.70E-02	6.61E-05	5.95E-01
				Zinc	7.69E-05	2.51E-04	2.10E-01	3.66E-04	1.19E-03
				DEHP	2.99E-04	6.73E-04	2.00E-02	1.50E-02	3.36E-02
			Incidental ingestion	Manganese	1.12E-04	5.47E-04	2.00E-01	5.59E-04	2.74E-03
				PCBs	3.44E-06	1.46E-04	NA	NA	NA
				Dioxin	3.26E-10	4.36E-09	NA	NA	NA
				Copper	3.66E-03	6.58E-02	3.70E-02	9.88E-02	1.78E+00
				Zinc	1.15E-04	7.50E-04	2.10E-01	5.47E-04	3.57E-03
				DEHP	4.47E-04	2.01E-03	2.00E-02	2.24E-02	1.01E-01
				Total hazard, this exposure point: (on-site maintenance workers)				1.36E-01	2.52E+00

NA - Not applicable

	Most Probable Hazard Index	Maximum Hazard Index
Total hazard for on-site maintenance workers:	1.46E-01	2.52E+00
Total hazard for off-site residents (includes hunting & fishing scenario):	5.14E-01	2.31E+00
Total hazard for off-site workers:	1.56E-05	1.76E-05
Total hazard for hunters & fishermen:	5.65E-02	1.56E-01

Note: 100 mg/day was used in calculating ingestion of Surface soil and Fluff for maximum exposure; only the worst of the two was used in the total maximum hazard calculation.

POOR QUALITY ORIGINAL

Table 8
EDM Site Endangerment Assessment
Calculation of Noncarcinogenic Hazard Indices
(Child 2-6 Population)

Potential Transport Medium	Source	Potential Exposure Point	Potential Exposure Route	Indicator Compound	Calculated Most Probable Hypothetical Intake	Calculated Maximum Hypothetical Intake	Reference Dose	Most Probable Hazard Index	Maximum Hazard Index
Air	Fluff	Off-site residents	Inhalation	PCBs	9.93E-08	2.87E-08	NA	NA	NA
				Dioxin	9.25E-12	9.26E-12	NA	NA	NA
				Zinc	1.03E-06	1.16E-06	1.00E-02	1.03E-04	1.16E-04
				Total hazard, this exposure point:				1.03E-04	1.16E-04
Ground Water	Fluff Pile	Hypothetical downgradient well	Ingestion	Manganese	3.93E-01	1.85E+00	2.00E-01	1.96E+00	9.26E+00
				Trichloroethene	2.27E-03	8.55E-03	NA	NA	NA
				Copper	7.52E-04	3.78E-03	3.70E-02	2.03E-02	1.02E-01
				Zinc	4.00E-03	1.59E-02	2.10E-01	1.91E-02	7.56E-02
			Dermal contact (Bathing)	Manganese	3.01E-04	1.42E-03	2.00E-01	1.50E-03	7.09E-03
				Trichloroethene	1.74E-06	6.55E-06	NA	NA	NA
				Copper	5.76E-07	2.88E-06	3.70E-02	1.56E-05	7.78E-05
				Zinc	3.07E-06	1.22E-05	2.10E-01	1.46E-05	5.79E-05
			Inhalation While Bathing (Volatile compounds only)	Manganese	---	---	NA	NA	NA
				Trichloroethene	5.30E-03	2.00E-02	NA	NA	NA
				Copper	---	---	NA	NA	NA
				Zinc	---	---	NA	NA	NA
				Total hazard, this exposure point:				2.01E+00	9.44E+00
Surface Water	Ground Water (&/or Sediment leaching)	Little Schuylkill R.	Bioaccumulation (Fish ingestion)	Manganese	3.88E-02	1.13E-01	2.00E-01	1.94E-01	5.65E-01
				Copper	1.30E-03	3.09E-03	3.70E-02	3.51E-02	8.79E-02
				Zinc	3.18E-03	7.05E-03	2.10E-01	1.51E-02	4.66E-01
				Total hazard, this exposure point:				2.44E-01	1.12E+00
				Total hazard, all exposure points:				2.25E+00	1.06E+01

NA - Not applicable

POOR QUALITY ORIGINAL

ble 7 (continued)
EDM Site Endangerment Assessment
Calculation of Noncarcinogenic Hazard Indices
(Child 6-12 Population)

Potential Transport Medium	Source	Potential Exposure Point	Potential Exposure Route	Indicator Compound	Calculated Most Probable Hypothetical Intake	Calculated Maximum Hypothetical Intake	Reference Dose	Most Probable Hazard Index	Maximum Hazard Index
Surface Water continued...	Ground water (&/or Sediment leaching)	Intermittent stream	Dermal contact	Manganese	1.96E-06	5.72E-06	2.00E-01	9.82E-06	2.86E-05
				Copper	3.29E-08	7.82E-08	3.70E-02	8.90E-07	2.11E-06
				Zinc	3.42E-07	7.59E-07	2.10E-01	1.63E-06	3.62E-06
			Incidental ingestion	Manganese	1.17E-04	3.41E-04	2.00E-01	5.86E-04	1.71E-03
				Copper	1.97E-06	4.67E-06	3.70E-02	5.31E-05	1.26E-04
				Zinc	2.04E-06	4.53E-06	2.10E-01	9.73E-06	2.16E-04
				Total hazard, stream water, this exposure point:				7.40E-04	2.06E-03
		Little Schuylkill R.	Dermal contact	Manganese	1.96E-06	5.72E-06	2.00E-01	9.82E-06	2.86E-05
				Copper	3.29E-08	7.82E-08	3.70E-02	8.90E-07	2.11E-06
				Zinc	3.42E-07	7.59E-07	2.10E-01	1.63E-06	3.62E-06
			Incidental ingestion	Manganese	1.17E-04	3.41E-04	2.00E-01	5.86E-04	1.71E-03
				Copper	1.97E-06	4.67E-06	3.70E-02	5.31E-05	1.26E-04
				Zinc	2.04E-06	4.53E-06	2.10E-01	9.73E-06	2.16E-04
				Total hazard, river water, this exposure point:				7.40E-04	2.06E-03
		Little Schuylkill R.	Bioaccumulation (Fish ingestion)	Manganese	2.14E-02	6.23E-02	2.00E-01	1.07E-01	3.12E-01
				Copper	7.17E-04	1.70E-03	3.70E-02	1.94E-02	4.60E-02
				Zinc	1.75E-03	3.89E-03	2.10E-01	8.35E-03	1.85E-02
				Total hazard, bioaccumulation, this exposure point:				1.35E-01	3.76E-01
Soil	Fluff	On-site	Dermal Contact	PCBs	2.57E-06	7.40E-04	NA	NA	NA
				Dioxin	2.46E-09	2.46E-09	NA	NA	NA
				Zinc	2.66E-04	3.01E-04	2.10E-01	1.27E-03	1.43E-03
			Incidental ingestion	PCBs	7.11E-06	1.37E-03	NA	NA	NA
				Dioxin	6.82E-10	4.54E-09	NA	NA	NA
				Zinc	2.46E-04	5.55E-04	2.10E-01	1.17E-03	2.64E-03
				Total hazard, fluff, this exposure point:				2.44E-03	4.06E-03
	Surface soil	On-site	Dermal contact	Manganese	1.72E-06	4.20E-05	2.00E-01	8.59E-06	2.10E-04
				PCBs	1.76E-08	1.12E-06	NA	NA	NA
				Dioxin	1.07E-10	3.34E-10	NA	NA	NA
				Copper	5.62E-07	5.06E-03	3.70E-02	1.52E-05	1.37E-01
				Zinc	1.76E-06	5.76E-05	2.10E-01	8.40E-06	2.74E-04
				DEHP	6.87E-05	1.54E-04	2.00E-02	3.43E-03	7.72E-03
			Incidental ingestion	Manganese	4.51E-05	2.21E-04	2.00E-01	2.25E-04	1.10E-03
				PCBs	1.30E-06	5.90E-05	NA	NA	NA
				Dioxin	1.32E-10	1.75E-09	NA	NA	NA
				Copper	1.47E-03	2.65E-02	3.70E-02	3.98E-02	7.17E-01
				Zinc	4.63E-05	3.02E-04	2.10E-01	2.20E-04	1.44E-03
				DEHP	1.80E-04	8.11E-04	2.00E-02	9.01E-03	4.05E-02
				Total hazard, soil, this exposure point:				6.20E-02	9.06E-01
				Total hazard, all exposure points:				1.31E+00	6.55E+00

POOR QUALITY ORIGINAL

Note: 100 mg/day was used in calculating ingestion of Surface soil and Fluff for maximum exposure; only the worst of the two was used in the total maximum hazard calculation.

exposure scenario for incidental ingestion of surface water.

For soil and fluff, the potential for hazard due to lead was assessed by comparing detected concentrations to the interim guidelines for soil lead cleanup levels established by EPA (OSWER Directive #9355.4-02). The range given in the referenced guidance is 500 to 1,000 ppm total lead for soil in residential areas. Lead levels within the fluff greatly exceed the upper-bound level of 1,000 ppm and therefore present a potential hazard.

2. Carcinogenic Risk

For potential carcinogens, risks are estimated as probabilities. Excess lifetime cancer risks are determined by multiplying the intake level with the cancer potency slope and expressing the result in scientific notation. An excess lifetime cancer risk of 1×10^{-6} indicates that, as a plausible upper bound, an individual has a one in one million chance of developing cancer as a result of site-related exposure to a carcinogen over a 70-year lifetime under the specific exposure conditions at a site.

Tables 10-12 present the calculated potential carcinogenic risks for each age group of the potentially exposed populations. Both most probable and maximum carcinogenic risks (using most probable and maximum intakes) have been calculated for each carcinogen found at the identified points of exposure.

The indicators responsible for the potential risk levels associated with the fluff and the onsite soil are PCBs and dioxin. PCBs may be bound within the fluff materials, and therefore, their bioavailability may be limited. The assumptions in the intake calculations, however, assume a bioavailability equal to that found with similar compounds in soil.

The indicator responsible for the risk associated with the hypothetical scenario for residential use of ground water is trichloroethylene, which may be ingested and also volatilized during bathing and subsequently inhaled.

Total maximum and most probable case risks associated with actual and hypothetically applicable exposure points were calculated. These total worst case and most probable case risks are shown in Tables 10-12. Lifetime estimates of risk are presented in Table 13. These have been calculated for offsite residents, following the same procedure used to calculate lifetime hazard indices.

3. Environmental Risk

The major ecosystem of the EDM site and surrounding ridges is the eastern deciduous forest. The wetland community is limited to the small flood plain of the intermittent stream and the LSR and several small emergent wetlands. All of these wetland areas,

Table 9
EDM Site Endangerment Assessment
Theoretical Noncarcinogenic Hazard Indices

	Most Probable Noncarcinogenic Hazard Index	Maximum Noncarcinogenic Hazard Index
Adults, off-site residents	5.14E-01	2.31E+00
Children, age 6-12	1.31E+00	6.55E+00
Children, age 2-6	2.25E+00	1.06E+01

Notes:
The exposure pathways included in these calculations are listed below.

All ages: off-site fugitive dust (predicted by air model)
fish ingestion (theoretical bioaccumulation)
residential use of hypothetical downgradient well water

Adults: additional off-site fugitive dust exposure as hunters and fishermen

Adults,
Children 6-12: off-site recreational exposure to river water

Children 6-12: off-site recreational exposure to intermittent stream water and sediment
on-site recreational exposure to surface soil, fluff, and leachate (fence-down scenario)

It should be noted that some of these pathways are hypothetical and do not represent actual exposures under current conditions.

Table 10 continued
KDM Site Endangerment Assessment
Calculation of Carcinogenic Risk
(Adult Population)

Potential Transport Medium	Source	Potential Exposure Point	Potential Exposure Route	Indicator Compound	Calculated Most Probable Hypothetical Intake	Calculated Maximum Hypothetical Intake	Carcinogenic Potency Factor (CPF)	Most Probable Carcinogenic Risk	Maximum Carcinogenic Risk
Surface water continued...	Ground water (&/or Sediment leaching)	Little Schuylkill R. Off-site residents, hunters and fishermen	Bioaccumulation (Fish ingestion)	Manganese	8.87E-03	2.56E-02	NA	NA	NA
				Copper	2.87E-04	7.08E-04	NA	NA	NA
				Zinc	7.36E-04	1.61E-03	NA	NA	NA
						Total risk, this exposure point:		No contribution	No contribution
Soil	Fluff	On-site Maintenance Workers	Dermal Contact	PCBs	1.13E-04	3.22E-03	7.70E+00	8.61E-04	2.48E-02
				Dioxin	1.07E-08	1.07E-08	1.56E+05	1.67E-03	1.67E-03
				Zinc	1.10E-03	1.31E-03	NA	NA	NA
			Incidental ingestion	PCBs	1.76E-05	1.02E-03	7.70E+00	1.36E-04	7.85E-03
				Dioxin	1.08E-09	3.38E-09	1.56E+05	2.84E-04	5.28E-04
				Zinc	6.16E-04	1.38E-03	NA	NA	NA
						Total risk, this exposure point		2.98E-03	3.46E-02
	Surface soil	On-site Maintenance Workers	Dermal contact	Manganese	7.46E-06	1.83E-04	NA	NA	NA
				PCBs	7.66E-06	4.89E-05	7.70E+00	5.90E-05	3.77E-04
				Dioxin	7.30E-10	1.46E-09	1.56E+05	1.14E-04	2.37E-04
				Copper	2.45E-06	2.20E-02	NA	NA	NA
				Zinc	7.66E-06	2.51E-04	NA	NA	NA
				DEHP	2.96E-04	6.73E-04	1.40E-02	4.18E-06	9.42E-06
			Incidental ingestion	Manganese	1.12E-04	5.47E-04	NA	NA	NA
				PCBs	3.44E-06	1.46E-04	7.70E+00	2.65E-05	1.13E-03
				Dioxin	3.26E-10	4.35E-09	1.56E+05	5.08E-05	6.78E-04
				Copper	3.06E-03	6.58E-02	NA	NA	NA
				Zinc	1.15E-04	7.50E-04	NA	NA	NA
				DEHP	4.47E-04	2.01E-03	1.40E-02	6.26E-06	2.82E-05
						Total risk, this exposure point:		2.60E-04	2.45E-03
				Total carcinogenic risk to on-site maintenance workers:				3.19E-03	3.73E-02
				Total carcinogenic risk to off-site residents (includes hunting and fishing scenario):				6.05E-06	2.40E-04
				Total carcinogenic risk to off-site workers:				3.25E-07	3.50E-06
				Total carcinogenic risk to hunters and fishermen:				9.06E-09	1.13E-07

NA - Not applicable

Note: 100 mg/day was used in calculating ingestion of Surface soil and Fluff for maximum exposure; only the worst of the two was used in the total maximum risk calculation.

Table 10
EDM Site Endangerment Assessment
Calculation of Carcinogenic Risk
(Adult Population)

Potential Transport Medium	Source	Potential Exposure Point	Potential Exposure Route	Indicator Compound	Calculated Most Probable Hypothetical Intake	Calculated Maximum Hypothetical Intake	Carcinogenic Potency Factor (CPF)	Most Probable Carcinogenic Risk	Maximum Carcinogenic Risk
Air	Fluff	On-site Maintenance Workers	Inhalation	PCBs	9.65E-09	2.77E-07	7.70E+00	7.43E-08	2.14E-06
				Dioxin	8.97E-13	8.97E-13	1.56E+05	1.40E-07	1.40E-07
				Zinc	9.96E-09	1.13E-07	NA	NA	NA
						Total risk, this exposure point:		2.14E-07	2.28E-06
		Off-site residents	Inhalation	PCBs	7.53E-08	2.18E-06	7.70E+00	5.80E-07	1.68E-05
				Dioxin	5.91E-12	5.91E-12	1.56E+05	9.22E-07	9.22E-07
				Zinc	6.57E-07	7.43E-07	NA	NA	NA
						Total risk, this exposure point:		1.50E-06	1.77E-05
		Off-site workers (Warehouse)	Inhalation	PCBs	1.51E-08	4.34E-07	7.70E+00	1.16E-07	3.34E-06
				Dioxin	1.40E-12	1.40E-12	1.56E+05	2.18E-07	2.18E-07
				Zinc	1.56E-07	1.70E-07	NA	NA	NA
						Total risk, this exposure point:		3.34E-07	3.56E-06
		Hunters and fishermen	Inhalation	PCBs	4.82E-10	1.39E-08	7.70E+00	3.71E-09	1.07E-07
				Dioxin	3.78E-14	3.78E-14	1.56E+05	5.90E-09	5.90E-09
				Zinc	4.20E-09	4.75E-09	NA	NA	NA
						Total risk, this exposure point:		9.61E-09	1.13E-07
Ground Water	Fluff Pile	Hypothetical downgradient well	Ingestion	Manganese	8.85E-02	4.22E-01	NA	NA	NA
				Trichloroethane	5.16E-04	1.95E-03	1.10E-02	5.67E-06	2.14E-05
				Copper	1.71E-04	6.56E-04	NA	NA	NA
				Zinc	9.13E-05	3.82E-03	NA	NA	NA
			Dermal contact Bathing	Manganese	1.70E-04	6.43E-04	NA	NA	NA
				Trichloroethane	1.03E-06	3.89E-06	1.10E-02	1.13E-08	4.28E-08
				Copper	2.42E-07	1.71E-06	NA	NA	NA
				Zinc	1.82E-07	7.23E-06	NA	NA	NA
			Inhalation While Bathing (Volatile compounds only)	Manganese	---	---	NA	NA	NA
				Trichloroethane	4.10E-03	1.55E-02	1.30E-02	5.33E-05	2.01E-04
				Copper	---	---	NA	NA	NA
				Zinc	---	---	NA	NA	NA
					Total risk, residential use of ground water:			5.90E-05	2.22E-04
Surface water	Ground water (&/or Sediment leaching)	Little Schuylkill R. Hunters and Fishermen	Dermal contact	Manganese	3.47E-06	1.01E-05	NA	NA	NA
				Copper	5.61E-08	1.30E-07	NA	NA	NA
				Zinc	6.04E-07	1.34E-06	NA	NA	NA
			Incidental ingestion	Manganese	1.05E-04	3.05E-04	NA	NA	NA
				Copper	1.75E-06	4.16E-06	NA	NA	NA
				Zinc	1.82E-06	4.04E-05	NA	NA	NA
						Total risk, this exposure point:		No contribution	No contribution

Table 11 (continued)
EDM Site Endangerment Assessment
Calculation of Carcinogenic Risk
(Child 6-12 Population)

Potential Transport Medium	Source	Potential Exposure Point	Potential Exposure Route	Indicator Compound	Calculated Most Probable Hypothetical Intake	Calculated Maximum Hypothetical Intake	Carcinogenic Potency Factor (CPF)	Most Probable Carcinogenic Risk	Maximum Carcinogenic Risk
Surface Water continued...	Ground water (&/or Sediment leaching)	Intermittent stream	Dermal contact	Manganese	1.96E-06	5.72E-06	NA	NA	NA
				Copper	3.29E-08	7.82E-08	NA	NA	NA
				Zinc	3.42E-07	7.58E-07	NA	NA	NA
			Incidental ingestion	Manganese	1.96E-06	5.72E-06	NA	NA	NA
				Copper	1.97E-06	4.67E-06	NA	NA	NA
				Zinc	2.04E-05	4.53E-05	NA	NA	NA
							Total risk, this exposure point:	No contribution	No contribution
		Little Schuylkill R.	Dermal contact	Manganese	1.96E-06	5.72E-06	NA	NA	NA
				Copper	3.29E-08	7.82E-08	NA	NA	NA
				Zinc	3.42E-07	7.58E-07	NA	NA	NA
			Incidental ingestion	Manganese	1.96E-06	5.72E-06	NA	NA	NA
				Copper	1.97E-06	4.67E-06	NA	NA	NA
				Zinc	2.04E-05	4.53E-05	NA	NA	NA
			Bioaccumulation (Fish ingestion)	Manganese	2.14E-02	6.23E-02	NA	NA	NA
				Copper	7.17E-04	1.70E-03	NA	NA	NA
				Zinc	1.75E-03	3.88E-03	NA	NA	NA
							Total risk, this exposure point:	No contribution	No contribution
Soil	Fluff	On-site	Dermal Contact	PCBs	2.57E-05	7.40E-04	7.70E+00	1.98E-04	5.70E-03
				Dioxin	2.46E-09	2.46E-09	1.56E+05	3.84E-04	3.84E-04
				Zinc	2.66E-04	3.01E-04	NA	NA	NA
			Incidental ingestion	PCBs	7.11E-06	2.05E-04	7.70E+00	5.48E-05	1.58E-03
				Dioxin	6.82E-10	6.82E-10	1.56E+05	1.06E-04	1.06E-04
				Zinc	2.46E-04	2.78E-04	NA	NA	NA
							Total risk, this exposure point:	7.43E-04	7.78E-03
	Surface soil	On-site	Dermal contact	Manganese	1.72E-06	4.20E-05	NA	NA	NA
				PCBs	1.76E-06	1.12E-05	7.70E+00	1.35E-05	8.65E-05
				Dioxin	1.67E-10	3.34E-10	1.56E+05	2.61E-05	5.21E-05
				Copper	5.62E-07	5.06E-03	NA	NA	NA
				Zinc	1.76E-06	5.76E-06	NA	NA	NA
				DEHP	6.87E-05	1.54E-04	1.40E-02	9.61E-07	2.16E-06
			Incidental ingestion	Manganese	4.51E-05	2.21E-04	NA	NA	NA
				PCBs	1.39E-06	5.90E-05	7.70E+00	1.07E-05	4.54E-04
				Dioxin	1.32E-10	1.75E-09	1.56E+05	2.06E-05	2.74E-04
				Copper	1.47E-03	2.65E-02	NA	NA	NA
				Zinc	4.63E-05	3.02E-04	NA	NA	NA
				DEHP	1.80E-04	8.11E-04	1.40E-02	2.52E-06	1.13E-05
							Total risk, this exposure point:	7.43E-05	6.06E-04
							Total risk, all exposures:	9.06E-04	8.13E-03

Note: 100 mg/day was used in calculating ingestion of Surface soil and Fluff for maximum exposure; only the worst of the two was used in the total maximum risk calculation.

Table 11
BDM Site Endangerment Assessment
Calculation of Carcinogenic Risk
(Child 6-12 Population)

Potential Transport Medium	Source	Potential Exposure Point	Potential Exposure Route	Indicator Compound	Calculated Most Probable Hypothetical Intake	Calculated Maximum Hypothetical Intake	Carcinogenic Potency Factor (CPF)	Most Probable Carcinogenic Risk	Maximum Carcinogenic Risk
Air	Fluff	On-site	Inhalation	PCBs	1.08E-08	3.09E-08	7.70E+00	8.29E-09	2.38E-07
				Dioxin	1.00E-13	1.00E-13	1.56E+05	1.56E-08	1.56E-08
				Zinc	1.11E-08	1.25E-08	NA	NA	NA
						Total risk, this exposure point:		2.38E-08	2.54E-07
		Off-site residents	Inhalation	PCBs	1.01E-07	2.91E-06	7.70E+00	7.76E-07	2.24E-05
				Dioxin	7.91E-12	7.91E-12	1.56E+05	1.23E-06	1.23E-06
				Zinc	8.78E-07	9.94E-07	NA	NA	NA
						Total risk, this exposure point:		2.01E-06	2.37E-05
Ground Water	Fluff Pile	Hypothetical downgradient well	Ingestion	Manganese	2.17E-01	1.02E+00	NA	NA	NA
				Trichloroethene	1.26E-03	4.73E-03	1.10E-02	1.38E-05	5.21E-05
				Copper	4.16E-04	2.08E-03	NA	NA	NA
				Zinc	2.22E-03	8.78E-03	NA	NA	NA
			Dermal contact (Bathing)	Manganese	2.51E-04	1.18E-03	NA	NA	NA
				Trichloroethene	1.45E-06	5.46E-06	1.10E-02	1.59E-08	6.01E-08
				Copper	4.80E-07	2.40E-06	NA	NA	NA
				Zinc	2.56E-06	1.01E-05	NA	NA	NA
			Inhalation While Bathing (Volatile compounds only)	Manganese	---	---	NA	NA	NA
				Trichloroethene	5.54E-03	2.09E-02	1.30E-02	7.21E-05	2.72E-04
				Copper	---	---	NA	NA	NA
				Zinc	---	---	NA	NA	NA
					Total risk, residential use of ground water:			8.58E-05	3.24E-04
Sediment	Fluff (mixed with sediment)	Off-site (stream)	Dermal contact	Manganese	3.82E-05	1.56E-04	NA	NA	NA
				PCBs	1.25E-07	3.83E-07	7.70E+00	9.60E-07	3.03E-06
				Copper	2.78E-05	1.04E-04	NA	NA	NA
				Zinc	7.44E-06	1.41E-05	NA	NA	NA
				DEHP	1.06E-05	3.51E-05	1.40E-02	1.48E-07	4.91E-07
			Incidental ingestion	Manganese	2.01E-04	8.15E-04	NA	NA	NA
				PCBs	1.96E-07	2.06E-06	7.70E+00	1.51E-06	1.59E-05
				Copper	1.47E-04	5.45E-04	NA	NA	NA
				Zinc	3.91E-05	7.30E-05	NA	NA	NA
				DEHP	5.54E-05	1.84E-04	1.40E-02	7.76E-07	2.58E-06
						Total risk, this exposure point:		3.40E-06	2.20E-05
Surface water	Leachate	On-site	Dermal Contact	Manganese	1.20E-06	2.55E-05	NA	NA	NA
				PCBs	5.60E-09	1.23E-08	7.70E+00	4.31E-08	9.51E-08
				Trichloroethene	2.57E-08	9.05E-08	1.10E-02	2.83E-10	9.96E-10
				Copper	3.68E-06	1.31E-05	NA	NA	NA
				Zinc	8.54E-06	1.66E-05	NA	NA	NA
				DEHP	2.88E-07	2.88E-07	1.40E-02	4.03E-09	4.03E-09
						Total risk, this exposure point:		4.74E-08	1.00E-07

NA - Not Applicable

POOR QUALITY ORIGINAL

Table 13
EDM Site Endangerment Assessment
Calculation of Theoretical Total Lifetime Carcinogenic Risk

	Contribution to Most Probable Lifetime Risk	Contribution to Maximum Lifetime Risk
Adults, off-site residents	5.16E-05	2.05E-04
Children, age 6-12	8.01E-05	7.17E-04
Children, age 2-6	5.64E-06	2.22E-05
THEORETICAL TOTAL MOST PROBABLE LIFETIME CANCER RISK:	1.37E-04	
THEORETICAL TOTAL MAXIMUM LIFETIME CANCER RISK:		9.44E-04

Note:
The hypothetical exposure assumptions included in these calculations are listed below.

All ages: off-site fugitive dust at residence (predicted by air model)
residential use of hypothetical downgradient well water

Adults: additional off-site fugitive dust exposure as hunters and fishermen

Children 6-12: off-site recreational exposure to intermittent stream sediment
on-site recreational exposure to surface soil, fluff, and leachate (fence-down scenario)

Other Populations	Most Probable Lifetime Risk	Maximum Lifetime Risk
Total carcinogenic risk, on-site maintenance workers (30 yrs. exposure)	1.4E-03	1.6E-02
Total carcinogenic risk, off-site workers (30 yrs. exposure)	1.5E-07	1.6E-06
Total carcinogenic risk, hunters and fishermen (58 yrs. exposure)	8.2E-09	9.6E-08

Table 12
EDM Site Endangerment Assessment
Calculation of Carcinogenic Risk
(Child) 2-6 Population)

Potential Transport Medium	Source	Potential Exposure Point	Potential Exposure Route	Indicator Compound	Calculated Most Probable Hypothetical Intake	Calculated Maximum Hypothetical Intake	Carcinogenic Potency Factor (CPF)	Most Probable Carcinogenic Risk	Maximum Carcinogenic Risk
Air	Fluff	Off-site residents	Inhalation	PCBs	9.93E-08	2.87E-06	7.70E+00	7.64E-07	2.21E-05
				Dioxin	7.79E-12	7.78E-12	1.56E+05	1.22E-06	1.22E-06
				Zinc	8.86E-07	8.78E-07	NA	NA	NA
						Total risk, this exposure point:		1.98E-06	2.33E-05
Ground Water	Fluff Pile	Hypothetical downgradient well	Ingestion	Manganese	3.93E-01	1.05E+00	NA	NA	NA
				Trichloroethene	2.27E-03	8.55E-03	1.10E-02	2.49E-05	9.41E-05
				Copper	7.52E-04	3.70E-03	NA	NA	NA
				Zinc	4.80E-03	1.50E-02	NA	NA	NA
			Dermal contact (Bathing)	Manganese	3.01E-04	1.42E-03	NA	NA	NA
				Trichloroethene	1.74E-06	6.55E-06	1.10E-02	1.91E-08	7.21E-08
				Copper	5.70E-07	2.88E-06	NA	NA	NA
				Zinc	3.07E-06	1.22E-05	NA	NA	NA
			Inhalation While Bathing (Volatile compounds only)	Manganese	---	---	NA	NA	NA
				Trichloroethene	5.30E-03	2.00E-02	1.30E-02	6.89E-05	2.60E-04
				Copper	---	---	NA	NA	NA
				Zinc	---	---	NA	NA	NA
					Total risk, residential use of ground water:			9.38E-05	3.54E-04
Surface Water	Ground Water (&/or Sediment leaching)	Little Schuylkill R.	Bioaccumulation (Fish ingestion)	Manganese	3.08E-02	1.13E-01	NA	NA	NA
				Copper	1.30E-03	3.08E-03	NA	NA	NA
				Zinc	3.18E-03	7.05E-03	NA	NA	NA
						Total risk, this exposure point:		No contribution	No contribution
						Total risk, all exposures:		9.58E-05	3.78E-04

NA - Not Applicable

POOR QUALITY ORIGINAL

except one small emergent wetland, are located offsite. No rare or endangered species have been reported or observed on or near the Site. Although an intensive ecological risk assessment was not conducted, some indication of potential risk to wildlife and the environment can be assessed from the toxicity testing (bioassays), field assessment, and human health risk analysis and Site conditions.

The lack of suitable habitat on or near the Site and the Site fence discourages wildlife utilization of the Site. Large mammals are prevented from easily entering by the Site fence. Small animals, birds, and soil invertebrates are limited by lack of habitat.

The intermittent stream currently supports little aquatic life, most likely due to elevated contaminant levels. Direct discharge of contaminated overburden ground water and contaminated seeps into the intermittent stream have resulted in contaminated sediments and surface water in the stream. Federal and state surface water standards are exceeded for copper, lead, zinc, manganese, and iron in this stream. The results of the intermittent stream bioassays indicate possible Site-related toxicity to aquatic life in the intermittent stream due to metals.

The Little Schuylkill River does not support resident aquatic life for approximately 5 miles downstream due to its acid mine degraded condition. Transport of sediment does not seem to have a significant effect on metals concentrations because sediment samples collected from the Little Schuylkill River both upstream and downstream of the tributary did not significantly differ for metals.

D. <u>Significant Sources of Uncertainty</u>

Discussion of general limitations inherent in the risk assessment process as well as the uncertainty related to some of the major assumptions made in this assessment are included below.

1. The Risk Assessment is based upon the data collected during the RI and uses RI sampling results and predictive modeling to represent environmental concentrations over large areas. This extrapolation contributes to the uncertainty of the Risk Assessment. Also, air and emissions modeling is used rather than actual sampling to predict the exposure concentrations due to fugitive dust emissions from the Site.

2. The potential human exposure to ground water is probably not very substantial. No existing ground water users are present in areas hydraulically downgradient of the Site. Also, no downstream use of the Little Schuylkill River water (which is the discharge point for ground water from the Site) for residential water supplies has been identified in the vicinity of the Site at this time. However, aquatic life is exposed to contaminated ground

water via direct discharge and seepage to the intermittent stream.

3. The onsite exposures for children ages 6-12 are based on the assumptions that the fence around the Site is not in place and that no remediation has occurred.

4. Lead, phthalates, and PCBs may be chemically bound in the plastic matrix of the fluff and, therefore, fluff (and soil) may not be as bioavailable as assumed in the risk assessment.

5. Due to the limitations of the risk assessment process itself and to conservative assumptions made specific to the EDM Site, the risk levels calculated are considered to be estimates of worst-case risk.

6. The CPSs and reference doses contain uncertainties resulting from extrapolating from high to low doses and from animals to humans. Protective assumptions were made to cover these uncertainties.

E. Risk Assessment Conclusions

1. Exposure of adult onsite maintenance workers to copper in the surface soil and exposure to a hypothetical downgradient well (on the Site or state game lands) for all age groups were significant (hazard index greater than one) noncarcinogenic hazards for individual pathways and populations at the Site. Actual exposures for children age 2-6 also presented a significant noncarcinogenic risk.

2. Exposure to the fluff and onsite surface soil by onsite maintenance workers, and (for fluff only) children age 6-12 trespassing on the EDM site presented significant carcinogenic risks greater than 1×10^{-4}. The potential risks associated with these exposures are related to PCBs and dioxin in fluff material and Site soils.

3. Residential use of ground water from a hypothetical well located downgradient of the Site exceeded 1×10^{-4} for maximum estimates of carcinogenic risk. The risk is driven by the presence of trichloroethylene in ground water.

4. The estimated "most probable" lifetime carcinogenic risk for offsite residents is above the potentially acceptable range. Under the "maximum" lifetime carcinogenic risk scenario, the risk to offsite residents also exceeds 1×10^{-4}.

5. The intermittent stream currently supports little aquatic life, most likely due to elevated contaminant levels. Direct discharge of contaminated overburden ground water and contaminated seeps into the intermittent stream have resulted in contaminated sediments and surface water in the stream. The results of the intermittent

stream bioassays indicate possible Site-related toxicity to aquatic life in the intermittent stream due to metals. Federal and state surface water standards are exceeded for copper, lead, zinc, manganese, and iron. Due to acid mine degradation in the Little Schuylkill River, it is extremely difficult to measure Site impacts on that river.

Actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

VIII. DESCRIPTION OF ALTERNATIVES

In accordance with Section 300.430 of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R. § 300.430, a list of remedial response actions and representative technologies were identified and screened to meet the remedial action objectives at the Site. The technologies that passed the screening were assembled to form remedial alternatives. The Feasibility Study (FS) evaluated a variety of technologies used in the development of alternatives for addressing the fluff. Upon further analysis, the technologies and approaches contained in the following alternatives were determined to be the most applicable for OU3 of this Site.

Remedial Action Alternative 1 - NO ACTION

The NCP requires that EPA consider a "No Action" alternative for every site to establish a baseline for comparison to alternatives that do require action. Under this alternative, no action would be taken to remove, remediate, contain, or otherwise address contamination at the EDM Site.

Because this alternative would neither eliminate nor reduce to acceptable levels the threats to human health or the environment presented by contamination at OU3, this alternative serves only as a baseline for comparison to other alternatives.

Capital Cost:	$ 0
Annual O&M, Present Worth:	$ 0
TOTAL COST	$ 0

Remedial Action Alternative 2 - ONSITE RECYCLING OF FLUFF; DISPOSAL OF NON-RECYCLABLES AND RECYCLING RESIDUALS; SOIL SAMPLING

A. Description

Under this alternative, all recyclable fluff (waste insulation material consisting primarily of polyvinyl chloride and polyethylene chips; fibrous material; and paper, soil, and metal on the surface of the Site other than that to be remediated pursuant to the March 1991 ROD) would be recycled to prevent further release of hazardous substances into the environment from this material. All non-recyclable materials within the fluff and recycling residuals (wastes resulting from the recycling process) would be tested for RCRA hazardous characteristics. Hazardous materials and residuals would be treated and disposed of in an offsite landfill. Non-hazardous materials and residuals would be disposed of in an offsite landfill as well. Soils underlying the fluff would be sampled and analyzed to determine the nature and extent of soil contamination, if any. Erosion and sedimentation controls would be developed and implemented to control drainage and minimize erosion of exposed soils at the Site.

Among the most common recycling techniques for material like the fluff at the Site are Bulk Processing and Separation Processing. These techniques are described below:

1. <u>Bulk Processing</u>

Bulk Processing would convert the fluff as is with minimal cleaning or separation into products with a solid plastic mass. This process would involve the application of heat, pressure, and optional chemical additives to fuse the fluff together. Implementation would result in virtually complete elimination of the fluff material with minimal unrecyclable residual. Because the fluff consists of a mixture of plastics and other non-plastic materials such as fiber, paper, soil, and metals, the bulk process would produce low-grade plastic products. The fluff could be used as the sole feed for certain products, or as partial feed with other plastic to enhance product quality.

In addition to significantly reducing the amount of fluff waste by recycling, the Bulk Process could recover full potential value of the fluff material as a resource. Bulk recycling has been commercialized successfully in Europe, and limited recycling currently occurs in the U.S. Products made using the Bulk Process include mats, tiles, fenders, cushions, and fillers.

2. <u>Separation Processing</u>

Separation Processing would separate the polyethylene (PE), polyvinylchloride (PVC), and other components of the fluff. The recovered plastics could be sold as a raw material to plastics manufacturers. Several manufacturers nationwide are currently recycling wire and cable scrap using Separation Processing and are selling the plastics pellets for use as a raw material in plastics products or as an additive to blacktop or concrete, or are manufacturing products for resale at their facilities.

Beneficial reuse of the plastic and other components of the fluff through Separation Processing would significantly reduce the volume of the waste pile. The fluff may contain as much as 60 percent reusable PE and PVC. The scrap metal (principally copper and aluminum) component of the fluff would also be recoverable as would, potentially, the fiber and paper component. Considering that many of the fluff components are recyclable, the fluff volume could be reduced from 60 to 95 percent through use of the Separation Process.

Separation and recovery would involve a series of mechanical processes for separating the plastics, fiber, paper, dirt, metals, and rubber which comprise the fluff material. Mechanical separation has been commercialized by several sources and standard processing machinery such as grinders, screens, sieves, air and water separators and clarifiers would be used. Dirt, fibers, metals, and rubber can be removed by processing the fluff over water-washed screens. The PVC and PE fractions could then be separated by density difference in a water clarifier. Metals could be separated from the PVC component of the plastic by electrostatic separation. The separated materials would then require drying, and possibly grinding and pelletizing for shipping.

The recycling process, including either the Separation or Bulk Processing techniques, is similar to stabilization in that contaminants are encapsulated and thereby bound in the plastic matrix. After recycling, the contaminants would be encapsulated in the plastic matrix, thereby becoming immobilized. The surface area of the recycled product will be significantly less than that of the fluff material which also aids in immobilizing the contaminants. Existing plastics specifications regarding product uses are very stringent. Food and Drug Administration (FDA) regulations regarding food additives would preclude the use of recycled fluff in food packaging. Other stringent requirements of organizations such as the Consumer Products Safety Commission would discourage or prohibit use of the recycled materials in products with the potential for significant human contact and in many structural applications. However, there are numerous other potential uses for the recycled products.

B. <u>Non-Recyclable Materials, Recycling Residuals, and Soils Management</u>

All non-recyclable materials (determined through Pilot Studies during Remedial Design) and recycling residuals (wastes resulting from the recycling process) which may include soil, paper, fiber, and debris, would be disposed in an offsite landfill. After reduction of the total volume of waste by recycling, the estimated maximum volume of residual waste remaining would be approximately 100,000 cubic yards or 45 percent of the total potentially recyclable fluff volume. The residual waste volume could be significantly less if the Bulk Process or the Separation Process with multi-component separation and recovery is used.

Non-recyclable materials and recycling residuals would be tested for hazardous characteristics. Hazardous materials would be treated before being disposed in an offsite municipal or hazardous waste landfill; treatment methods would be determined following treatability testing. If a stabilization technology were used to treat the residuals, the volume would increase, but the waste would become non-hazardous. Other potential treatment technologies, such as washing of the residuals, would not result in a volume increase.

Soils underlying the fluff would be sampled and analyzed to determine the nature and extent of soils contamination, if any. Erosion and sedimentation controls would be developed and implemented to control drainage and minimize erosion of exposed soils at the Site. EPA would determine whether, and to what extent, further response actions (not within the scope of this Operable Unit) are necessary to address soil contamination following analyses of the soils samples performed as part of this response action.

C. Implementation

Pilot studies conducted during Remedial Design would determine the types and percentage of fluff materials which could be reused, the most feasible recycling method, optimal number of machines and the recycling rate, and whether recycling residuals will require treatment. Fluff recycling would take approximately 5-10 years for completion depending upon the number of separation and/or recycling machines placed onsite. Fluff recycling, whether conducted using the Bulk or Separation Process, would require, among other things, the following steps:

- Development of a fluff recycling implementation plan, including process descriptions, an operation plan, a health and safety plan, a production schedule, and contractual agreements with recycling contractors.
- Construction of recycling facility warehousing and purchase and transport of recycling machinery to the Site.
- Selective removal of fluff from the fluff pile in portions equivalent to the desired recycling feed rate while taking precautions to prevent erosion;
- Recycling fluff material creating raw materials and/or plastics products.

Although the small onsite emergent wetland would not be in the direct path of excavation activities, care would need to be taken when conducting any construction and excavation activities near this area, and possible impacts would need to be minimized and mitigated in accordance with EPA policy.

D. Summary

Onsite recycling of fluff materials and offsite disposal of non-recyclable materials and recycling residuals would reduce the risks to human health and the environment presented by OU3 by preventing direct contact with fluff materials and preventing further release of hazardous substances from fluff materials into soils, sediments, surface water, and ground water at the Site. Recycling the fluff material would prevent future exposure and reduce mobility by encapsulating the contaminants in a plastic matrix (the recycled product). Volume would be reduced by approximately 40-60 percent and, ultimately, part or all of the fluff material could be removed from the Site. Treating, if necessary, and disposing of residuals through offsite landfilling would prevent exposure via dermal contact, inhalation, and ingestion.

E. <u>ARARs and TBCs</u>

Major ARARs under this alternative include:

1. <u>Chemical-Specific ARARs</u>

(a) 25 PA Code Chapter 261 and 40 C.F.R. § 261.24 for identification of characteristic hazardous wastes;
(b) the National Ambient Air Quality Standards (NAAQS) set forth at 40 C.F.R. Part 50;
(c) the Pennsylvania Air Pollution Control Act, 25 PA Code Chapters 123 and 127;

2. <u>Action-Specific ARARs</u>

(d) 25 PA Code Chapter 102, which pertains to erosion control requirements related to excavation activities.
(e) RCRA and Department of Transportation regulations governing the generation and transportation of hazardous wastes, 25 PA Code Chapters 262 and 263; 49 C.F.R. Parts 107, 171-179;
(f) 25 PA Code Chapter 264 and 40 C.F.R. Part 268 regarding the storage, disposal, and treatment of hazardous wastes;
(g) 40 C.F.R. Part 266, SubPart C relating to recyclable materials used in a manner constituting disposal;
(h) National Pollution Discharge Elimination System requirements, 40 C.F.R. Part 122 regarding wastewaters;
(i) OSHA standards for worker's protection, 29 C.F.R. Parts 1904, 1910, and 1926;

3. <u>Location-Specific ARARs</u>

(j) The Clean Water Act, 33 U.S.C. §§ 1251 <u>et seq.</u>; 40 C.F.R. Part 403 relating to the discharge of wastewaters to a publicly-owned treatment works;

4. <u>To Be Considered</u>

(k) Executive Order 11988, 40 C.F.R. § 6, Appendix A, concerning federal wetlands policies;

(l) PA Proposed Residual Waste Regulations to be codified at 25 PA Code Parts 287-299 (requirements will be considered during remedial design);

(m) Draft Interim Guidance on Establishing Soil Lead Cleanup Levels at Superfund Sites (OSWER Directive No. 9355.4-02 (June 13, 1989)).

F. Costs

Capital	$ 6,200,000 to $15,000,000
O & M	$ 6,900,000 to $ 6,900,000
Total Present Worth	$13,100,000 to $21,900,000

Costs and timeframes will vary depending on which recycling technology is implemented, the number of machines onsite, contractual agreements between owners and recyclers, the volume of non-recyclables and recycling residuals, and whether the residuals are hazardous and need treatment.

Alternative 3 - CAPPING

A. Description

Under this alternative, the fluff (waste insulation material consisting primarily of polyvinyl chloride and polyethylene chips; fibrous material; and paper, soil, and metal on the surface of the Site other than that to be remediated pursuant to the March 1991 ROD) would be capped to prevent direct contact, reduce leachate production by minimizing precipitation that infiltrates and percolates through the fluff pile, and prevent transport of fluff via wind and/or surface runoff erosion. Capping of the fluff pile would contain the approximately 220,000 cubic yards of fluff material which will remain onsite after treatment and removal of the principal threat hotspot areas and miscellaneous debris (Operable Unit 1). The fluff pile would be confined beneath a multi-layer engineered cover system (cap) similar to those used to close hazardous waste landfills.

B. Implementation

The essential components of the capping remedy are as follows:

- Consolidate fluff onto main pile;
- Regrade the main pile for placement of a final cover;
- Cap the fluff pile with a multi-layer cap meeting RCRA and PADER requirements;
- Conduct long-term maintenance and monitoring.

Regrading of the fluff pile would be required to achieve stable pile slopes prior to installation of the cap. Based on direct shear test results for the fluff, regraded maximum slope ratios of 3 horizontal to 1 vertical are expected to be stable. This would increase the footprint area of the pile from its current 7 acres to 10 acres.

A multi-layer cap would be placed over the regraded pile. The cap would be based on RCRA cap guidance and PADER landfill closure requirements. A typical RCRA cap consists of the following components:

- Vegetated surface
- 2 feet cover soil
- 1 foot sand drainage layer
- 20-mil or thicker flexible membrane
- 2 feet of clay bedding soil

A vegetated surface would be used for erosion control of the cover topsoil. A drainage layer of sand and/or synthetic materials and low permeability layers such as a combined synthetic membrane and soil liner system would be used. A synthetic geotextile would be incorporated into the cap between the fluff and bedding soil to lend structural integrity in areas where differential settlement of the underlying material may be a problem. An internal leachate drain would be constructed to facilitate the removal of residual leachate from the pile. The leachate would discharge to the upgraded equalization lagoon. Surface runoff control features would also be constructed. Deed restrictions would be imposed on the Site to protect the integrity of the cap.

The cap would be designed to meet RCRA cap performance standards to the extent practicable under Site conditions, but the configuration may deviate from the typical RCRA cap due to site- and waste-specific conditions. Some conditions which will have to be accounted for include 1) the granular and resilient nature of the fluff material which may make it difficult to compact clay to achieve 10^{-7} cm/sec permeability 2) the steep pile slopes which may make it difficult to obtain an acceptable friction angle between the flexible membrane liner and sand drainage layer 3) the addition of a geonet to expedite drainage from the surface of the liner. The actual cap configuration would be determined during the final design phase.

Although the small onsite emergent wetland would not be in the direct path of excavation activities, care would need to be taken when conducting any construction and excavation activities near this area, and possible impacts would need to be minimized and mitigated in accordance with EPA policy.

C. **Summary**

Multi-layer capping is a reliable technology for isolating wastes from the above-ground environment and significantly mitigates the effects of contaminants on human health and the environment. Soil and synthetic materials for capping are readily available and equipment used for implementation is primarily standard road construction equipment. Although capping significantly reduces contaminant mobility, it does not reduce the toxicity or volume of the waste and requires long-term maintenance and monitoring for continued effectiveness.

D. **ARARs and TBCs**

Major ARARs under this alternative include:

1. **Chemical-Specific ARARs**

(a) 25 PA Code Chapter 261 and 40 C.F.R. § 261.24 for identification of characteristic hazardous wastes;

(b) the National Ambient Air Quality Standards (NAAQS) set forth at 40 C.F.R. Part 50;

(c) the Pennsylvania Air Pollution Control Act, 25 PA Code Chapters 123 and 127;

2. **Action-Specific ARARs**

(d) 25 PA Code Chapter 102, which pertains to erosion control requirements related to excavation activities;

(e) 25 PA Code § 264.310 relating to closure and post-closure care;

(f) OSHA standards for worker's protection, 29 C.F.R. Parts 1904, 1910, and 1926;

3. **Location-Specific ARARs**

(g) The Clean Water Act, 33 U.S.C. §§ 1251 et seq.; 40 C.F.R. Part 403 relating to the discharge of wastewaters to a publicly-owned treatment works;

4. **To Be Considered**

(h) Executive Order 11988, 40 C.F.R. § 6, Appendix A, concerning federal wetlands policies;

(i) PA Proposed Residual Waste Regulations to be codified at 25 PA Code Parts 287-299 (requirements will be considered during remedial design);

(j) Draft Interim Guidance on Establishing Soil Lead Cleanup Levels at Superfund Sites (OSWER Directive No. 9355.4-02 (June 13, 1989)).

E. Costs

Capital	$14,000,000
O & M	$ 1,000,000
Total Present Worth	$15,000,000

Costs and implementation times are estimated.

Alternative 4 - INCINERATION; SOIL SAMPLING

A. Description

This alternative involves the complete excavation and incineration of the fluff (waste insulation material consisting primarily of polyvinyl chloride and polyethylene chips; fibrous material; and paper, soil, and metal on the surface of the Site other than that to be remediated pursuant to the March 1991 ROD). Incineration is an effective, proven technology for remediating organic contaminants at hazardous waste sites and would completely destroy the PCB and other organic contaminants in the fluff. The volume of contaminated media would be reduced by 80 percent. Incinerator ash and residuals would be tested for RCRA hazardous characteristics. Residuals would be treated (if necessary) and disposed of in an offsite landfill. Soils underlying the fluff would be sampled and analyzed to determine the nature and extent of soil contamination, if any. Erosion and sedimentation controls would be developed and implemented to control drainage and minimze erosion of exposed soils at the Site.

B. Implementation

An onsite mobile or transportable incinerator would be the most implementable choice because of the availability of these units and the fact that the fluff pile would not need to be transported offsite for treatment. Approximately one year would be required to retain a mobile incinerator for the Site. Offsite incineration facilities would most likely be unavailable because few facilities are permitted to accept PCB-contaminated waste. The demand is very high for these facilities and they can afford to be selective with regard to the types of wastes they receive. Most facilities would not accept the fluff material because of the expense and inconvenience involved with retrofitting their incinerators to meet fluff incineration requirements.

The onsite incinerator would have to meet all hazardous waste (RCRA) and PCB (TSCA) performance standards. Due to the presence of PCBs, the incinerator would be required to achieve 99.9999% destruction of all organic hazardous constituents pursuant to 40 C.F.R. § 264.343(a)(2). During the Remedial Design, pollution control devices would be selected and a test burn and other treatability studies would be conducted as necessary to optimize and refine incinerator operating conditions and pollution control equipment performance. Throughout actual operation, incinerator feed rates and operating conditions would be continuously monitored and controlled to ensure compliance with the performance standards. Continuous monitoring would ensure that emissions were below levels which would be harmful to human health and the environment. Incinerator emission estimates would also be evaluated to ensure that they would not adversely affect attainment of any National Ambient Air Quality Standards (NAAQS) promulgated under the Clean Air Act, particularly the NAAQS for lead, 40 C.F.R. Part 50, Appendix G.

Soils underlying the fluff would be sampled and analyzed to determine the nature and extent of soil contamination, if any. Erosion and sedimentation controls would be developed and implemented to control drainage and minimize erosion of exposed soils at the Site. EPA would determine whether, and to what extent, further response actions (not within the scope of this Operable Unit) are necessary to address soil contamination following analyses of the soil samples performed as part of this response action.

Although the small onsite emergent wetland would not be in the direct path of excavation activities, care would need to be taken when conducting any construction and excavation activities near this area, and possible impacts would need to be minimized and mitigated in accordance with EPA policy.

C. Residuals and Soils Management

Because the plastic fluff primarily consists of oxidizable organic constituents, the quantity by weight of ash after incineration is estimated to be approximately 20 percent of the original feed. The ash and other incinerator residuals would be tested for RCRA hazardous characteristics. If these media were determined to be hazardous, they would be treated by stabilization to render them non-hazardous before being disposed in an offsite municipal or hazardous waste landfill.

Stabilization using a cementitious or pozzolanic reagent mixture is an effective and proven technology for immobilizing contaminants such as the metals which would most likely remain in the ash and residuals after incineration. Stabilization reduces the toxicity and mobility of contaminants by chemically and/or physically binding them in the stabilization matrix. The stabilization process would result in a volume increase, but the residual would no longer be classified as a hazardous waste. Because onsite landfilling of residuals would not meet State ARARs and because of space and hydrogeological limitations with regard to an onsite landfill, offsite residuals disposal is necessary.

D. **Summary**

Incineration would eliminate the toxicity and mobility of organic contaminants and reduce the total volume of contaminated media. Stabilization of the incinerator residuals, if necessary, would reduce the toxicity and mobility of inorganic contaminants by chemically and/or physically binding them in the stabilized matrix. Volume would increase somewhat after stabilization. Disposal of the residuals offsite would prevent human and environmental contact. The fluff feed rate into the incinerator would be very low in order to achieve optimal performance of the pollution control equipment in capturing lead and other inorganic contaminants. Therefore, incineration of the fluff would take from nine to eighty-seven years.

E. **ARARs and TBCs**

Major ARARs under this alternative include:

1. Chemical-Specific ARARs

(a) 25 PA Code Chapter 261 and 40 C.F.R. § 261.24 for identification of characteristic hazardous wastes;
(b) the National Ambient Air Quality Standards (NAAQS) set forth at 40 C.F.R. Part 50;
(c) the Pennsylvania Air Pollution Control Act, 25 PA Code Chapters 123 and 127;

2. Action-Specific ARARs

(d) 25 PA Code Chapter 102, which pertains to erosion control requirements related to excavation activities;
(e) 25 PA Code Chapter 264, subchapter O - Pennsylvania regulations for hazardous waste incineration;
(f) the EPA TSCA regulations for incineration of PCB materials, 40 C.F.R. § 761.70;
(g) RCRA incineration standards set forth at 40 C.F.R. Part 264, subpart O;
(h) 25 PA Code Chapter 264 and 40 C.F.R. Part 268 regarding storage, disposal, and treatment of hazardous wastes;
(i) RCRA and Department of Transportation regulations governing the transportation of hazardous wastes, 25 PA Code Chapters 262 and 263 and 49 C.F.R. Parts 107 and 171-179, respectively;
(j) OSHA standards for worker's protection, 29 C.F.R. Parts 1904, 1910, and 1926;

3. Location-Specific ARARs

(k) The Clean Water Act, 33 U.S.C. §§ 1251 et seq.; 40 C.F.R. Part 403 relating to the discharge of wastewaters to a publicly-owned treatment works;

4. <u>To Be Considered</u>

(l) the EPA Guidance on Metals and Hydrogen Chloride Controls for Hazardous Waste Incinerators (EPA Office of Solid Waste, August 1989);

(m) Executive Order 11988, 40 C.F.R. § 6, Appendix A, concerning federal wetlands policies;

(n) PA Proposed Residual Waste Regulations to be codified at 25 PA Code Parts 287-299 (requirements will be considered during remedial design);

(o) Draft Interim Guidance on Establishing Soil Lead Cleanup Levels at Superfund Sites (OSWER Directive No. 9355.4-02 (June 13, 1989)).

F. <u>Costs</u>

Total Present Worth $150,000,000 to $636,000,000

Cost estimates vary widely depending on the type of incinerator used (mobile or transportable) incinerator is used and allowable fluff feed rates which would be determined during additional modeling and pilot testing. Incinerator operational costs are included in the total present worth estimate.

IX. COMPARATIVE ANALYSIS OF ALTERNATIVES

The four remedial action alternatives described above were evaluated under the nine evaluation criteria as set forth in the NCP at 40 C.F.R. § 300.430(e)(9). These nine criteria are organized according to the following categories as set forth at 40 C.F.R. § 300.430(f)(1):

<u>THRESHOLD CRITERIA</u>

- Overall protection of human health and the environment
- Compliance with applicable or relevant and appropriate requirements (ARARs)

<u>PRIMARY BALANCING CRITERIA</u>

- Long-term effectiveness
- Reduction of toxicity, mobility, or volume through treatment
- Short-term effectiveness
- Implementability
- Cost

<u>MODIFYING CRITERIA</u>

- Community acceptance
- State acceptance

Threshold criteria must be satisfied in order for a remedy to be eligible for selection. Primary balancing criteria are used to weigh major trade-offs between remedies. State and community acceptance are modifying criteria formally taken into account after public comment is received on the Proposed Plan. The evaluations are as follows:

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

A primary requirement of CERCLA is that the selected remedial action be protective of human health and the environment. A remedy is protective if it reduces current and potential risks to acceptable levels under the established risk range posed by each exposure pathway at the site.

Alternatives 2 (Recycling), 3 (Capping), and 4 (Incineration) would prevent exposure through dermal contact, inhalation and ingestion, and further release of hazardous substances from fluff materials into soils, sediments, surface water, and ground water at the Site. These alternatives would also reduce the risk at the Site to below or within the acceptable risk range of 1×10^{-4} to 1×10^{-6}.

Alternative 2 (Recycling) would reduce current and potential risks by preventing future exposure and reducing mobility by encapsulating the contaminants in a plastic matrix (the recycled product). Recycling would provide a high level of protection because the fluff would be converted to a non-hazardous form and most likely removed from the Site through distribution of the resultant recycled product and through residuals disposal. Residuals would be treated if necessary to be rendered nonhazardous. The volume of the main fluff pile would be reduced from 60-95% percent.

Alternative 3 (Capping) would reduce current and potential risks by capping the contaminated media. This remedy would prevent exposure through dermal contact, inhalation and ingestion, and further release of hazardous substances from fluff materials into soils, sediments, surface water, and ground water at the Site. The fluff pile would be confined beneath a multi-layered engineered cover system which would minimize infiltration and percolation of precipitation and prevent fluff transport via wind and erosion. However, no treatment would be employed and the cap would require long-term maintenance; therefore, it is a less desirable option than Alternative 2.

Alternative 4 (Incineration) would reduce current and potential risks by incinerating the fluff pile, thereby destroying the organic contaminants. Inorganic contaminants in the incinerator ash and residuals would be treated to immobilize them before being disposed offsite. Although Alternative 4 would reduce Site risks to an acceptable level, implementation would take significantly longer and cost significantly more than Alternatives 2 and 3, which achieve the same objectives of protecting human health and the environment.

Alternative 1 (No Action) allows risk to remain in the unacceptable range and therefore does not provide overall protection of human health and the environment. Fluff would continue to erode, leachate would continue to migrate, and risks to humans and the environment would remain.

B. Compliance with Applicable or Relevant and Appropriate Requirements

This criterion addresses whether or not a remedy will meet all of the applicable or relevant and appropriate requirements of other environmental statutes and/or provides grounds for invoking a waiver. A full discussion of ARARs for the selected remedy is set forth in Section XI, below.

Alternatives 2 (Recycling), 3 (Capping), and 4 (Incineration) could meet all ARARs. Major ARARs involved with Alternative 2 pertain to offsite landfilling. Major ARARs involved with Alternative 3 pertaining to onsite capping of hazardous wastes. Capping would meet action-specific ARARs by employing a multi-layer cap with performance equivalent to a RCRA closure cap. Major ARARs involved with Alternative 4 pertain to hazardous waste incineration and offsite landfilling.

Alternative 1 (No Action) would provide no remediation of contaminated media and therefore would not meet the chemical-specific ARARs.

C. Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence addresses the long-term protection of human health and the environment once remedial action cleanup requirements have been achieved, and focuses on residual risks that will remain after completion of the remedial action.

Alternative 2 (Recycling) would achieve a high level of long-term effectiveness and permanence as removal of the fluff pile would be permanent and irreversible. Recycling the fluff would encapsulate the contaminants in a plastic matrix (the recycled product) which would prevent exposure and virtually eliminate mobility of the contaminants from such matrix. The encapsulated fluff would likely be removed from the Site through distribution of the recycled product. Residuals would be treated if necessary before disposal offsite which would permanently remove any hazardous characteristics.

Alternative 3 (Capping) provides a moderate level of long-term effectiveness and permanence by providing an engineered cover system to prevent exposure to and transport of contaminants. A vegetated surface on the cover would protect the cover soils from being eroded and thus ensure longevity of the cover system. This would effectively prevent constituent migration by wind erosion, surface water erosion, or leachate generation as long as the cap is properly maintained. Thus, the Site would require post-closure inspection and operation and maintenance to ensure that the closure remains effective. This alternative is not as desireable as Alternative 2 because the fluff pile would remain onsite permanently and its long-term effectiveness would require ensured long-term maintenance. Regular inspection of the cap for signs of erosion, settlement, or subsidence would be necessary. A five-year review would be required.

Alternative 4 (Incineration) would provide long-term effectiveness by permanently destroying the organic contaminants in the fluff. Inorganic contaminants in the residual would most likely need to be treated to immobilize them before they were disposed offsite. Ultimately, all contaminated media would be removed from the Site except for the soils underlying the fluff pile which would be studied further. Air emissions controls would need to be installed and continuously monitored for the entire time of operation, which could take from nine to eighty-seven years. Because of the length of time that continuous monitoring would need to be performed, this alternative is less desirable than Alternative 2.

Alternative 1 (No Action) does not employ any additional measures to provide long-term effectiveness and permanence and therefore is unacceptable. All waste materials would remain onsite and exposed to current means of contaminant transport. Thus the pathways of contaminant transport and migration, as well as the risks posed by exposure to Site contaminants, would remain unchanged.

D. Reduction of Toxicity, Mobility, and Volume

This evaluation criterion addresses the degree to which a technology or remedial alternative reduces the toxicity, mobility, or volume of a hazardous substance. Section 121(b) of CERCLA, 42 U.S.C. § 9621(b), establishes a preference for remedial actions that permanently and significantly reduce the toxicity, mobility, or volume of hazardous substances over remedial actions which will not result in such reduction.

Alternative 2 (Recycling) provides significant reductions in toxicity, mobility, and volume. By immobilizing contaminants in the recycled plastic product, recycling reduces the toxicity and mobility of contaminants. Permanent volume reductions of hazardous materials from 60% to potentially 95%, depending on which recycling technology is used, would also be achieved. Toxicity would be reduced through the treatment of any hazardous residuals to remove the characteristic by which they are hazardous. If a stabilization process were used, the residuals could potentially double in volume; however, the resulting treated media would not be hazardous.

Alternative 3 (Capping) does not reduce toxicity or volume. Mobility, however, is significantly reduced. Capping would isolate the fluff and underlying soils thus minimizing the mobility of the contaminants. Capping of the fluff pile would reduce leachate production by minimizing precipitation that infiltrates and percolates through the fluff and soil and prevent transport of fluff via wind and/or surface runoff erosion. Risks that remain include any loss of structural integrity over the long-term, which would allow leachate production and contaminant transport to resume.

Alternative 4 (Incineration) reduces toxicity by destroying organic contaminants in the fluff material; fluff volume would be reduced by 80 percent. Inorganic contaminants present in the incinerator residuals would be treated to remove the characteristics by which they are classified as hazardous, thereby reducing toxicity. Treatment through stabilization of the incinerator residuals would reduce the toxicity and mobility of contaminants by chemically and/or physically binding them in the stabilization matrix. Stabilization would increase the residuals volume, but they would become inert and non-hazardous.

Because both Alternatives 2 and 4 reduce toxicity, mobility, and volume, these alternatives are more desirable than Alternative 3, which reduces only mobility and Alternative 1, which provides for no reductions in toxicity, mobility, or volume.

E. <u>Short-Term Effectiveness</u>

Short-term effectiveness addresses the period of time needed to achieve protection of human health and the environment, and any adverse impacts that may be posed during the construction and operation period until cleanup goals are achieved.

During implementation of Alternative 2 (Recycling) the fluff would be disturbed for loading and hauling to the onsite processing facility. Possible fugitive dust emissions during material handling could be minimized by controlled wetting of the fluff. Monitoring would be performed to ensure that processing emissions were at safe levels for onsite workers and the community. Pollution control devices would be fitted to machinery as technically feasible and necessary. Site workers both inside and outside of the processing building would be protected from dust inhalation and dermal contact by wearing appropriate protective equipment. Completion of fluff recycling would take approximately

5-10 years.

Alternative 3 (Capping) would require wetting the fluff to control possible fugitive dust emissions during fluff regrading. Site workers would be further protected from dust inhalation and dermal contact by wearing appropriate protective equipment. Completion of capping would take approximately 2-3 years from design through construction. Because of the speed by which Alternative 3 could be implemented to achieve protection of human health and the environment, it would most likely be more effective in the short-term than Alternative 2.

Alternative 4 (Incineration) would require that the fluff be disturbed for loading and hauling to the incinerator. Possible fugitive dust emissions during materials handling could be minimized by controlled wetting of the fluff. Site workers both inside and outside the processing building would be protected from dust inhalation and dermal contact by wearing appropriate protective equipment. Air emissions controls would be installed on the incinerator and continuous monitoring would be performed to ensure that incinerator exhaust emissions are below levels harmful to human health and the environment. The fluff feed rate into the incinerator would be very low in order to achieve optimal performance of the pollution control equipment in capturing lead and other inorganic contaminants. Therefore, incineration of the fluff could take from nine to eighty-seven years depending on the type of incinerator used and the allowable fluff feed rates, which would be determined during design. Because of the long implementation time period, this alternative is less desirable than Alternatives 2 or 3 with regard to short-term effectiveness. Alternative 1 would not provide any short-term effectiveness.

F. Implementability

Implementability refers to the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement the chosen solution.

Alternative 2 (Recycling) is highly implementable with regard to technology. This alternative would use readily available standard processing machinery such as sieves, grinders, and clarifiers to sort the fluff. Recycling machinery such as various types of extruders would be used to create a product. The marketability of the product is more questionable; however, several wire and cable recycling companies nationwide are currently finding markets for their recycled products. EPA has identified companies that recycle and successfully sell over one million pounds per month of recycled wire and cable scrap products. Most have been operating for a minimum of five years. Consequently, it is expected that appropriate markets could be found for the recycled fluff products.

Alternative 3 (Capping) would involve standard construction technologies, materials, and equipment which are readily available. Although capping has been proven to be highly implementable, it is less desirable than Alternatives 2 (Recycling) and 4 (Incineration) because it neither treats the waste nor reduces its volume.

Alternative 4 (Incineration) would require a mobile incinerator and typical earth moving equipment which is commercially available. However, advance scheduling (an estimated 2 years) is necessary to secure a mobile facility. The application of incineration for site remediation has been successful at other sites where feed has been reasonably uniform, as is the case for this Site. Approximately one acre of the Site would be required to house an incinerator system, operator facilities, laboratory, pre-processing systems, and storage areas for ash and excavated solid media. Incineration would require installation of utilities including natural gas, power and potable water. A test burn would be necessary to demonstrate compliance with hazardous waste incineration performance standards and to evaluate the performance and compatibility of emissions control systems. Although this alternative is more difficult to implement than Alternative 3, it is more desirable because it destroys and/or treats the fluff contaminants. However, it is less desirable than Alternative 2; Alternative 2 may be easier to implement.

G. <u>Cost</u>

CERCLA requires selection of a cost-effective remedy that protects human health and the environment and meets the other requirements of the statute. Project costs include all construction and operation and maintenance costs incurred over the life of the project. Capital costs include those expenditures necessary to implement a remedial action.

Because Alternative 2 (Recycling) is an innovative alternative, cost estimates are more variable than those for other alternatives which have been implemented previously. Cost estimates will vary depending on which recycling process is used, the number of machines placed onsite, contractual arrangements between owners and recyclers, the volume of non-recyclables and recycling residuals, and whether the residuals are hazardous and need treatment. Estimates of costs are as follows:

Capital	\$ 6,200,000 to \$15,000,000
O & M	\$ 6,900,000 to \$ 6,900,000
Total Present Worth	\$13,100,000 to \$21,900,000

Alternative 3 (Capping) costs can be reliably estimated since capping has been implemented many times before. Estimated costs are as follows:

Capital	$14,000,000
O & M	$ 1,000,000
Total Present Worth	$15,000,000

A range of costs is provided for Alternative 4 (Incineration) because the expected operation and maintenance time may vary between nine and eighty-seven years, depending on the allowable feed rate and whether a mobile or transportable incinerator is used. Incinerator operational costs are included in the total present worth estimate. Estimated costs are as follows:

Total Present Worth $150,000,000 to $636,000,000

The estimated cost of Alternative 2 is within the same range as Alternative 3, and significantly less than Alternative 4. Alternative 2 provides a higher degree of certainty that this remedy will be effective in the long-term due to the significant reduction of the toxicity and volume of the wastes achieved through recycling that would not occur through Alternative 3. Alternative 2 achieves a greater degree of protectiveness and effectiveness proportional to its costs than Alternatives 3 or 4.

H. <u>Community Acceptance</u>

A public meeting on the Proposed Remedial Action Plan proposing selection of Alternative 2 (Recycling) was held on April 30, 1992, in Hometown, Pennsylvania. Most comments received at that meeting centered on health concerns related to worker and community safety with regard to an onsite recycling facility. Comments received during the meeting and comment period are discussed in the Responsiveness Summary attached to this ROD.

At the public meeting, EPA received many comments pertaining to Alternative 2 (Recycling). Most comments related to concerns about pollution emissions from a recycling facility and the corresponding impacts to onsite workers and the surrounding community. EPA explained at the meeting that emissions control monitoring would be performed and pollution control devices would be fitted to the recycling machinery if necessary. Workers would be provided with personnel protection health and safety equipment as necessary.

Alternative 3 (Capping) received several unfavorable comments. The community did not want the fluff to remain in their neighborhood. Many members of the community expressed vehement opposition to Alternative 4 (Incineration) because of health concerns. EPA explained that air emissions controls would be installed on the incinerator and monitored continuously to ensure that incinerator exhaust emissions were below levels harmful to human health and the environment. No Alternative emerged during the public comment period as a clear community favorite.

I. State Acceptance

The Commonwealth of Pennsylvania has concurred with this selected Remedial Action.

As set forth above, EPA must evaluate a proposed remedy with regard to these nine criteria which have been set forth in detail, and balance the criteria in selecting a remedy.

X. SELECTED REMEDY AND PERFORMANCE STANDARDS

Following extensive review and consideration of the information contained in the Administrative Record file, the requirements of CERCLA and the NCP, and public comment, EPA selects Alternative 2 (Recycling) as the most appropriate remedy for Operable Unit 3 of the Eastern Diversified Metals Site. The selected remedy represents the best balance among the nine evaluation criteria and satisfies the statutory requirements of protectiveness, compliance with ARARs, cost effectiveness, and the utilization of permanent solutions and treatment to the maximum extent practicable.

The following actions will be conducted and the following performance standards attained under this alternative:

1. All fluff at the Site (waste insulation material consisting primarily of polyvinyl chloride and polyethylene chips; fibrous material; and paper, soil, and metal on the surface of the Site other than that to be remediated pursuant to the March 1991 ROD) will be recycled onsite within fifteen (15) years of the date EPA issues this Record of Decision and in accordance with the following:

   (a) Recycling of the fluff into a form that will be used without further processing ("Final Product") offsite (e.g., floor mats, plastic lumber, or bumpers) shall ensure that the hazardous substances, pollutants, and contaminants within the Final Product are inseparable from the Final Product by physical forces attending ordinary use of the Final Product; or

   (b) Recycling of the fluff into a form that will undergo further processing offsite in order to produce a usable product ("Non-Final Product") (e.g., plastic pellets) shall ensure that (1) the Non-Final Product does not exhibit RCRA hazardous characteristics, and (2) the hazardous substances, pollutants, and contaminants within any Final Product produced therefrom are inseparable from the Final Product by physical forces attending ordinary use of the Final Product.

2. Recycling residuals including, but not limited to, debris within the fluff, will be tested to determine whether such residuals exhibit RCRA hazardous characteristics. Recycling residuals that do not exhibit RCRA hazardous characteristics will be disposed of in an offsite landfill.

3. Treatability tests shall be performed on recycling residuals that do exhibit RCRA hazardous characteristics so that EPA can determine the most appropriate method of treatment prior to disposal. These materials will then be treated so that such materials no longer exhibit RCRA hazardous characteristics and will be disposed of in an offsite landfill.

4. Soils underlying the fluff shall be sampled and analyzed as approved by EPA to determine the nature and extent of contamination of such soils by hazardous substances, pollutants, and contaminants.

5. Erosion and sedimentation controls approved by EPA shall be implemented to control drainage and minimize erosion of exposed soils at the Site.

Response actions to address soil contamination, if any, will be selected by EPA in a subsequent Record of Decision following analysis of the soil samples taken as part of this remedy.

Costs associated with this remedy are shown below. Costs and timeframes will vary depending on which recycling technology is implemented, the number of machines placed onsite, the volume of non-recyclables and recycling residuals, and whether the residuals are hazardous and need treatment. A more detailed analysis of costs for the selected remedy are shown in Tables 14 and 15.

Capital	$ 6,200,000 to $15,000,000
O & M	$ 6,900,000 to $ 6,900,000
Total Present Worth	$13,100,000 to $21,900,000

Minor changes may be made to the remedy as a result of the remedial design and construction process. Such changes, in general, reflect modifications resulting from the engineering design process.

XI. STATUTORY DETERMINATIONS

Section 121 of CERCLA requires that the selected remedy:

- be protective of human health and the environment;
- comply with ARARs;

Table 14

SELECTED REMEDY LOW-END COSTS
(5% Residual)

ITEM	QUANTITY	UNIT COST		INSTALLED COST
Pilot Studies	3 Studies	$ 3,300 / study	$ 10,000	$ 10,000
Site Preparation				$ 500,000
Mobilization/Demobilization	1 Ea	$ 50,000 / Ea	$ 50,000	
Staging Area Construction	1 Ea	$ 100,000 / Ea	$ 100,000	
Electrical and Plumbing	1 Lot	$ 100,000 / Lot	$ 100,000	
Decon Area Preparation	1 Ea	$ 50,000 / Ea	$ 50,000	
Clearing, Grubbing, and Road Upgrades	1 Lot	$ 25,000 / Lot	$ 25,000	
Trailers and Hookups	1 Lot	$ 75,000 / Lot	$ 75,000	
General Conditions (Security, Phones, Sanitary, Documentation)	1 Lot	$ 100,000 / Lot	$ 100,000	
Recycling Machinery	*2 Lines	$1,000,000/ Line	$ 2,000,000	$ 2,000,000
Analytical Work - TCLP and Soils Sampling	100 Samples	$ 1,000 / Sample	$ 100,000	$ 100,000
**Residuals Treatment	8,500 Tons	$ 35.00 / Ton	$ 300,000	$ 300,000
Residuals Transport	360 Loads	$ 300.00 / Load	$ 110,000	$ 110,000
***Residuals Disposal in Offsite Landfill	8,500 Tons	$ 65.00 / Ton	$ 550,000	$ 550,000
Surface Runoff Controls				$ 60,000
Berm	3,400 Cy	$ 13.00 / Cy	$ 44,200	
Ditches	3,600 Ft	$ 4.00 / Ft	$ 14,400	
TOTAL DIRECT CONSTRUCTION COST (TDCC)				$ 3,630,000
INDIRECT COSTS				$ 1,500,000
Legal	1 Lot	$ 100,000 / Lot	$ 100,000	
Health and Safety	1 Lot	$ 400,000 / Lot	$ 400,000	
Engineering	1 Lot	$ 500,000 / Lot	$ 500,000	
Insurance	1 Lot	$ 100,000 / Lot	$ 100,000	
Construction Management	1 Lot	$ 400,000 / Lot	$ 400,000	
CONTINGENCY @ 30% TDCC				$ 1,090,000
TOTAL CAPITAL COST				$ 6,200,000
10-YEAR O&M PRESENT WORTH @ 5%				$ 6,900,000
ESTIMATED TOTAL PROJECT COST				# $13,100,000

*One line includes a screening machine, grinding machine, front end loader, electrostatic separator, wash tank, secondary wash system, PE and PVC extruder

**Assumes residuals are hazardous and need treatment (conservative cost assumption).

***Assumes disposal in an offsite non-hazardous residual waste landfill.

Does not include profit from potential sale of recycled products.

Table 15

SELECTED REMEDY HIGH-END COSTS
(40% Residual)

ITEM	QUANTITY	UNIT COST		INSTALLED COST
Pilot Studies	3 Studies	$ 3,300 / study	$ 10,000	$ 10,000
Site Preparation				$ 500,000
Mobilization/Demobilization	1 Ea	$ 50,000 / Ea	$ 50,000	
Staging Area Construction	1 Ea	$ 100,000 / Ea	$ 100,000	
Electrical and Plumbing	1 Lot	$ 100,000 / Lot	$ 100,000	
Decon Area Preparation	1 Ea	$ 50,000 / Ea	$ 50,000	
Clearing, Grubbing, and Road Upgrades	1 Lot	$ 25,000 / Lot	$ 25,000	
Trailers and Hookups	1 Lot	$ 75,000 / Lot	$ 75,000	
General Conditions (Security, Phones, Sanitary, Documentation)	1 Lot	$ 100,000 / Lot	$ 100,000	
Recycling Machinery	*2 Lines	$1,000,000/ Line	$ 2,000,000	$ 2,000,000
Analytical Work - TCLP and Soils Sampling	100 Samples	$ 1,000 / Sample	$ 100,000	$ 100,000
**Residuals Treatment	68,640 Tons	$ 35.00 / Ton	$ 2,400,000	$ 2,400,000
Residuals Transport	2,930 Loads	$ 300.00 / Load	$ 880,000	$ 880,000
***Residuals Disposal in Offsite Landfill	68,640 Tons	$ 65.00 / Ton	$ 4,460,000	$ 4,460,000
Surface Runoff Controls				$ 60,000
Berm	3,400 Cy	$ 13.00 / Cy	$ 44,200	
Ditches	3,600 Ft	$ 4.00 / Ft	$ 14,400	
TOTAL DIRECT CONSTRUCTION COST (TDCC)				$10,410,000
INDIRECT COSTS				$ 1,500,000
Legal	1 Lot	$ 100,000 / Lot	$ 100,000	
Health and Safety	1 Lot	$ 400,000 / Lot	$ 400,000	
Engineering	1 Lot	$ 500,000 / Lot	$ 500,000	
Insurance	1 Lot	$ 100,000 / Lot	$ 100,000	
Construction Management	1 Lot	$ 400,000 / Lot	$ 400,000	
CONTINGENCY @ 30% TDCC				$ 3,120,000
TOTAL CAPITAL COST				$15,000,000
10-YEAR O&M PRESENT WORTH @ 5%				$ 6,900,000
ESTIMATED TOTAL PROJECT COST				# $21,900,000

*One line includes screening machine, grinding machine, front end loader, electrostatic separator, wash tank, secondary wash system, PE and PVC extruder
**Assumes residuals are hazardous and need treatment (conservative cost assumption).
***Assumes disposal in an offsite non-hazardous residual waste landfill.
Does not include profit from potential sale of recycled products.

- be cost-effective;
- utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and
- address whether the preference for treatment as a principal element is satisfied.

A description of how the selected remedy satisfies each of the above statutory requirements is provided below.

A. Protection of Human Health and the Environment

The selected remedy for OU3 protects human health and the environment through onsite recycling of fluff materials and offsite disposal of residuals. Recycling reduces the risks to human health and the environment by encapsulating fluff contaminants in a plastic matrix (the recycled product) thereby preventing exposure through dermal contact, inhalation, and ingestion. The recycling process also decreases contaminant mobility and prevents further release of hazardous substances from fluff into soils, sediments, surface water, and ground water. Volume will be reduced by approximately 40-60 percent and, ultimately, part or all of the recycled material may be removed from the Site through distribution of the recycled product. Treatment, if necessary, and disposal of recycling residuals through landfilling will decrease mobility by preventing additional leachate production and will prevent exposure via dermal contact, inhalation, and ingestion. Implementation of the selected remedy will not pose unacceptable short-term risks or cross-media impacts to the Site, the workers, or the community.

B. Compliance with ARARs

All applicable or relevant and appropriate requirements (ARARs) pertaining to the selected remedy will be attained. The ARARs are presented below.

1. Chemical-Specific ARARs

(a) 25 PA Code Chapter 261 and 40 C.F.R. § 261.24 for identification of characteristic hazardous wastes;
(b) the National Ambient Air Quality Standards (NAAQS) set forth at 40 C.F.R. Part 50;
(c) the Pennsylvania Air Pollution Control Act, 25 PA Code Chapters 123 and 127;

2. Action-Specific ARARs

(d) 25 PA Code Chapter 102, which pertains to erosion control requirements related to excavation activities.

(e) RCRA and Department of Transportation regulations governing the generation and transportation of hazardous wastes, 25 PA Code Chapters 262 and 263; 49 C.F.R. Parts 107, 171-179;

(f) 25 PA Code Chapter 264 and 40 C.F.R. Part 268 regarding the storage, disposal, and treatment of hazardous wastes;

(g) 40 C.F.R. Part 266, SubPart C relating to recyclable materials used in a manner constituting disposal;

(h) National Pollution Discharge Elimination System requirements, 40 C.F.R. Part 122 regarding wastewaters;

(i) OSHA standards for worker's protection, 29 C.F.R. Parts 1904, 1910, and 1926;

3. Location-Specific ARARs

(j) The Clean Water Act, 33 U.S.C. §§ 1251 *et seq.*; 40 C.F.R. Part 403 relating to the discharge of wastewaters to a publicly-owned treatment works;

4. To Be Considered

(k) Executive Order 11988, 40 C.F.R. § 6, Appendix A, concerning federal wetlands policies;

(l) PA Proposed Residual Waste Regulations to be codified at 25 PA Code Chapters 287-299 (requirements will be considered during remedial design);

(m) Draft Interim Guidance on Establishing Soil Lead Cleanup Levels at Superfund Sites (OSWER Directive No. 9355.4-02 (June 13, 1989)).

C. Cost-Effectiveness

The estimated present worth cost for the selected remedy is $13,100,000 - $21,900,000. Costs will vary depending upon the recycling technology used, the number of machines placed onsite, contractual arrangements between owners and recyclers, the volume of non-recyclables and recycling residuals, and whether the residuals are hazardous and need treatment. The remedy is cost-effective in mitigating the risks posed by OU3 of the Site in a reasonable period of time and meets all other requirements of CERCLA. The estimated cost of Alternative 2 (Recycling) is within the same range as Alternative 3 (Capping), and significantly less than Alternative 4 (Incineration). Alternative 2 provides a higher degree of certainty that this remedy will be effective in the long-term due to the significant reduction of the toxicity and volume of the wastes achieved through recycling that would not occur through Alternative 3. Alternative 2 provides the best balance among the nine criteria and achieves a greater degree of protectiveness and effectiveness proportional to its costs than Alternatives 3 or 4.

D. <u>Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable</u>

The selected remedy for OU3 utilizes permanent solutions and treatment technologies to the maximum extent practicable while providing the best balance among the other evaluation criteria. It achieves the best balance of tradeoffs with respect to the primary balancing criteria of long-term effectiveness and permanence; reduction in toxicity, mobility, and volume through treatment; short-term effectiveness; implementability; and cost; while also considering the statutory preference for treatment as a principal element and State and community acceptance.

The selected remedy provides a high degree of long-term effectiveness and permanence as the removal of the fluff pile through the recycling process would be permanent and irreversible. Recycling the fluff would encapsulate the contaminants in a plastic matrix (the recycled product) which will prevent exposure and reduce mobility. Any residuals would be treated which would permanently remove any hazardous characteristics, and then removed and securely contained offsite. Capping the fluff would achieve only a moderate level of long-term effectiveness and permanence as the fluff would remain onsite permanently and its long-term effectiveness would require ensured long-term maintenance. Onsite incineration could achieve a moderate to high level of long-term effectiveness and permanence because destruction of the fluff would be permanent and irreversible; however, large quantities of ash and residuals would need to be treated and disposed and the implementation time period could be excessive.

The selected remedy provides significant reductions in toxicity, mobility, and volume by immobilizing contaminants in the recycled product and achieving significant volume reductions. Capping provides no reduction in toxicity or volume. Incineration would destroy organic contaminants and require treatment to stabilize the inorganic contaminants for ultimate disposal. The selected remedy is less effective than capping in the short-term, but significantly more effective than incineration which could take anywhere from nine to eighty-seven years to achieve protectiveness. The selected remedy may be slightly less implementable than capping due to the uncertainties with regard to recycling markets, but is probably more easily implementable than incineration. With regard to cost, the selected remedy may be less expensive than capping and would be less expensive than incineration.

E. <u>Preference for Treatment as a Principal Element</u>

By recycling the fluff material, contaminants would be encapsulated in the recycled product reducing toxicity, mobility, and volume. Residuals would be treated if necessary to reduce toxicity before disposal. Therefore, the statutory preference for remedies that employ treatment as a principal element is satisfied.

XII. EXPLANATION OF SIGNIFICANT CHANGES

The Proposed Remedial Action Plan (Proposed Plan) identifying EPA's Preferred Remedial Alternative for OU3 of the Eastern Diversified Metals Site was released for comment on April 16, 1992. The selected remedy described in this ROD differs from the remedies in the Proposed Plan with regard to the following:

1. No Contingency Remedy

The remedy selected in this Record of Decision was identified as the Preferred Remedial Alternative in the Proposed Plan. The Proposed Plan also identified a Preferred Contingency Alternative which would have been implemented under circumstances identified in that document. EPA determined that a contingency alternative is unnecessary since research conducted as part of the RI/FS indicates that recycling is both technically feasible and implementable.

2. Residuals Management

In the Proposed Plan, onsite capping or landfilling of recycling residuals were included as potential residuals management options along with offsite landfilling. Because onsite capping would not meet State ARARs it was deleted as a potential residual management option. After further review of onsite landfilling space and hydrogeological requirements, EPA also deleted onsite landfilling as an option. Consequently, recycling residuals will be treated (if necessary) and disposed in an offsite landfill.

3. Soils Management

In the Proposed Plan, soils underlying the fluff pile exceeding target levels were to be either capped or landfilled. In this Record of Decision, soils underlying the fluff will be sampled and analyzed to determine the nature and extent of soil contamination, if any. Erosion and sedimentation controls will be developed and implemented to control drainage and minimize erosion of exposed soils at the Site. EPA will determine whether, and to what extent, further response actions are necessary to address soil contamination in a subsequent Record of Decision following analyses of the soil samples performed as part of this remedy.