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915145

GPS —

FEASIBILITY STUDY
NEW YORK STATE SUPERFUND STANDBY CONTRACT
LEHIGH INDUSTRIAL PARK SITE
Lackawanna, Erie County

WORK ASSIGNMENT NO. D002478-14
SITE NO. 9-15-145

PREPARED FOR

Prepared for:

New York State
Department of
Environmental Conservation

50 Wolf Road, Albany, New York 12233
Thomas C. Jorling, Commissioner

Division of Hazardous Waste Remediation
Michael J. O'Toole, Jr., P.E., Director

PREPARED BY

ES

ENGINEERING-SCIENCE
Liverpool, New York

DECEMBER 1993

DISK\DECCOVS\LEHIGHCV.DS4

December 30, 1993

Mr. Steven M. Scharf
New York State Department
of Environmental Conservation
Division of Hazardous Waste Remediation
50 Wolf Road
Albany, NY 12233-7010

RECEIVED
JAN 20 1994
N.Y.S. DEPT. OF
ENVIRONMENTAL CONSERVATION
REGION 9

Re: Lehigh Industrial Park (LIP) Site
Feasibility Evaluation (Tasks 7-9)

Dear Steve:

As you requested, Engineering-Science, Inc. (ES) is enclosing two copies of the above-referenced report for your review. ES has revised the previous report (dated December 13, 1993) based on our recent telephone conversations with you and your letter dated December 28, 1993. Per our previous discussion, the current Table 1.2 and Table 2.2 from the initial Draft Report submittal are measuring the same quantities of above-grade material (approximately 17,000 cubic yards (C.Y.). The volume of surface contamination shown in Table 1.2 is one-half the volume shown in draft Table 2.2 because the excavation depth had been modified from 2 feet to 1 foot based on discussions during our November 30, 1993 meeting.

Once again, thank you for being available and willing to discuss this feasibility study report during its development. We look forward to working with you as this project goes into the remedial design and construction phase.

Sincerely,

ENGINEERING-SCIENCE, INC.

Richard Fox for DBB

David B . Babcock, P.E.
Task Manager

DBB/tcc
Enclosures
cc: P.M. Petrone, ES
N.K. Wohlabaugh, ES

FEASIBILITY STUDY

REPORT FOR

NEW YORK STATE SUPERFUND STANDBY CONTRACT

LEHIGH INDUSTRIAL PARK
CITY OF LACKAWANNA, ERIE COUNTY
WORK ASSIGNMENT NO. D-002478-14
SITE NO. 9-15-145

Prepared For:

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF HAZARDOUS WASTE REMEDIATION

Prepared By:

ENGINEERING-SCIENCE, INC.
37 FRANKLIN STREET
200 CATHEDRAL PARK TOWER
BUFFALO, NEW YORK 14202

AND

290 ELWOOD DAVIS ROAD
SUITE 312
LIVERPOOL, NEW YORK 13088

DECEMBER 1993

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

SECTION 1

SECTION 1

INTRODUCTION

1.1 GENERAL

This Feasibility Study (FS) Report has been developed for the Lehigh Industrial Park (LIP) site, a Class 2 inactive hazardous waste site located in the City of Lackawanna. The study was performed by Engineering Science, Inc. (ES) for the New York State Department of Environmental Conservation (NYSDEC), under the State Superfund Program.

1.2 BACKGROUND

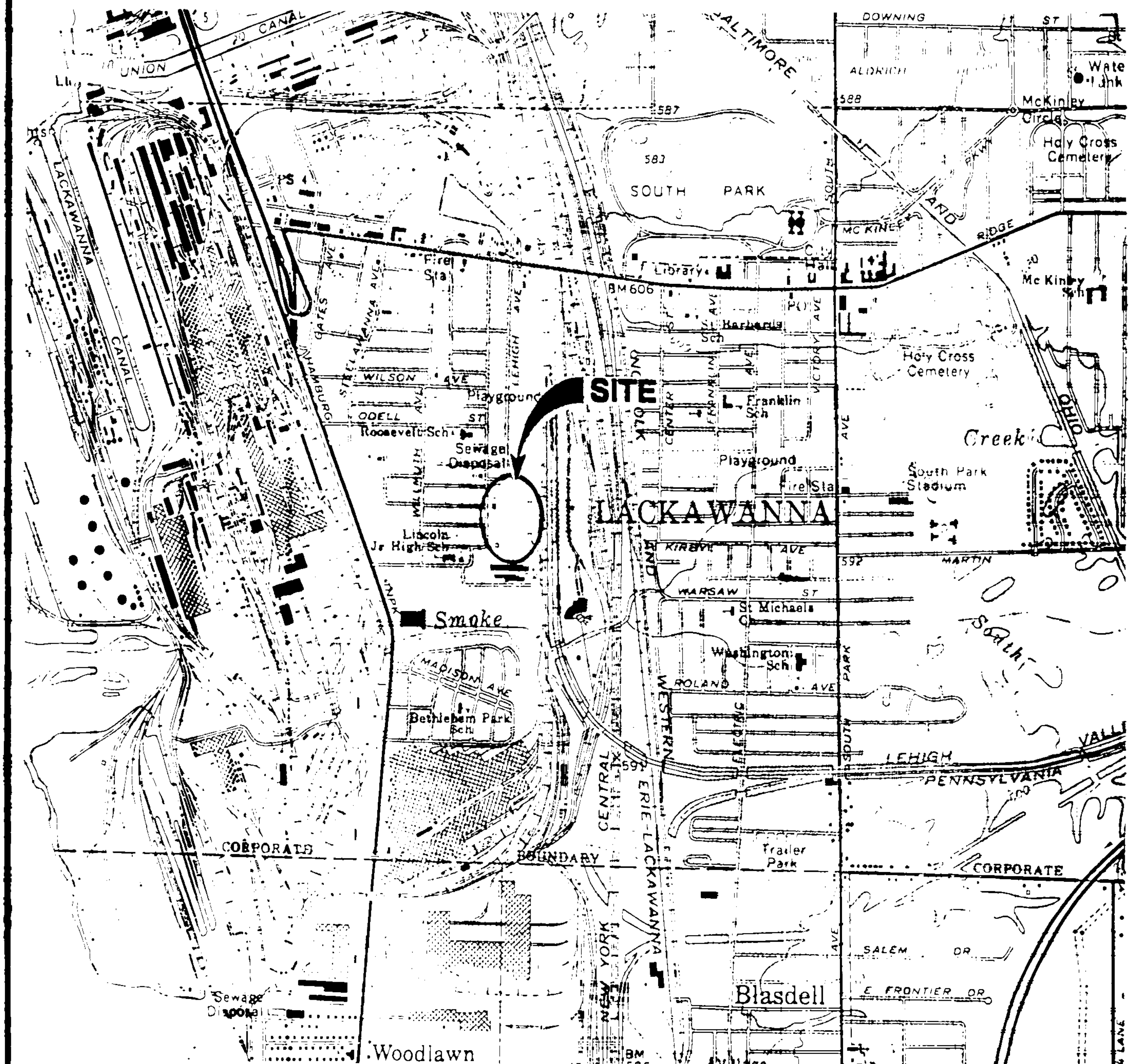
The LIP site is a former automotive scrapping facility, located at 31 South Street in the City of Lackawanna, Erie County, New York. The site occupies 9.1 acres of land and is bounded by South St. to the north, Buffalo Brake Beam Co. to the south, Conrail and South Buffalo Railway right-of-way to the east, and a residential area on the west. The shore of Lake Erie is approximately 1 mile to the west and Smokes Creek is approximately 1000 ft. south of the southern border. Figure 1.1 shows the site location with respect to major roads in Lackawanna.

A Site History Report (prepared by ES, dated September 1992) was developed for the LIP site and presents detailed information on previous owners and operators, site conditions and occurrences of spills and other mishaps. In summary, a deed search of Lehigh Industrial Park revealed that in the early 1900's, the site was initially separated into four parcels, and that these parcels were utilized independently from one another under different owners. They eventually became consolidated under a single owner in 1973. Though ownership has changed hands many times, aerial photographs dating back to 1938 have revealed that the site has been used primarily as an automotive and metal scrap yard through time. The last business to operate at the site was known as Roblin Industries, Inc. (Roblin). Roblin filed for bankruptcy in 1985. Conversations with past Roblin employees and review of documents on file with various public agencies indicate that spills were commonplace, and some drums were received, scrapped, and possibly buried under waste/soil piles. There are, however, no records of drums on file with any of the agencies contacted. The Lehigh Industrial Park purchased the site from the bankruptcy trustee of Roblin in 1988.

Large electrical transformers have been stored on the site, resulting in PCB spills being reported on two separate occasions. The easy accessibility to the site as well as high concentrations of PCBs found in previous testing has been a concern to local residents as well as local, state, and federal agencies. A thorough discussion and presentation of the background documentation that was collected and reviewed is part of the Site History Report.

Prior to NYSDEC involvement, the Erie County Department of Environmental Planning (ECDEP) has been involved with environmental compliance issues at the LIP site. In 1979, soil sampling was supervised by the ECDEP as part of a cleanup of a

FIGURE 1.1



SOURCE: U.S.G.S. 7.5 MINUTE SERIES TOPOGRAPHIC BUFFALO SE QUADRANGLE. 1965

QUADRANGLE LOCATION

LATITUDE: 42°49'00"
LONGITUDE: 78°50'25"

SCALE
0 2000 4000 FT.
2000 FT.

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NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SITE LOCATION MAP
LEHIGH INDUSTRIAL PARK SITE

polychlorinated biphenyl (PCB)-laden oil spill from a leaking transformer. After excavation of oil-stained soil was performed, Roblin was advised that no further action was required on its part.

In 1988, after Roblin had gone bankrupt and the site was inactive, another PCB spill occurred (near the location of the previous spill), when hazardous waste disposal workers were removing a transformer. Subsequent sampling confirmed that PCB-contaminated soils were present again at the site.

EPA Region II visited the site in 1990 and collected additional samples. The LIP site was designated as a Class 2 inactive hazardous waste site [hazardous waste that constitutes a significant threat to the environment] in December, 1990. For the past several years, the site has been plagued by vandalism, illegal dumping, and suspicious fires.

A Preliminary Remedial Investigation (PRI) Report was developed for the LIP site by ES under the state superfund program and submitted to the NYSDEC in January, 1993. The PRI was a broad investigation, the objectives of which were to confirm the presence/absence of contamination at the site, determine its potential impact on groundwater, determine the presence/absence of off-site migration via surface drainage, determine subsurface stratigraphy and investigate the waste types present at the site. Results of the PRI indicated that high levels of contamination, particularly PCBs, lead, chromium, and cadmium were present at various locations across the site. As a result, additional studies to delineate the areas of contamination were approved by the NYSDEC and were performed by ES in July, 1993. The Additional Studies Report provided additional detailed information regarding the geographical and vertical extent of contamination at the LIP site.

A Preliminary Risk Assessment (PRE) Report was also generated during the investigative work at the LIP site. The PRE is included in this report as Appendix A and is discussed in the next section.

1.3 PROJECT GOALS AND OBJECTIVES

For this site, the goal of the FS is to identify and evaluate possible remedial alternatives for the LIP site. This study forms the basis for the NYSDEC to prepare a Proposed Remedial Action Plan and subsequently, a Record of Decision upon which site remediation efforts will be based. The FS was performed in a manner consistent with the objectives stated in Section 121 (Cleanup Standards) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980. The primary objective of the FS is to select a remediation alternative that provides cost-effective protection of human health and environment. This is achieved by performing a preliminary screening of remedial technologies followed by a detailed analysis of remedial alternatives. In the preliminary screening, the technologies selected for detailed evaluation as alternatives are those most applicable to the LIP site (of all possible remedial technologies available) based on two factors:

- the nature and extent of contamination at the site as described in the Remedial Investigation (RI) Report (prepared by ES, dated January 1993) and the Additional Studies Addendum Report (prepared by ES, dated October 1993), and

- the effectiveness of the technology in reducing the environmental risks identified in the Preliminary Risk Evaluation (PRE) Report (see Appendix A).

The PRE performed by ES, using the preliminary and supplemental investigative data, resulted in two key conclusions. First, it was determined that the act of controlling environmental impacts associated with PCBs, lead (Pb), cadmium (Cd), and chromium (Cr) would control the potentially significant adverse impacts associated with the LIP site. Second, the pathways of concern at the LIP site are limited to direct human contact with waste materials/contaminated surface soils and potential inhalation of dusts from those same materials. The groundwater pathway is not a concern, because PCBs and metals are not found above background levels in shallow groundwater at the on-site monitoring wells, and because groundwater is not used locally. The surface water pathway also is not a concern, because contaminants have not been found above local background levels in a swale east of the site that carries intermittent storm water flows south to Smokes Creek. Impacts to terrestrial biota are not a concern above and beyond the human health concerns. A summary of all exposure pathways evaluated in the PRE is presented in Table 1.1. To address the identified health risks at the LIP site, the NYSDEC and NYSDOH have established soil clean-up objectives of 1 ppm PCBs in shallow soil 0 to 2 feet in depth, 10 ppm PCBs in deep soil, 10 ppm cadmium, 50 ppm chromium, and 500 ppm lead. Soil cleanup objectives for cadmium, chromium, and lead apply to both shallow and deep soils.

Therefore, the remedial action objective (RAO) for the Lehigh site is to prevent human contact over the long term with above-grade waste materials and surface soils having concentrations greater than 1 ppm PCBs, 10 ppm cadmium, 50 ppm chromium, or 500 ppm lead. Materials with contamination that exceeds these concentrations can be categorized into five waste groups. Three waste groups exist above-grade: the Soil-Covered Waste Pile, the Auto Fluff Pile, and the Scrap Metal Piles. Figure 1.2 shows the property boundaries, building designations, and locations of the above-grade waste piles. All of the contaminants of concern were found in significant concentrations throughout all of these waste piles. The Soil-Covered Waste Piles consist of soil mixed with large amounts of miscellaneous debris, primarily corroded scrap metal and auto parts. The Auto Fluff piles consist of soil mixed with crushed or shredded plastics, vinyl, glass, auto batteries and other auto parts. The Scrap Metal Piles consist of large metal castings, metal structural shapes, and other miscellaneous metal, all in badly-weathered condition.

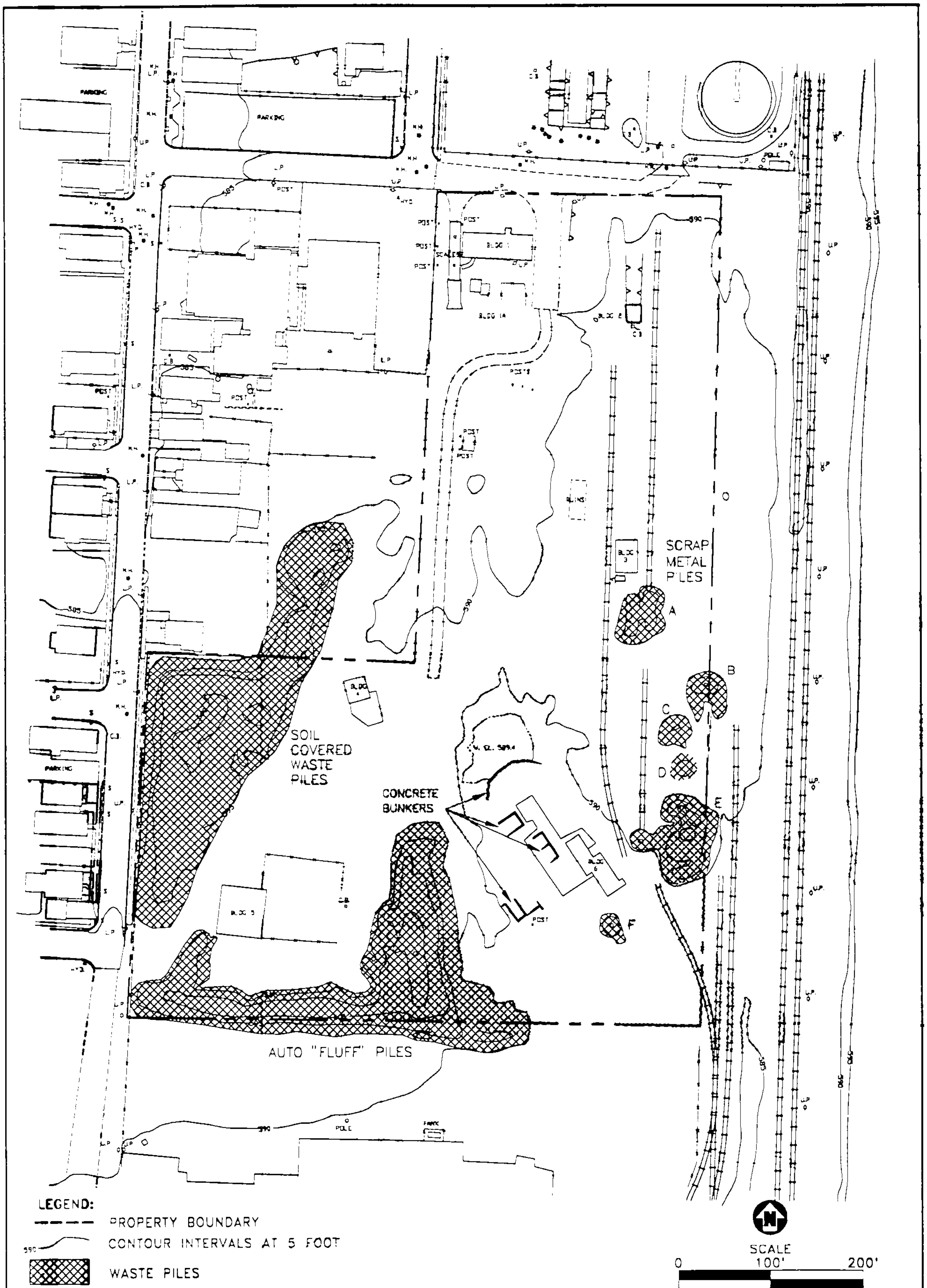
The fourth waste group is the existing surface soil (the first 1 ft. of depth below grade) that has become contaminated with metals and PCBs from site activities. Figure 1.3 indicates the contaminants of concern that exist at different shallow soil zone areas across the LIP site. The fifth group is existing surface soil "hot spots" that have become contaminated with PCBs at a concentration greater than 50 ppm. This soil is considered toxic waste by law and must be removed from the site for proper disposal if disturbed. Table 1.2 presents the approximate volumes associated with each waste group.

TABLE 1.1
MATRIX OF POTENTIAL EXPOSURE PATHWAYS
LEHIGH INDUSTRIAL PARK SITE
LACKAWANNA, NEW YORK

Potentially Exposed Population	Exposure Route, Medium and Exposure Point	Complete Exposure Pathway	Comment
Residents	Ingestion of or dermal contact with downgradient groundwater in home	No	The entire area surrounding the site relies on a municipal source.
Residents	Inhalation of volatiles from downgradient groundwater in home	No	The entire area surrounding the site relies on a municipal source.
Residents	Ingestion of, or dermal contact with surface water	No	The site does not appear to have any significant impact on perennial surface water bodies. On-site surface water is of a transient nature.
Residents	Ingestion of, or dermal contact with surface soils and waste on site	Yes	Contaminants were detected in site surface soils and waste. Access is partially restricted by a fence. Occasional trespassing occurs.

TABLE 1.1 (CONTINUED)
MATRIX OF POTENTIAL EXPOSURE PATHWAYS
LEHIGH INDUSTRIAL PARK SITE
LACKAWANNA, NEW YORK

Potentially Exposed Population	Exposure Route, Medium and Exposure Point	Complete Exposure Pathway	Comment
Residents	Inhalation of volatiles and dust at the site via outdoor air	Yes	Trespassers may inhale dust contaminated with PCBs and metals, although dust meters indicated levels near background. Volatiles are not present at soil concentrations likely to impact the air pathway. PID readings above background were not observed except during excavation. The prevailing wind blows away from nearby residences.



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NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION FEASIBILITY EVALUATION

SITE PLAN AND ABOVE-GRADE WASTE PILE LOCATION MAP

LEHIGH INDUSTRIAL PARK
LACKAWANNA, NEW YORK

FIGURE 1.2

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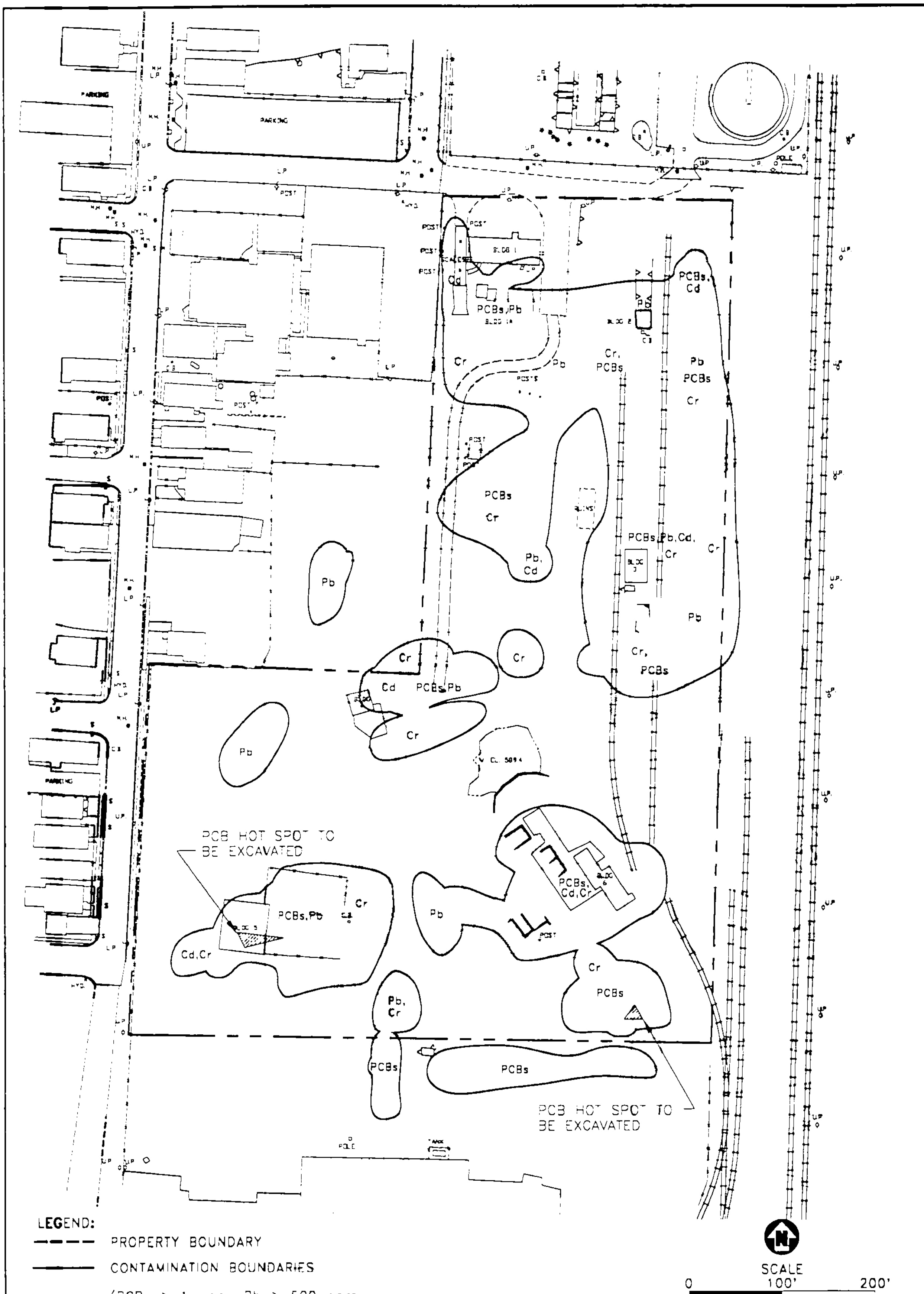

LEGEND:

- — — — PROPERTY BOUNDARY
- ——— CONTAMINATION BOUNDARIES

(PCBs > 1 ppm, Pb > 500 ppm, Cd > 10ppm, and/or Cr >50 ppm)

PCB: POLYCHLORINATED BIPHENYL
Pb: LEAD
Cd: CADMIUM
Cr: CHROMIUM

ENGINEERING-SCIENCE, INC.

NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION FEASIBILITY EVALUATION

SURFACE SOIL ZONE AREAS WITH CONTAMINATION ABOVE NYSDEC/NYSDOH-ESTABLISHED SOIL CLEAN-UP LEVELS LEHIGH INDUSTRIAL PARK LACKAWANNA, NEW YORK

FIGURE 1.3

REVISED: 12/13/93
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TABLE 1.2

Waste Group Volumes

Waste Group	Approximate Volume (Cubic Yard)[1]
Soil Covered Waste Pile	8000
Auto Fluff Pile	7100
Scrap Metal Piles	1800
Surface Contamination (to 1 ft. depth)	9500
PCB Hot Spots	150
Total	26,000

[1] Approximate volume calculations rounded to 2 significant digits.

1.4 OTHER CONSIDERATIONS

As shown on Figure 1.2, Buildings 1, 1A, 2, 3, 4, 5, and 6 exist on the site. In addition, there are heavy-duty concrete bunkers near Building 6. These structures will be an impediment to construction activities. Since these buildings are structurally unsafe and deteriorated beyond recovery, costs for demolition of the above-grade structure of these buildings are included in the remedial alternatives that include construction. Building 1 is an exception to the above description. It may have future value and will be retained.

During the investigative efforts, abandoned 55-gallon drums and compressed gas cylinders in poor condition were discovered periodically on the site. While the presence of these objects creates an additional safety risk for construction activities, the results of test pit excavations during the RI suggest that abandoned drums and cylinders do not exist in great numbers. Engineering precautions will be taken during any future construction activities to insure that the safety risk is minimized.

The shallow soils do contain some asbestos as reported in Section 4 of the Preliminary RI Report (ES, January 1993). Construction activities that include material movement will have dust control measures to keep asbestos particles from becoming airborne.

The 100-year floodplain for Lake Erie and its tributaries was evaluated to determine if any impact was predicted for the LIP site. According to the Flood Insurance Study Report (Federal Emergency Management Agency, January 1980), the 100-year flood will not reach the LIP site.

During the RI effort at the LIP site, many soil samples were analyzed for total content of contaminants of concern. In addition, a single sample was taken from the Soil-Covered Waste Piles and analyzed using the RCRA Toxicity Characteristic Leaching Procedure (TCLP). The result of this sample was 18 mg/L of lead, which exceeds the federal land disposal TCLP limit of 5 mg/L for lead. Material which has been characterized as failing the federal limits cannot normally be disposed in an off-site hazardous waste landfill until its leachability is reduced to the regulatory limits. However, this single soil sample may not be representative of the materials within the Soil-Covered Waste Piles. If the Remedial Action Objective can be satisfied, the NYSDEC may allow the waste/soil to be remediated by containment on-site without requiring treatment.

SECTION 2

SECTION 2

PRELIMINARY SCREENING OF TECHNOLOGIES

2.1 REMEDIAL TECHNOLOGIES AND PRELIMINARY SCREENING

Table 2.1 lists the technologies that ES has identified and their applicability to the LIP site. The only technologies that are needed to control impacts of direct contact and future inhalation are technologies that provide covering or technologies for excavation and disposal. The groundwater pathway for human exposure is not a concern, as determined by the Preliminary Risk Evaluation previously discussed in Section 1.3. Soils or solid wastes with PCB concentrations over 50 ppm can be disposed in an approved TSCA disposal facility. Soils or solid wastes containing metals can be covered in place or disposed at a municipal land disposal facility if non-hazardous or disposed at a RCRA disposal facility if hazardous (e.g. based on leach toxicity). Treatment of soil or solid waste from the Lehigh site is not warranted based on cost effectiveness. Costs to treat PCBs or any one of the metals can range from $100 to $500 per cubic yard. Total costs to treat PCBs and the three metals (cadmium, chromium, and lead) would most likely exceed $500 per cubic yard. Conversely, the remedial action objective can be met suitably at a lower price without treatment either by covering the soil and waste or by disposing of the soil and waste off-site at an appropriate landfill.

Covering can be done with soil or with paving (concrete or asphalt-base) materials. Because the objective is to minimize direct contact, these cover types are considered effective over the long term and also easily implementable. The choice between cover types is primarily based on cost. For the LIP site, a 12-inch compacted soil cap would be less costly than, for example, a 6-inch concrete or asphalt cover even when long-term maintenance costs (for grass mowing) are included. A soil thickness of 12 inches is needed to reasonably prevent long-term exposure from occasional human use of the site.

2.2 SITE SPECIFIC CONSIDERATIONS

The recycle potential for the Auto Fluff Pile and the Scrap Metal Piles was assessed. ES contacted several materials recycling businesses and also several active automotive scrap yards. Recycling service catalog listings were referenced. No one questioned could identify an auto fluff recycler. Hurwitz Bros. of Lackawanna, NY, a reputable local scrap metal recycler, visited the LIP site in October, 1993 and provided an assessment of the scrap metal value. Due to the grades of metal present and their poor condition, the Scrap Metal Piles were determined to have negligible salvage value. However, the existing rail spurs have been noted as having potential scrap value.

TABLE 2.1
TECHNOLOGY SCREENING

Response Type	Technology	Screening Comments
No Action	None	Retain for baseline comparison
Cover	Soil (e.g. 12-inch thickness)	Retain
	Concrete (e.g. 6-inch thickness)	Not cost effective
	Bituminous	Retain - effective away from soil piles
Excavation	Backhoe and related equipment	Retain
Partial Excavation	Strip off top foot from one portion and place in a second portion of the site	Retain
Treatment	Thermal (PCBs)	Will not meet objective (ineffective for metals)
	Dechlorination (PCBs)	Will not meet objective (ineffective for metals)
	Flushing or washing	Will not meet objective (ineffective for PCBs)
	Stabilization (metals) with binding agents	Will not meet objective (not proven effective for PCBs)
Material handling	Solidification	Not needed
Disposal	On-Site	Retain
	Off-Site Landfill	Retain

2.3 RESULTS OF PRELIMINARY SCREENING

For the technologies retained in Table 2.1, four alternatives can be developed that merit evaluation.

Alternative 1: No Action is a no-action alternative, presented only as a basis of comparison for the other alternatives. The LIP site would remain as it currently exists, with minimal controls to restrict human exposure to contamination.

Alternative 2: Fencing and Monitoring includes improvements to the LIP site fence so that it completely surrounds the site. In addition, long-term semi-annual inspections would be included to assess the extent to which unauthorized entry is being limited. It does not, however, include significant construction to directly reduce exposure to contamination. Long-term groundwater monitoring would be included.

Alternative 3: Consolidation and Capping is a covering alternative where the contaminated waste piles would be consolidated at the southern end of the site and the surface soils that exceed clean-up objectives would either be included in a consolidation pile or covered in-place. All areas with contamination greater than clean-up levels would receive a covering layer of compacted, low permeability soil. PCB surface soil hot spots would be excavated and disposed off-site. Off-site contamination, both above-grade and in surface soils, that is located adjacent to the site would be moved on-site. Long-term operations and maintenance activities would include periodic groundwater monitoring and grass mowing. The fence would be improved to completely surround the LIP site. After remediation, the northern portion of the site may possibly be reusable for commercial or industrial applications.

Alterative 4: Excavation and Off-Site Disposal is an off-site disposal alternative where contaminated above-grade waste materials (including those outside of the LIP property boundaries) would be disposed off-site. PCB surface soil hot spots would be excavated and disposed off-site. Surface soil with concentrations exceeding clean-up objectives would be covered with a clean 12 inch compacted soil layer. Contaminated surface soils (to 1 ft. depth) that exist outside of the LIP site boundaries would be excavated and replaced by clean fill. The removed (contaminated) surface soil would be disposed off-site at an approved landfill. The fence would be repaired to totally surround the LIP site. No site maintenance would be conducted. However, long-term groundwater monitoring would be included.

SECTION 3

SECTION 3

DETAILED ANALYSIS OF ALTERNATIVES

3.1 DESCRIPTION OF REMEDIAL ALTERNATIVES

3.1.1 Alternative 1: No Action

In this alternative, no actions are implemented. Therefore, all the current risks to human health and the environment would remain unchanged from their current state. Site trespassers might be exposed to PCBs and/or high concentrations of lead, cadmium, or chromium.

3.1.2 Alternative 2: Fencing / Monitoring

In Alternative 2, there would be no modification of the site characteristics other than the addition of chain-link fence to completely surround the site (approximately 1000 additional feet). The PCB hot spots and all of the waste piles would remain at their current locations. To be effective, this alternative would require a commitment to long-term monitoring. Periodic air and/or water monitoring requirements associated with the continued presence of hazardous and toxic materials would be fulfilled by an environmental monitoring program.

NYSDEC cannot mandate a deed restriction on contaminated property. However, for this alternative and also for Alternatives 3 and 4, the NYSDEC will advise the participants of any future deed transaction of the importance of a deed restriction for maintaining the effectiveness of the remedial actions taken at the site.

NYSDEC requires that remedial actions which leave any hazardous wastes at the site be reviewed no less than once every five years after completion of the remedial action (NYSDEC , 1990). This review would be required in addition to any regularly scheduled monitoring and operation and maintenance. The objective of the review would be to evaluate if the implemented remedy protects human health and the environment, and to identify if any "permanent" remedy is available for the site at the time of the review. Alternatives 2, 3, and 4 include this 5-year review. The cost for performing this review was assumed to be negligible and was not included in the cost estimate for any alternative.

3.1.3 Alternative 3: Consolidation and Capping

In Alternative 3, the PCB hot spots (greater than 50 ppm) would be excavated and disposed off-site as hazardous waste. The above-grade contaminated waste/soil piles (above NYSDEC/DOH clean-up levels) would be consolidated into a central pile. Contaminated surface soils (to 1 ft. depth) that exist outside of the LIP site boundaries would be excavated and replaced by clean fill. Some on-site contaminated surface soils will also be excavated and replaced with clean fill. The removed (contaminated) surface soil, and any contaminated above-grade wastes that exist adjacent to the LIP site boundaries, would be included in the on-site consolidation pile. Those areas requiring cover but not associated with the consolidation pile would receive a 9 inch layer of compacted clean fill and a 3 inch layer of topsoil. Figure 3.1 shows a conceptual plan of the completed Alternative 3.

The consolidation pile would have a 12 inch layer of either clean or contaminated soil (ie: soil from contaminated off-site and on-site areas) that would function as a sub-cap for structural stabilization, followed by a cap layer of 9 inches of compacted clean fill and 3 inches of topsoil. The 24 inch total thickness is considered adequate to provide structural stability. A final permeability of the cap would be approximately 10^{-5} to 10^{-6} cm/sec. The pile would have a footprint of approximately 300 ft. by 550 ft. and a maximum height across the top ridge of approximately 9.5 ft above the existing grade. The slope on the sides of the pile would be approximately 6%. Planted grass on the topsoil layer would prevent erosion.

The only site maintenance would consist of cutting the vegetation on the cover three to four times each summer and noting any significant damage. The existing perimeter fence would be repaired and additional fencing (approx. 1000 ft.) would be installed to completely enclose the LIP site. Groundwater sampling and analysis would be performed twice per year. The site would be evaluated again by the NYSDEC after 5 years to reassess the suitability of containment.

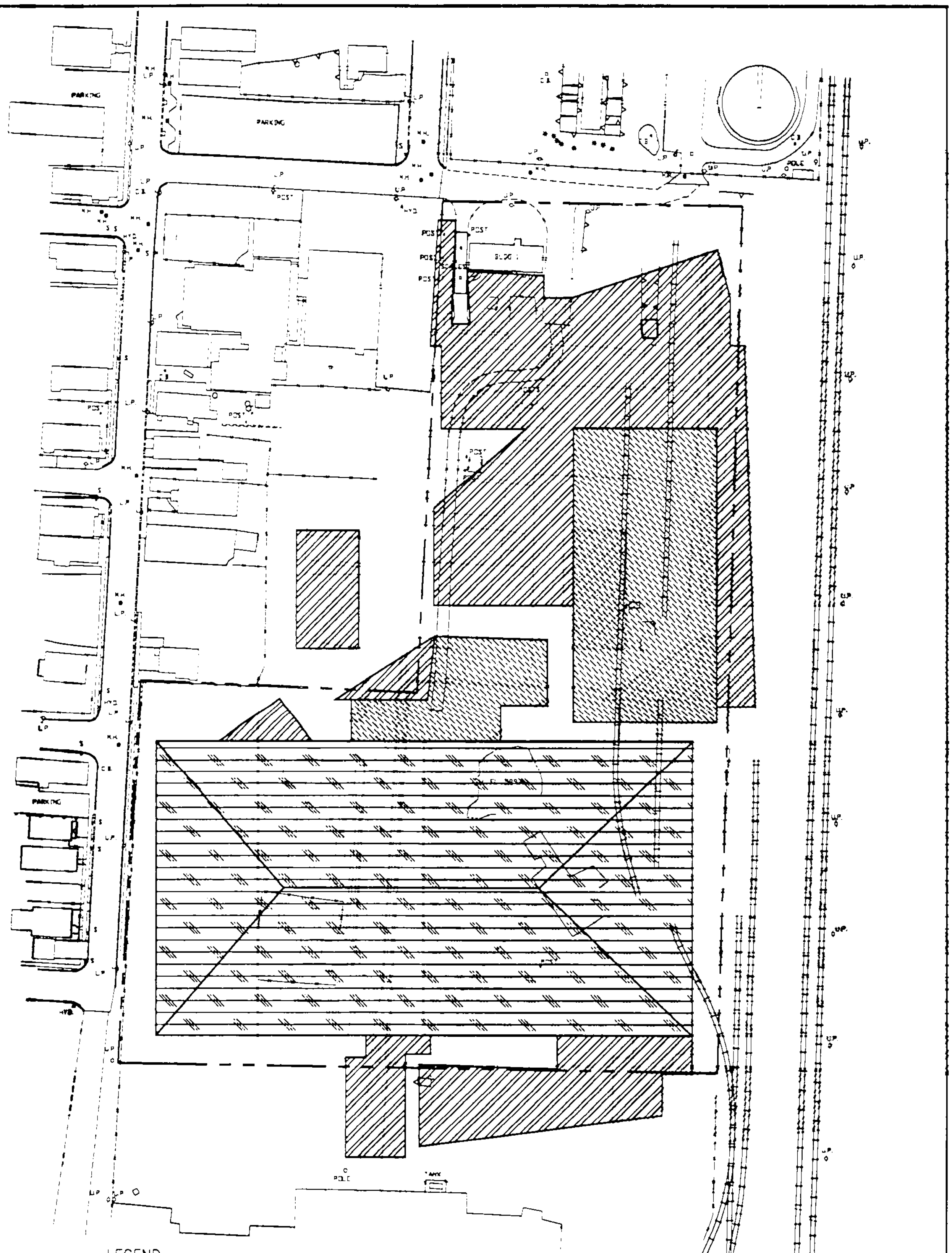
For off-site hauling, tractor-trailer dump trucks with an approximate capacity of 22 CY per truck are proposed for use in Alternatives 3 and 4. The beds of these trucks are lined before loading and tightly covered after loading. The off-site disposal of hazardous PCB wastes for Alternative 3 would require approximately 6 truck loads.

The implementability of the waste/soil consolidation in Alternative 3 and the final cost of off-site disposal of waste/soil in Alternative 4 (to be discussed) depend on the interpretation of available soil sample results and of New York State site remediation and land disposal regulations. Per guidance provided by the NYSDEC, it is assumed that the single RCRA TCLP result (that exceeds 5 mg/L) is not sufficient to prohibit the use of an on-site containment alternative. However, for the purposes of considering off-site disposal of waste/soil that exceeds the RCRA TCLP limit for lead, it is assumed that treatment would be required to reduce leachability prior to disposal in an off-site hazardous waste landfill.

3.1.4 Alternative 4: Excavation and Off-Site Disposal

The remediation of hazardous PCB waste (greater than 50 ppm) would be performed as described for Alternative 3.

Off-site contaminated surface soils (above clean-up levels) would be disposed off-site as hazardous waste, but on-site contaminated surface soils would be covered in-place. However, instead of including the above-grade hazardous and non-hazardous waste/soil (above NYSDEC/DOH clean-up levels) under the soil cap, it would be characterized, transported and disposed of in accordance with NYS Solid Waste Management Facility Regulations. Excavated hazardous waste that fails TCLP for metals (i.e. lead) would be treated, if necessary, to <5 mg/L in TCLP or EP Toxicity Test leachate by an ex-situ process (soil washing is assumed) prior to disposal in a RCRA hazardous waste landfill. Air monitoring during remediation, grass planting for erosion control, and control of storm water run-off during remediation would follow



LEGEND

PROPERTY BOUNDARY

AREAS WITH 1 FT. SURFACE SOIL REPLACED BY CLEAN FILL AND TOPSOIL

AREAS WITH 1 FT. ADDED COVER (CLEAN FILL AND TOPSOIL)

FOOTPRINT OF CONSOLIDATED SOIL PILE (MAXIMUM HEIGHT APPROX. 9 FEET SLOPE APPROX. 6 PERCENT.)

SCALE
0 100' 200'

ENGINEERING-SCIENCE, INC.

NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION FEASIBILITY EVALUATION

REMEDIAL ALTERNATIVE 3

LEHIGH INDUSTRIAL PARK
LACKAWANNA, NEW YORK

FIGURE 3.1

REVISED: 12/13/93
C01631\@\5Y279\ALTERN3.DWG

the procedures in Alternative 3. Figure 3.2 shows a conceptual plan of the completed Alternative 4. (with the above-grade piles removed).

In the Soil-Covered Waste Pile, it is assumed, conservatively, that there are an estimated 6,000 CY of soil/waste (approximately 75% of the total volume of the pile) that exceeds the TCLP limit of 5 mg/L for lead based on the result of one TCLP test. This test result has been assumed to be representative of the majority of the waste pile. It is assumed that there is no TCLP contaminant problem in the Auto Fluff Pile. No TCLP data for the Auto Fluff Pile was generated during the RI.

The off-site disposal of hazardous PCB and lead wastes for Alternative 4 would require approximately 300 truck loads. The off-site disposal of waste/soil exceeding NYSDEC/DOH clean-up levels is estimated to require an additional 500 truck loads.

A soil cover (nine inches of compacted clean fill and three inches of topsoil) would be used for covering surface soil contamination left in-place at the LIP site. The cover would have a final permeability of approximately 10^{-5} to 10^{-6} cm/sec. The cover would be seeded to prevent erosion. No site maintenance would be conducted. Groundwater sampling and analysis would be performed twice per year. The site would be revisited by the NYSDEC every 5 years.

Additional fencing (approx. 1000 ft.) would be installed to completely enclose the LIP site.

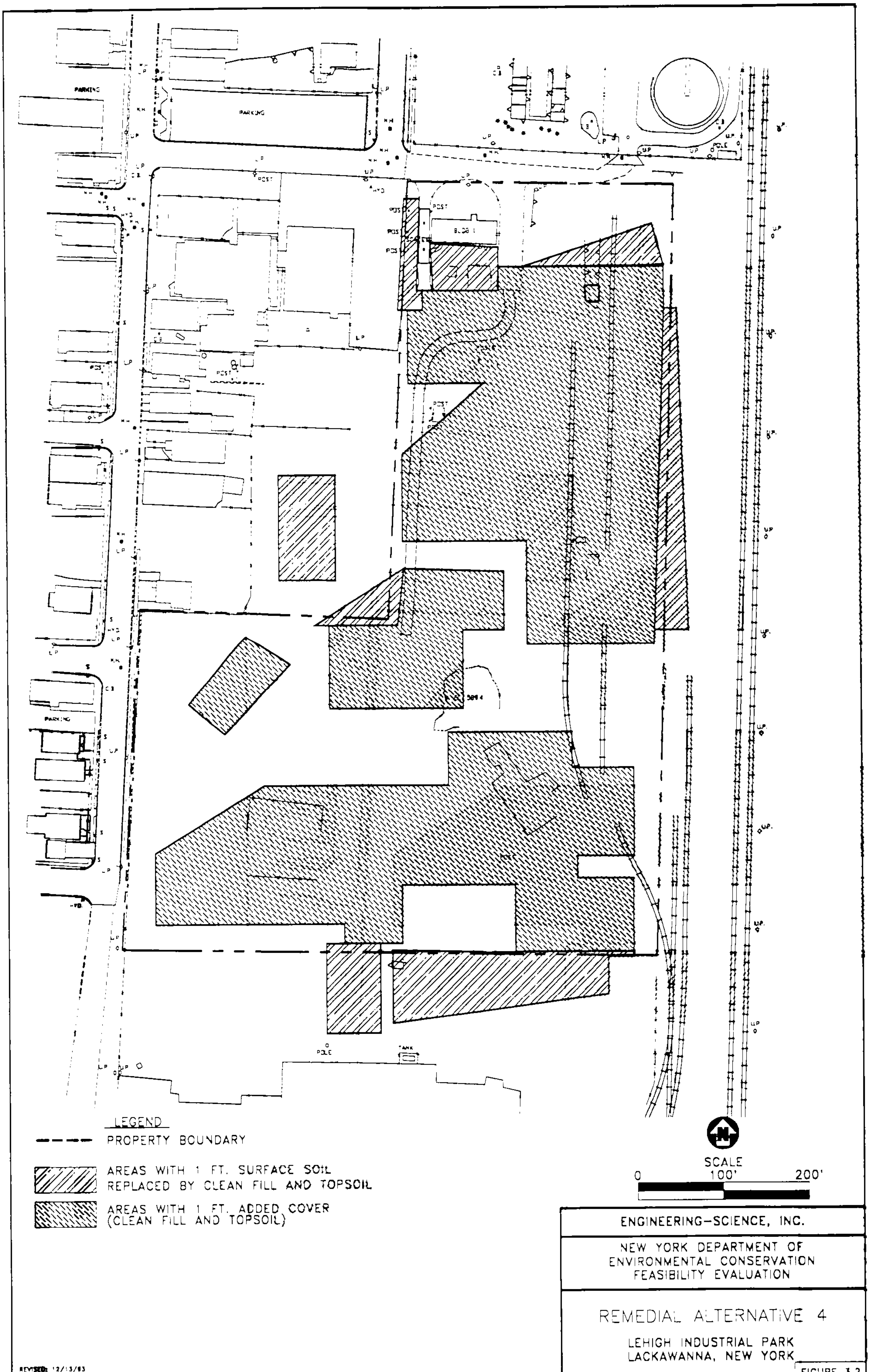
3.2 SITE-SPECIFIC EVALUATION CRITERIA

During the detailed analysis of alternatives, each of the four selected alternatives was assessed against the evaluation criteria described in NYSDEC Technical and Guidance Memorandum (TAGM) #HWR-90-4030 (NYSDEC, 1990) and USEPA feasibility study guidance (USEPA, 1988). The criteria include:

- the Remedial Action Objective (RAO);
- Compliance with applicable Standards, Criteria, and Guidelines (SCGs);
- Short-term risk;
- Long-term effectiveness and permanence;
- Toxicity, mobility, and volume of contamination;
- Implementability;
- Protection of human health and environment; and
- Cost.

The following is a brief discussion of each criterion as it was interpreted with respect to the specific circumstances of the LIP site.

The Remedial Action Objective (RAO) to be satisfied by each alternative is to eliminate direct human contact (dermal, ingestion) and potential inhalation of contaminated above-grade wastes and surface soils.


LEGEND
PROPERTY BOUNDARY
AREAS WITH 1 FT. SURFACE SOIL REPLACED BY CLEAN FILL AND TOPSOIL
AREAS WITH 1 FT. ADDED COVER (CLEAN FILL AND TOPSOIL)
SCALE
0
100'
200'
PARKING
BLDG 1
POST
ENGINEERING-SCIENCE, INC.
NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION FEASIBILITY EVALUATION
REMEDIAL ALTERNATIVE 4
LEHIGH INDUSTRIAL PARK
LACKAWANNA, NEW YORK
FIGURE 3.2
REVISED: 12/13/93

Compliance with applicable Standards, Criteria, and Guidelines (SCGs) was evaluated in three parts. Chemical-specific SCGs, following the soil clean-up levels as established by the NYSDEC and the New York State Department of Health (NYSDOH), are presented are in Table 3.1.

TABLE 3.1
NYSDEC / NYSDOH-ESTABLISHED SOIL CLEAN-UP LEVELS

Contaminant	Surface Soil (mg/L)	Subsurface Soil (mg/L)
Polychlorinated Biphenyls (PCBs)	1	10
Lead (Pb)	500	500
Cadmium (Cd)	10	10
Chromium (Cr)	50	50

Other chemical-specific SCGs include federal ambient air quality standards, federal emission standards for hazardous air pollutants, and NYSDEC ambient air guidelines. NYSDEC groundwater quality standards were dropped from further consideration based on the results of the Preliminary Risk Evaluation. The action-specific SCGs identified as being applicable were USEPA TSCA requirements for soils with PCBs greater than 50 ppm, USEPA TSCA requirements for asbestos handling, RCRA and NYSDEC Land Disposal Restrictions (LDRs) for metals, NYSDEC / NYSDOH-established soil clean-up levels, and NYSDEC storm water run-off requirements for construction activities. There are no additional action-specific local regulations. As a construction project, the remediation of the LIP site may require approval from the City of Lackawanna Planning Board. There are no location-specific SCGs.

This evaluation also examined the risk of short-term pollutant exposure, physical injury and damage to site workers, community residents, community structures, and the greater environment during the implementation of each alternative. The assessment of long-term effectiveness and permanence included the "durability" of actions to block pollutant pathways and the minimization of monitoring requirements. The evaluation of toxicity, mobility, and volume was based on the degree to which PCBs, lead (Pb), cadmium (Cd), and chromium (Cr) were contained, treated, or removed from the site. Implementability was addressed based on the difficulty of applying the alternative to the site. Technical constraints included existing structures, nearby residences, and street access. Administrative considerations included the complexity of land use restrictions (if implemented) and long-term monitoring obligations. Protection of human health and environment was assessed based on the overall effectiveness of the alternative to block pathways of human exposure to the contamination.

A preliminary construction cost estimate was prepared for each alternative. The estimate is accurate within - 30% to + 50% for the assumptions provided in the discussion of each alternative.

3.3 CRITERIA EVALUATION OF ALTERNATIVES

Each of the three alternatives, as described in the previous section, was evaluated using the site-specific criteria presented in Section 3.2. The results of the evaluations are presented in Sections 3.3.1, 3.3.2, 3.3.3, and 3.3.4. A summary of each alternative with results from the evaluation of each criterion is presented in Table 3.2.

3.3.1 Alternative 1: No Action

For Alternative 1, the remedial action objective is not satisfied. The risk of human exposure via trespassing is facilitated by an incomplete fence and contamination located above-grade or on the surface that can be contacted directly. In the foreseeable future, there is the potential for contaminated waste to become exposed by erosion over time and then become airborne, creating a risk to nearby residents.

Most SCGs would be not be satisfied by Alternative 1. While the remedial investigation performed at the LIP site showed that chemical-specific standards for groundwater and ambient air are currently met, none of the NYSDEC / NYSDOH soil clean-up levels are achieved. Since there would be no excavation, hazardous waste would remain at its current location and action-specific SCGs would not be invoked.

Since there would be no site work, the evaluation of short-term risk does not apply.

Alternative 1 would not represent a permanent solution. The hazardous materials remaining at the site would pose a long-term risk to trespassers or future users. There may be containers of hazardous substances buried in the waste piles that might become exposed in the future or leak and cause further contamination. The potential for future air contamination due to wind erosion exists. Without cover, the existing surface is expected to erode over time.

The toxicity and volume of the contaminated waste and soil would be unchanged. Based on the lack of significant PCB and metals concentrations in the groundwater, the contaminants of concern have a very low matrix mobility at the site as it currently exists. However, human contact with surface materials can still occur. Pathway mobility via direct human contact is not reduced.

Implementability is not applicable since there would be no action to implement. Protection of human health would not be achieved. There are no costs associated with the implementation of Alternative 1.

TABLE 3.2

LEHIGH INDUSTRIAL PARK
ALTERNATIVES EVALUATION SUMMARY

Criteria	1 – No Action	2 – Fencing and Monitoring	3 – Consolidation and Capping	4 – Excavation and Off-site Disposal
Compliance with SCGs	No	Clean-up levels not met	Compliant	Compliant
Satisfy the Remedial Action Objective	No	Partially	Yes	Yes
Short- and Long-term Impacts and Effectiveness	Existing risks would continue long-term	Reduced but continued access. Continued erosion. Negligable short-term impacts.	Direct contact reduced significantly. Possible beneficial reuse of northern portion of site.	Direct contact reduced significantly. Possible beneficial reuse of northern portion of site.
Reduction of Toxicity, Mobility, or Volume	No change	No change	Reduced mobility.	Reduced mobility.
Technical Implementability	Nothing to implement	Easily implementable	Implementable	Implementable (Pb treatment may be difficult.
Administrative Implementability	Nothing to implement	Deed restriction may be difficult.	Deed restriction may be difficult.	Deed restriction may be difficult.
Protection of Human Health and Environment	No protection beyond existing conditions	Existing exposure would continue.	Direct contact exposure is controlled.	Direct contact exposure is controlled.
Approx. Present Worth Cost	None	$ 100 thousand	$ 800 thousand (1)	$ 8 million (2)

(1): Assumes no treatment of waste/soil for lead.

(2): Assumes soil washing treatment of 6020 CY of waste/soil followed by disposal in a hazardous waste landfill.

3.3.2 Alternative 2: Fencing and Monitoring

For Alternative 2, the remedial action objective would be satisfied only for the short-term. In the foreseeable future, there would be the potential for contaminated waste to become exposed by erosion over time and then become airborne, creating a risk to nearby residents. In addition, despite physical and legal barriers, the risk still exists for human exposure via trespassing or unsafe access by a future user of the property.

Most SCGs would not be satisfied by Alternative 2. The remedial investigation performed at the LIP site showed that chemical-specific standards for groundwater and ambient air are currently met. Any RCRA or TSCA requirements for monitoring would be fulfilled by the environmental monitoring program. However, soil clean-up levels for PCBs, Pb, Cd, and Cr would not be met. Since there would be no excavation, hazardous waste would remain on-site and action-specific SCGs would not be invoked.

The risk of injury or damage associated with fence modification would be negligible. There would be a minor reduction in risk of contaminant exposure to a trespasser. There would be no immediate change in risk to the general community, compared with existing conditions.

Alternative 2 would not represent a permanent solution. The hazardous materials remaining at the site would pose a long-term risk to trespassers or future users. There may be containers of hazardous substances buried in the waste piles that might leak in the future and cause further contamination. The potential for future air contamination due to wind erosion exists. Without cover, the existing surface is expected to degrade over time. In addition, a future user might excavate in a restricted area and spread contamination to new areas. According to the City of Lackawanna, the 1990 tax assessment value of the LIP site was $98,100 ($10,400/acre). It is assumed that the proposed access restriction would reduce the value of the site property.

The toxicity and volume of the contaminated waste and soil would be unchanged. Based on the lack of significant PCB and metals concentrations in the groundwater, the contaminants of concern have a very low matrix mobility at the site as it currently exists. However, human contact with surface materials can still occur. Pathway mobility via direct human contact would be reduced by fencing only.

Technical aspects of this alternative would be easily implementable. Implementability of long-term access restriction might be difficult.

Protection of human health would not be firmly achieved. Exposure prevention would depend solely on the effectiveness of the fence, signs, and land use restrictions to prevent access. Risk of contamination to the environment was determined in the RI as lower than the risk of human exposure.

The total present-worth cost to implement Alternative 2 is estimated to be $118,000. A detailed breakdown of the cost components is presented in Table 3.3 based on the assumption that an additional 1000 ft. of fencing would be sufficient to create a continuous fence-line around all contaminated waste and soil associated with the LIP site. No other site work would be required for Alternative 2. For the

TABLE 3.3

LEHIGH INDUSTRIAL PARK FEASIBILITY EVALUATION

Construction Cost Estimate for Alternative 2
Fencing and Monitoring

CAPITAL COSTS

Item	Description	Unit	Quantity	Unit Cost	Total Cost	Source of Unit Cost
I	MOBILIZATION/DEMOBILIZATION					
	Equipment Mob/Demob (van, tools, trailer)	LS	1	$500	$500	ES Experience
	Bond (none) & Insurance	LS	1	$1,500	$1,500	ES Experience
I	Subtotal				$2,000	
II	SITE WORK					
	Install add'l chain link fence (6' high, galv. steel)	LF	1,000	$14.75	$14,750	Means
	Corner posts	EA	6	$98	$590	Means
	Braces	EA	10	$35	$350	Means
II	Subtotal				$15,690	
	SUBTOTAL CAPITAL COSTS				$17,700	
	Performance Bond (none)				$0	
	Engineering (none) (for design & construction mgmt)	0.0%			$0	
	Contingency	10%			$1,770	
	TOTAL ESTIMATED CAPITAL COSTS				$19,000	

ANNUAL OPERATING AND MAINTENANCE COSTS

Item	Description	Unit	Quantity	Unit Cost	Total Cost	Source of Unit Cost
I	GROUNDWATER & SURFACE WATER MONITORING (5 GW & 2 SW samples/round @ $180/sample for PCBs and TCLP metals (no leach): 14 hours @ $105/hour for sample crew including travel expenses and ODCs)	Round	2	$2,730	$5,460	Vendor, ES
II	SITE MAINTENANCE (fence repair, erosion repair, etc.)	LS	1	$1,000	$1,000	ES Experience
III	SECURITY INSPECTION (1 report/month, 4 hr./report)		12	$80	$960	Vendor, ES
IV	ANNUAL DATA REVIEW & REPORTING, ADMINISTRATION	Hrs	40	$70	$2,800	ES Experience
	TOTAL ESTIMATED ANNUAL O & M COSTS				$10,220	
	ALTERNATIVE 2 ESTIMATED O & M PRESENT WORTH (based on a 30 year life at 10% interest)	(Pw = Pc + 9.43 x Po+m)			$96,000	
	ALTERNATIVE 2 ESTIMATED CAPITAL COSTS				$19,000	
	ALTERNATIVE 2 TOTAL ESTIMATED PRESENT WORTH				$115,000	

purpose of converting annual costs to a present worth cost, a 30-year life cycle is assumed (for all alternatives).

3.3.3 Alternative 3: Consolidation and Capping

The remedial action objective would be satisfied under this alternative because the risk for trespassers to be exposed to hazardous contamination by the direct contact pathway would not exist. The risk of a future user causing on-site exposure of personnel or spread of contaminants by excavating in a restricted area would be significantly reduced (compared to Alternatives 1 and 2) because the most concentrated PCB wastes would be removed, and the surface of the site would be covered. However, the risk might still exist, only if access restrictions negotiated between the NYSDEC and a future property owner fail to prevent future subsurface excavations below the cover.

SCGs would be satisfied by Alternative 3. The remedial investigation performed at the LIP site showed that chemical-specific standards for groundwater and ambient air are currently met. Excavated hazardous PCB waste would be characterized, transported and disposed of in accordance with regulations under RCRA, TSCA and 6 NYCRR Part 373. During excavation, ambient air quality would be monitored for PCBs, metals of concern, and asbestos in accordance with NY and federal air quality standards. Storm water run-off during the implementation of the alternative would be monitored in compliance with the NYSDEC general storm water permit for construction activities.

The short-term risk of injury or damage associated with construction and demolition activities would be low, provided that safe procedures are implemented. If a gas cylinder or pressurized drum is discovered at the site, it would need to be unearthed to minimize the potential for causing an accident or release during excavation, or a tractor-trailer accident during shipment of hazardous PCB waste/soil off-site. Health and safety measures such as careful excavation, contingency plans for drum or gas cylinder discovery, and road use planning would be used to control the site work risks. Also, the risk of creating airborne asbestos fibers during earth work has been addressed in this alternative by including dust suppression measures and the use of a contractor trained for asbestos handling and dust control.

Once implemented, the long-term effectiveness of Alternative 3 for blocking exposure pathways would be much greater than for Alternatives 1 and 2. However, since non-hazardous contamination remains at the site, Alternative 3 would not be a permanent solution. A long-term risk to future users would still exist if future construction activities are undertaken in the covered area. If an access restriction is imposed, some loss of value to the site property may occur.

The mobility of on-site hazardous PCB waste would be reduced by off-site disposal. The toxicity and volume of the remaining sub-surface and above-grade contaminated waste and soil would be unchanged with respect to treatment. However, the volume of PCB waste would be reduced with respect to the LIP site. Based on the RI, the contaminants of concern have a very low matrix mobility at the site as it currently exists. Pathway mobility of sub-surface and above-grade contaminated waste would be reduced by the installation of a soil cover.

Most technical aspects of this alternative would be easily implementable. However, the implementability or enforcement of the access restriction by the NYSDEC may be difficult. The reliability of the access restriction would be slightly less important due to the absence of the PCB wastes.

Protection of human health would be achieved. Direct contact would be blocked by the soil cap. Inhalation risk via wind erosion of exposed contamination would be negated. The risk of contamination to the environment was determined in the RI as lower than the risk of human exposure. Some potential for exposure or spread of contamination during site work exists, but this exposure would be minimized by the use of engineering controls included in the alternative. Future land use would be restricted.

The total present-worth cost to implement Alternative 3 is estimated to be $774,000. A detailed breakdown of the cost components is presented in Table 3.4. The following is a list of assumptions that are common to the cost estimates developed for Alternatives 3 and 4.

- The waste/soil density is estimated to be 2 tons per cubic yard (CY).
- A contractor with hazardous waste and asbestos removal certification would be required for the site work. The total costs for site work (shown in Sections III, IV, V, and VI of Table 3.4 [hauling and disposal excluded]) are increased by 15% over standard construction rates presented in Means cost estimating manuals. The amount of material actually requiring asbestos removal techniques would be negligible.
- The use of dust masks by all on-site remediation workers would not increase the construction costs above standard rates.
- On-site stabilization of waste/soil to prevent leaching of metals would not be required.
- Any above-grade waste/soil that does not exceed NYSDEC/DOH clean-up levels would be left in place if it does not interfere with cap installation.
- Six on-site buildings that are not salvageable would be leveled for site safety reasons.
- There are no recyclable materials of value in either the Soil-Covered Waste Pile or the Auto Fluff Pile.

The following assumptions are specific to Alternative 3.

- All above-grade waste/soil and some surface soil that exceeds NYSDEC/NYSDOH-established clean-up levels would be consolidated into a low, wide pile and capped.
- If bituminous asphalt (ie: three-inch wearing course over a three-inch binder course, covering 7,100 square yards) is used in the north, less-contaminated region of the site, the cost of Alternative 3 would increase by approximately $49,000.

TABLE 3.4

LEHIGH INDUSTRIAL PARK FEASIBILITY EVALUATION

Construction Cost Estimate for Alternative 3
Excavate Hazardous PCB and Lead Wastes, Dispose off-site
Consolidate Non-Hazardous Waste, Cap Remaining Waste
and Surface Contam. with Soil

CAPITAL COSTS

Item	Description	Unit	Quantity	Unit Cost	Total Cost	Source of Unit Cost
I	MOBILIZATION / DEMOBILIZATION					
	Equipment Mob / Decon / Demob: (dozer, f.e. loader, vib. roller, tractor seeder, dump truck, street sweeper)	LS	1	$4,000	$4,000	Means
	H&S Plans	LS	1	$25,000	$25,000	ES Experience
	Permits, (e.g. discharge, wetland, storm water, etc.)	LS	1	$25,000	$25,000	ES Experience
I	Subtotal				$54,000	
II	GENERAL SITE PREPARATION					
	Decontamination Pad: 20'x 20' concrete pad with sump and 6' f'glass sidewals, $35.00 /SF & 1500 gal tank	LS	1	$14,700	$14,700	ES Experience
	Decontamination Trailer Rental (sized for 10 man crew with showers, lockers, toilet, etc.)	Month	3	$5,000	$15,000	ES, Vendor
	Site Topo & Record Survey (assume a 2-men crew, 1 day/wk for 10 wks)	Days	10	$800	$8,000	ES Experience
	Temporary Security Fence (1,000' orange plastic netting @ $3/ft)	LS	1	$3,000	$3,000	Means
	Health & Safety Disposal, Level 'C' (respirators, gloves, boots, eye glasses, tyveks)	Month	3	$1,500	$4,500	ES Experience
	Utilities Installation (power & water to trailers)	LS	1	$10,000	$10,000	ES Experience
	Electricity for trailers (@100 kwh/day for 70 days)	KWH	7,000	$0.10	$700	ES Experience
	Water for dust control, decon. & sanitation @ 13 tons/day	Tons	650	$10	$6,500	ES Experience
	Laborer for Dust Suppression System	Days	50	$250	$12,500	ES Experience
	Office Supplies, Telephone Charges	Months	3	$500	$1,500	ES Experience
	Trailer Hookups (2 for office, 2 for storage)	Each	4	$500	$2,000	ES, Means
	Designate Work Zones, e.g. excavation, decon.,etc. (2 men @ $100/hr)	Hrs	12	$100	$1,200	ES Experience
	Disposal of Decon Water to POTW (assume 500 gal/day, 20 days/mo., 3 months; includes transportation)	1000 gal	30	$50	$1,500	ES Experience
	Street sweeper clean-up: (assume 1 hr. op/day, 5 days/wk for 10 weeks, 3 mo. equip. rental)	LS	1	$1,500	$1,500	Means
II	Subtotal				$82,600	
III	DEMOLISH EXISTING STRUCTURES					
	Demo of small, concrete bldg #1A using dozer or f.e. loader, no haul	CF	1500	$0.28	$420	Means
	Demo of small, concrete bldg #2 using dozer or f.e. loader, no haul	CF	3000	$0.28	$840	Means
	Demo of small, concrete bldg #3 using dozer or f.e. loader, no haul	CF	7000	$0.28	$1,960	Means
	Demo of small, concrete bldg #4 using dozer or f.e. loader, no haul	CF	6250	$0.28	$1,750	Means
	Demo of small, concrete bldg #5 using dozer or f.e. loader, no haul	CF	50000	$0.28	$14,000	Means
	Demo of small, concrete bldg #6 using dozer or f.e. loader, no haul	CF	30000	$0.28	$8,400	Means
	Demo of 18' concrete bunker walls using dozer or f.e. loader, no haul	SF	3000	$15	$45,000	ES, Means
	Demo and removal of 900 ft abandoned rail (See Note 1)	LF	900	N.C.	$0	Vendor
III	Subtotal				$72,400	
IV	EXCAVATE / DISPOSE OF HAZARDOUS PCB MAT'LS					
	F.E. Loader, 1.5 yd bucket, no haul, loading till (PCB wastes > 50 ppm)	CY	124	$5	$600	Means
	Haul of PCB wastes to Model City facility	CY	124	$9.80	$1,200	Means
	PCB wastes disposal (2.0 ton/CY)	Ton	248	$250	$62,000	Vendor
IV	Subtotal				$63,800	
V	CONSOLIDATE ON-SITE MAT'LS INTO PILE (INCLUDES SUB-CAP)					
	F.E. Loader or dozer, 105 HP, 150' haul, moving common earth	CY	21200	$1.42	$30,100	Means
	Dump truck, 12 CY, 1/4 mi. haul	CY	10600	$1.87	$19,800	Means
V	Subtotal				$49,900	
VI	CONSTRUCT CAP OR COVER, REPLACE REMOVED SURFACE SOIL					
	Common earth, delivered & dumped in-place at site (from 10 mi away)	CY	9500	$10	$95,000	DEC Const. Svcs.
	Spread dumped mat'l over layer using dozer, f.e. loader	CY	9500	$1.33	$12,600	Means
	Vib. roller compaction, 6" lifts, 3 passes	CY	9500	$0.39	$3,700	Means
	Topsoil, delivered & dumped in-place at site (from 10 mi away)	CY	3170	$15	$47,600	DEC Const. Svcs.
	Spread dumped mat'l over layer using dozer, f.e. loader	CY	3170	$1.33	$4,200	Means
	Seeding of topsoil by tractor seeder	SF	342000	$0.02	$6,200	Means
VI	Subtotal				$169,300	

TABLE 3.4 (CON'T)

LEHIGH INDUSTRIAL PARK FEASIBILITY EVALUATION

Construction Cost Estimate for Alternative 3
Excavate Hazardous PCB and Lead Wastes, Dispose off-site
Consolidate Non-Hazardous Waste, Cap Remaining Waste
and Surface Contam. with Soil

CAPITAL COSTS

Item	Description	Unit	Quantity	Unit Cost	Total Cost	Source of Unit Cost
VII	**ANALYTICAL TESTING**					
	PCB confirmatory soil testing (including labor)	Ea	15	$168	$2,490	ES Experience
VIII	**AIR MONITORING**					
	Air Monitoring Equipment (2 Mini-RAM on-line total dust monitors, 3 PAM units) (Photo-vac TIP on-site)	LS	1	$20,000	$20,000	ES Experience
	Analytical Costs (3 samples analyzed weekly for PCBs, asbestos and lead)	Week	10	$1,950	$19,500	ES Experience
	Labor Costs (10 hr/wk @ $60/hr + data validation)	Week	10	$1,200	$12,000	ES Experience
VIII	Subtotal				$51,500	
	SUBTOTAL CAPITAL COSTS				$548,000	
	Performance Bond ($25 / $1000)				$13,700	
	Engineering (for design & construction mgmt, See Note 2)	15%			$72,300	
	Contingency	10%			$54,600	
	TOTAL ESTIMATED CAPITAL COSTS				$687,000	

Note 1: Steel recycler is available to demolish and remove rail: will pay for scrap value minus removal expenses.

Note 2: Estimated engineering fees rate (15%) not applied to Section IV: Haz. Waste Disposal Costs

ANNUAL OPERATING AND MAINTENANCE COSTS

Item	Description	Unit	Quantity	Unit Cost	Total Cost	Source of Unit Cost
I	GROUNDWATER & SURFACE WATER MONITORING (5 GW & 2 SW samples/round @ $180/sample for PCBs and TCLP metals (no leach): 14 hours @ $105/hour for sample crew including travel expenses and ODCs)	Round	2	$2,730	$5,460	Vendor, ES
II	SITE MAINTENANCE (grass mowing, erosion repair, etc.)	LS	1	$1,000	$1,000	ES Experience
III	ANNUAL DATA REVIEW & REPORTING, ADMINISTRATION	Hrs	40	$70	$2,800	ES Experience
	TOTAL ESTIMATED ANNUAL O & M COSTS				$9,260	
	ALTERNATIVE 3 ESTIMATED O & M PRESENT WORTH (based on a 30 year life at 10% interest)	(Pw = Pc + 9.43 x Po+m)			$87,300	
	ALTERNATIVE 3 ESTIMATED CAPITOL COSTS				$687,000	
	ALTERNATIVE 3 TOTAL ESTIMATED PRESENT WORTH				$774,000	

- Costs for stabilization of lead wastes that fail TCLP are included in the Alternative 3 estimated costs shown in Table 3.4. If lime/fly ash or cementous stabilization is added, the cost of Alternative 3 would increase by approximately $675,000. The additional estimated cost includes additional materials handling, waste/soil screening, and vendor unit costs for treating approximately 6,000 CY of waste/soil.

3.3.4 Alternative 4: Excavation and Off-Site Disposal

The remedial action objective would be satisfied for the same reasons presented in the discussion of Alternative 3.

All SCGs would be satisfied by Alternative 4.

The short-term risk of this alternative would be very similar, but greater than Alternative 3 due to the additional potential for an accident associated with shipping much greater volumes (18,600 CY vs. 150 CY for Alternative 3) of contaminated material off-site. Alternative 4 would use the same truck system as proposed for Alternative 3.

Once implemented, the long-term effectiveness of this alternative for blocking exposure pathways would be only slightly greater than Alternative 3 due to a further reduction of on-site contamination. Since non-hazardous contamination (above clean-up levels) would remain at the site, this would not be a permanent solution.

The mobility of on-site hazardous waste and above-grade non-hazardous contamination would be reduced by off-site disposal and the toxicity of the hazardous waste would be reduced during the treatment for lead. The toxicity and volume of the remaining sub-surface contaminated waste/soil would be unchanged with respect to treatment. However, the volume of contaminated on-site waste would be reduced by 18,600 CY with respect to the LIP site. Based on the RI, the contaminants of concern have a very low matrix mobility at the site as it currently exists. Pathway mobility of sub-surface contaminated waste would be reduced by the installation of a soil cover.

Most technical aspects of this alternative would be easily implementable. The possible treatment of excavated waste/soil to remove lead may be difficult, although soil-washing has been proven effective in other cases. In addition, the implementability or enforcement of an access restriction by the NYSDEC may be difficult. The reliability of the access restriction would be slightly less important due to the absence of the most-concentrated wastes.

The protection of human health provided by Alternative 4 is the same as for Alternative 3.

The total present-worth cost to implement Alternative 4 was estimated to be $8,100,000. A detailed breakdown of the cost components is presented in Table 3.5. Assumptions for the Alternative 4 cost estimate that are common with Alternative 3 are presented in Section 3.3.3. The following assumptions are specific to Alternative 4.

- In addition to Sections III through VI, Section VII also has a 15% cost increase included in the site work to account for properly managing the soil/waste containing asbestos.

TABLE 3.5

LEHIGH INDUSTRIAL PARK FEASIBILITY EVALUATION

Construction Cost Estimate for Alternative 4
Excavate Hazardous PCB and Lead Wastes, Dispose Off-site
Excavate Non-Hazardous Waste, Dispose Off-Site
Cap Surface Contamination with Soil

CAPITAL COSTS

Item	Description	Unit	Quantity	Unit Cost	Total Cost	Source of Unit Cost
I	MOBILIZATION / DEMOBILIZATION					
	Equipment Mob / Decon / Demob: (dozer, f.e. loader, vib. roller, tractor seeder, street sweeper)	LS	1	$8,000	$8,000	Means
	H&S Plans	LS	1	$25,000	$25,000	ES Experience
	Permits, (e.g. discharge, wetland, storm water, etc.)	LS	1	$25,000	$25,000	ES Experience
I	Subtotal				$58,000	
II	GENERAL SITE PREPARATION					
	Decontamination Pad: 20'x 20' concrete pad with sump and 6' f'glass sidewalls, $35.00 /SF & 1500 gal tank	LS	1	$14,700	$14,700	ES Experience
	Decontamination Trailer Rental (sized for 10 man crew with showers, lockers, toilet, etc.)	Month	3	$5,000	$15,000	ES, Vendor
	Site Topo & Record Survey (assume a 2-man crew, 1 day/wk for 10 wks)	Days	10	$800	$8,000	ES Experience
	Temporary Security Fence (1,000' orange plastic netting @ $3/ft)	LS	1	$3,000	$3,000	Means
	Health & Safety Disposal, Level "C" (respirators, gloves, boots, eye glasses, tyveks)	Month	3	$1,500	$4,500	ES Experience
	Utilities Installation (power & water to trailers)	LS	1	$10,000	$10,000	ES Experience
	Electricity for trailers (@100 kwh/day for 70 days)	KWH	7,000	$0.10	$700	ES Experience
	Water for dust control, decon. & sanitation @ 13 tons/day	Tons	650	$10	$6,500	ES Experience
	Laborer for Dust Suppression System	Days	50	$250	$12,500	ES Experience
	Office Supplies, Telephone Charges	Months	3	$500	$1,500	ES Experience
	Trailer Hookups (2 for office, 2 for storage)	Each	4	$500	$2,000	ES, Means
	Designate Work Zones, e.g. excavation, decon.,etc. (2 men @ $100/hr)	Hrs	12	$100	$1,200	ES Experience
	Disposal of Decon Water to POTW (assume 500 gal/day, 20 days/mo., 3 months; includes transportation)	1000 gal	30	$50	$1,500	ES Experience
	Street sweeper clean-up: (assume 1 hr. op/day, 5 days/wk for 10 weeks, 3 mo. equip. rental)	LS	1	$1,500	$1,500	Means
II	Subtotal				$82,600	
III	DEMOLISH EXISTING STRUCTURES					
	Demo of small, concrete bldg #1A using dozer or f.e. loader, no haul	CF	1500	$0.28	$420	Means
	Demo of small, concrete bldg #2 using dozer or f.e. loader, no haul	CF	3000	$0.28	$840	Means
	Demo of small, concrete bldg #3 using dozer or f.e. loader, no haul	CF	7000	$0.28	$1,960	Means
	Demo of small, concrete bldg #4 using dozer or f.e. loader, no haul	CF	6250	$0.28	$1,750	Means
	Demo of small, concrete bldg #5 using dozer or f.e. loader, no haul	CF	50000	$0.28	$14,000	Means
	Demo of small, concrete bldg #6 using dozer or f.e. loader, no haul	CF	30000	$0.28	$8,400	Means
	Demo of 18" concrete bunker walls using dozer or f.e. loader, no haul	SF	3000	$15	$45,000	ES, Means
	Demo and removal of 900 ft abandoned rail (See Note 1)	LF	900	N.C.	$0	Vendor
III	Subtotal				$72,400	
IV	EXCAVATE / TREAT / DISPOSE OF HAZARDOUS MAT'LS					
	F.E. Loader, 1.5 yd bucket, no haul, loading till (PCB wastes > 50 ppm)	CY	124	$5	$600	Means
	Haul of PCB wastes to Model City facility	CY	124	$9.60	$1,200	Means
	PCB wastes disposal (2.0 ton/CY)	Ton	248	$250	$62,000	Vendor
	F.E. Loader, 1.5 yd bucket, no haul, loading till (untreated Pb wastes)	CY	6020	$5	$30,100	Means
	On-site, ex-situ soil washing, Pb wastes, 2.0 ton/CY	Ton	12030	$150	$1,804,500	Vendor
	F.E. Loader, 1.5 yd bucket, no haul, loading till (treated Pb wastes)	CY	6020	$5	$30,100	Means
	Haul of treated Pb wastes to Model City facility (no volume change)	CY	6020	$9.60	$57,800	Means
	Pb wastes disposal (2.0 ton/CY)	Ton	12030	$250	$3,007,500	Vendor
IV	Subtotal				$4,994,000	
V	EXCAVATE / DISPOSE OF NON-HAZARDOUS (ACTION LEVEL) MAT'LS					
	F.E. Loader, 1.5 yd bucket, no haul, loading till (above-grade wastes)	CY	10590	$5	$53,000	Means
	F.E. Loader, 1.5 yd bucket, no haul, loading till (off-site surface soil)	CY	1860	$5	$9,300	Means
	Haul of contam. soil to industrial landfill	CY	12450	$9.60	$119,500	Means
	Industrial waste disposal (1.4 ton/CY)	Ton	19900	$75	$1,492,500	Vendor
V	Subtotal				$1,674,000	
VI	SPREAD NON-HAZARDOUS (SUB-ACTION LEVEL) MAT'LS INTO LAYER					
	F.E. Loader or dozer, 105 HP, 150' haul, moving common earth	CY	268	$1.42	$400	Means

TABLE 3.5 (CON'T)

LEHIGH INDUSTRIAL PARK FEASIBILITY EVALUATION

Construction Cost Estimate for Alternative 4
Excavate Hazardous PCB and Lead Wastes, Dispose Off-site
Excavate Non-Hazardous Waste, Dispose Off-Site
Cap Surface Contamination with Soil

CAPITAL COSTS

Item	Description	Unit	Quantity	Unit Cost	Total Cost	Source of Unit Cost
VII	CONSTRUCT COVER FOR CONTAM. SURFACE SOILS (ON- AND OFF-SITE)					
	Common earth, delivered & dumped in-place at site (from 10 mi away)	CY	7500	$10	$75,000	DEC Const. Svcs.
	Spread dumped mat'l over layer using dozer, f.e. loader	CY	7500	$1.33	$10,000	Means
	Vib. roller compaction, 8" lifts, 3 passes	CY	7500	$0.38	$2,900	Means
	Topsoil, delivered & dumped in-place at site (from 10 mi away)	CY	2490	$15	$37,400	DEC Const. Svcs.
	Spread dumped mat'l over layer using dozer, f.e. loader	CY	2490	$1.33	$3,300	Means
	Seeding of topsoil by tractor seeder	SF	269300	$0.02	$4,900	Means
VII	Subtotal				$133,500	
VIII	ANALYTICAL TESTING					
	PCB confirmatory soil testing (including labor)	Ea	15	$166	$2,490	ES Experience
	TCLP Testing for soil wash feed characterization (including labor) (assume 1 test/500 cy soil excavated, for metals)	Ea	12	$204	$2,450	ES Experience
	TCLP Testing for confirmatory sampling (including labor) (assume 1 test/500 cy soil excavated, for metals)	Ea	12	$204	$2,450	ES Experience
VIII	Subtotal				$7,390	
IX	AIR MONITORING					
	Air Monitoring Equipment (2 Mini-RAM on-line total dust monitors, 3 PAM units) (Photo-vac TIP on-site) Air System, Additional Misc. Equip)	LS	1	$20,000	$20,000	ES Experience
	Analytical Costs (3 samples analyzed weekly for PCBs, asbestos and lead)	Week	10	$1,950	$19,500	ES Experience
	Labor Costs (10 hr/wk @ $60/hr + data validation)	Week	10	$1,200	$12,000	ES Experience
IX	Subtotal				$51,500	
	SUBTOTAL CAPITAL COSTS				$7,073,000	
	Performance Bond ($25 / $1000)				$177,000	
	Engineering (for design & construction mgmt, See Note 2)	15%			$61,000	
	Contingency	10%			$707,000	
	TOTAL ESTIMATED CAPITAL COSTS				$8,020,000	

Note 1: Steel recycler is available to demolish and remove rail; will pay for scrap value minus removal expenses.

Note 2: Estimated engineering fees rate (15%) not applied to Section IV: Haz. Waste Disposal Costs or Section V: Non-haz. Disposal Costs

ANNUAL OPERATING AND MAINTENANCE COSTS

Item	Description	Unit	Quantity	Unit Cost	Total Cost	Source of Unit Cost
I	GROUNDWATER & SURFACE WATER MONITORING (5 GW & 2 SW samples/round @ $180/sample for PCBs and TCLP metals (no leach); 14 hours @ $105/hour for sample crew including travel expenses and ODCs)	Round	2	$2,730	$5,460	Vendor, ES
II	ANNUAL DATA REVIEW & REPORTING, ADMINISTRATION	Hrs	40	$70	$2,800	ES Experience
	TOTAL ESTIMATED ANNUAL O & M COSTS				$8,260	
	ALTERNATIVE 4 ESTIMATED O & M PRESENT WORTH (based on a 30 year life at 10% interest)	(Pw = Pc + 9.43 x Po+m)			$78,000	
	ALTERNATIVE 4 ESTIMATED CAPITOL COSTS				$8,020,000	
	ALTERNATIVE 4 TOTAL ESTIMATED PRESENT WORTH				$8,100,000	

3.4 COMPARATIVE ANALYSIS OF ALTERNATIVES

There are four main reasons why the overall goal of LIP site remediation for the protection of human health is best achieved by the isolation and off-site disposal techniques proposed in Alternative 3 or Alternative 4. First, although Alternative 2 would provide for a complete fence, there would still be a potential for direct exposure to contamination, including hazardous waste, for anyone who could gain access to the site. The LIP site has a history of trespassers. For Alternatives 3 and 4, a trespasser would be protected and even a future user who inadvertently excavated at the site would be protected from contact with identified hazardous waste (that would have been removed from the site). Second, it is possible that drums or cylinders are buried in the above-grade piles. A pollutant release from a leaking container, a pollutant spread from an exploded container, or long-term erosion over contaminated piles might change the site conditions and create a new exposure pathway. Contamination could then pass through the fence as a gas, dust, or liquid stream. Third, the effectiveness of Alternative 2 relies on a strong commitment for long-term maintenance and monitoring which may be difficult to carry out. Lastly, Alternative 2 does not satisfy NYSDEC/NYSDOH-established soil clean-up levels for the LIP site.

There are some characteristics that are common to the Alternatives 2, 3, and 4 proposed in this FS Report. All three alternatives have short durations of site work. All three alternatives have adequate short-term effectiveness. None of the alternatives provide destruction or volume reduction of the contamination. With proper maintenance, the lifetimes of all alternatives are long-term.

Alternatives 3 and 4 have a higher short-term risk to the community and the environment due to the consolidation or transportation of contaminated materials, but the risk is controllable. The control measures do not impact the community or the environment. Part of this risk is due to possible unknown dangerous objects (i.e. drums or cylinders) in the waste piles. Excavation would be performed carefully, with contingency plans in place for encountering dangerous buried objects.

While Alternatives 1 and 2 cost the least, their predicted performance in satisfying the remedial action objective is marginal or nonexistent. Between Alternatives 3 and 4, there is no significant difference in short-term and long-term performance (in meeting the RAO).

Even though more contamination is removed from the site in Alternative 4, the increased benefit (compared to Alternative 3) is slight compared to the extra cost incurred. Therefore, Alternative 3 is the recommended alternative for remediating the LIP site.

SECTION 4

SECTION 4

SELECTION OF RECOMMENDED ALTERNATIVE

Based on the results of the comparative analysis presented in Section 3.4, Alternative 3 is the recommended alternative for the LIP site. The proposed Remedial Action Plan for Alternative 3 would include components such as a Health and Safety Plan, General Specifications for site work (where hazardous waste is present), and technical specifications covering structural demolition, site excavation, and cap construction. Soil to be used for the sub-cap would be taken from areas of surface soil contamination in an effort to optimize the re-use potential of on-site areas on the northern end of the site. See Figure 3.1 for a site plan showing Alternative 3. Since the presence of contaminated above-grade waste/soil and surface soils would be minimized in the northern portion of the site, it may be possible to sell the northern portion of the site as usable property.

If soil stabilization for lead is conducted, the performance specification would be <5 ppm lead in TCLP extract. The duration of the Alternative 3 construction work would be approximately two to four months.

The remediated site will be designated as a NYS Class 4 site [properly closed, but requiring continued operation, maintenance and/or monitoring].

Any salvageable metals from the LIP site would be reclaimed, although at present, only the rail spurs have been identified as having any value.

APPENDIX A

APPENDIX A

PRELIMINARY RISK EVALUATION FOR THE LIP SITE

LEHIGH INDUSTRIAL PARK SITE
PRELIMINARY RISK EVALUATION

The purpose of this preliminary risk evaluation (PRE) is to identify the chemicals of concern (COCs) and the pathways of potential exposure at the Lehigh Industrial Park site in Lackawanna, New York. The results will be used to aid in the selection of appropriate remedial alternatives and to make other appropriate recommendations. The steps in the PRE were as follows:

(1) establish representative background concentrations of chemicals;

(2) identify chemicals detected on site;

(3) compare the maximum concentrations of chemicals detected on site with appropriate background and cleanup goals (primary screening);

(4) identify the chemicals of concern;

(5) take a more in depth look at selected chemicals (secondary screening); and

(6) evaluate potential exposure pathways.

For most chemicals, five background samples were available. The data and statistics for these samples are summarized in Table 1. Due to the small sample size, the data were assumed to be normally distributed, and were not transformed. The representative background in most cases is the 95 percent upper confidence limit (UCL) on the arithmetic mean of the data, including nondetects at one-half the sample quantitation limit (SQL). In cases where the 95 percent UCL was found to be greater than or equal to the maximum concentration detected, the representative background is the maximum concentration detected.

Table 2 presents a list of the chemicals identified at the site. The table provides a comparison of the maximum concentrations detected on site, representative background concentrations, and criterion values. The representative background values for chemicals not detected in background samples are assumed to be the average of the background SQLs. The criterion values for this site are the site-specific cleanup goals established by the New York State Department of Environmental Conservation (NYSDEC) and the New York State Department of Health (NYSDOH). The potential chemicals of concern (Table 3) are those identified as posing the greatest potential threat to human health.

It was known at the outset that the concentrations of four on-site chemicals were high enough to warrant remediation. These chemicals, identified as the chemicals of concern for this site are polychlorinated biphenyls (PCBs), cadmium, chromium, and lead. The NYSDEC, in conjunction with the NYSDOH, established the following cleanup goals (Letter from Steven Scharf, NYSDEC to Cameron O'Connor, NYSDOH, May 6, 1993):

PCBs	1 ppm - surface: 10 ppm - subsurface
lead	500 ppm - soil
cadmium	10 ppm - soil
chromium (total)	50 ppm - soil

Five other chemicals were detected at levels high enough above background to warrant a closer look. These chemicals were bis(2-ethylhexyl)phthalate. 2,4-dimethylphenol. copper. nickel. and zinc. 2,4-Dimethylphenol was detected in only one sample which was from the block of resin located in one area of the site. As this discrete waste material will be dealt with, this chemical will not be carried further in this analysis. Furthermore. the locations of all the exceedences for bis(2-ethylhexyl)phthalate. copper. nickel. and zinc coincide with exceedences for the chemicals of concern (PCBs. lead. cadmium. and chromium). Therefore. bis(2-ethylhexyl)phthalate. copper. nickel. and zinc will also be dropped from further consideration.

Finally. Table 4 presents a summary matrix of potential exposure pathways for the site. The only receptor group identified is that of nearby residents. while the only complete pathways identified involve exposure to surface materials at the site. Trespassers have been observed on site. Presumably these trespassers are local residents. and are usually children under 18 years old. These receptors could potentially get surface soils and/or wastes on their exposed skin. or inhale dust originating from the surface materials. Once on the skin. significant dermal absorption of PCBs could occur. and, to a lesser extent. dermal absorption of the metals present could occur. Additionally, contaminated material on the skin may be transferred to the mouth via typical hand-to-mouth activities such as eating or smoking. Significant oral absorption may occur via this route.

Potential exposure pathways involving groundwater and surface water are considered to be incomplete. The area around the site is highly urbanized. and is served by a municipal water source unaffected by the site. Thus groundwater is not and will probably never be used for domestic purposes. The nearest surface water body of significance is Smokes Creek. about 0.5 miles south of the site. Given the lack of mobility of the contaminants of concern. it is unlikely that the site is significantly impacting this body of water. Furthermore. analyses of surface soils within the primary stormwater drainage swale did not show concentrations that were above local background levels.

The following recommendations are made:

(1) Control the impacts of cadmium. chromium. and lead site-wide in waste materials and surface soil based on the aforementioned site-specific cleanup goals.

(2) Implement access restrictions on the site such that following remediation any protective soil cover will not be disturbed.

TABLE 1
BACKGROUND DATA SUMMARY FOR SOILS (1)

Chemical	Range of Sample Quantitation Limits (mg/kg) (2)	Range of Detected Concentrations (mg/kg)	Frequency of Detection	Average Concentration (mg/kg) (3)	Standard Deviation (mg/kg)	Representative Concentration (mg/kg) (4)	Value of t or z (5)
Volatiles							
None Detected							
Semivolatiles							
Acenaphthene	0.4 - 0.4	0.022 - 6.3	4 / 5	1.57E+00	2.67E+00	4.11E+00	2.132
Acenaphthylene	0.4 - 0.4	0.046 - 0.77	4 / 5	2.42E-01	3.02E-01	5.30E-01	2.132
Anthracene	-	0.025 - 43	5 / 5	9.19E+00	1.89E+01	2.72E+01	2.132
Benzo(a)anthracene	-	0.18 - 5.1	5 / 5	2.37E+00	2.06E+00	4.33E+00	2.132
Benzo(a)pyrene	-	0.24 - 39	5 / 5	9.86E+00	1.64E+01	2.55E+01	2.132
Benzo(b)fluoranthene	0.78 - 0.78	0.32 - 7.4	4 / 5	2.98E+00	3.26E+00	6.09E+00	2.132
Benzo(g,h,i)perylene	-	0.13 - 17	5 / 5	3.80E+00	7.39E+00	1.08E+01	2.132
Benzo(k)fluoranthene	0.39 - 0.39	0.17 - 2.6	4 / 5	1.16E+00	1.16E+00	2.26E+00	2.132
Bis(2-ethylhexyl)phthalate	-	0.22 - 8.3	5 / 5	3.37E+00	3.19E+00	6.41E+00	2.132
Butylbenzylphthalate	-	0.16 - 0.39	5 / 5	2.68E-01	9.83E-02	3.62E-01	2.132
Carbazole	-	0.022 - 53	5 / 5	1.10E+01	2.35E+01	3.34E+01	2.132
Chrysene	-	0.22 - 3.3	5 / 5	1.56E+00	1.21E+00	2.72E+00	2.132
Dibenzo(a,h)anthracene	-	0.033 - 10	5 / 5	2.05E+00	4.44E+00	6.29E+00	2.132
Dibenzofuran	0.4 - 0.4	0.035 - 4.4	4 / 5	1.12E+00	1.85E+00	2.88E+00	2.132
2,6-Dinitrotoluene	0.39 - 0.48	0.43 - 0.43	1 / 5	2.60E-01	9.71E-02	3.53E-01	2.132
Di-n-butylphthalate	-	0.029 - 0.12	4 / 4	7.20E-02	3.73E-02	1.16E-01	2.353
Fluoranthene	-	0.36 - 110	5 / 5	2.69E+01	4.68E+01	7.15E+01	2.132
Fluorene	0.4 - 0.43	0.51 - 8.7	3 / 5	2.23E+00	3.66E+00	5.71E+00	2.132
Indeno(1,2,3-cd)pyrene	-	0.18 - 4.7	5 / 5	1.61E+00	1.82E+00	3.35E+00	2.132
2-Methylnaphthalene	0.4 - 0.4	0.088 - 1	4 / 5	3.50E-01	3.73E-01	7.05E-01	2.132
4-Methylphenol	0.4 - 0.48	0.098 - 0.098	1 / 5	1.98E-01	5.79E-02	9.80E-02 **	NA
Naphthalene	0.4 - 0.4	0.075 - 0.62	4 / 5	3.07E-01	2.08E-01	5.06E-01	2.132

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TABLE 1
BACKGROUND DATA SUMMARY FOR SOILS (1)

Chemical	Range of Sample Quantitation Limits (mg/kg) (2)	Range of Detected Concentrations (mg/kg)	Frequency of Detection	Average Concentration (mg/kg) (3)	Standard Deviation (mg/kg)	Representative Concentration (mg/kg) (4)	Value of t or z (5)
Semivolatiles (cont'd)							
Phenanthrene	–	0.18 – 290	5 / 5	6.15E+01	1.28E+02	1.83E+02	2.132
Phenol	0.4 – 0.48	0.28 – 0.28	1 / 5	2.34E-01	3.03E-02	2.63E-01	2.132
Pyrene	–	0.28 – 76	5 / 5	1.88E+01	3.22E+01	4.96E+01	2.132
Pesticides/PCBs							
Aroclor-1242	0.04 – 0.76	62 – 62	1 / 5	1.25E+01	2.77E+01	3.89E+01	2.132
Aroclor-1260	0.76 – 0.76	0.044 – 160	4 / 5	3.22E+01	7.14E+01	1.00E+02	2.132
4,4'-DDE	0.95 – 0.95	0.0029 – 0.026	4 / 5	1.05E-01	2.07E-01	2.60E-02 **	NA
4,4'-DDT	0.004 – 0.95	0.05 – 0.05	1 / 5	1.11E-01	2.05E-01	5.00E-02 **	NA
Heptachlor Epoxide	0.0021 – 0.49	0.017 – 0.017	1 / 5	5.52E-02	1.06E-01	1.70E-02 **	NA
Methoxychlor	0.021 – 4.9	0.067 – 0.067	1 / 5	5.32E-01	1.07E+00	6.70E-02 **	NA
Inorganics							
Antimony	12.5 – 15.1	20.9 – 20.9	1 / 5	9.55E+00	6.36E+00	1.56E+01	2.132
Arsenic	–	8.2 – 22.3	5 / 5	1.24E+01	5.71E+00	1.78E+01	2.132
Barium	–	52.4 – 155	5 / 5	8.70E+01	3.97E+01	1.25E+02	2.132
Beryllium	1.3 – 1.5	3.4 – 3.4	1 / 5	1.22E+00	1.22E+00	2.38E+00	2.132
Cadmium	–	9.9 – 29	5 / 5	1.44E+01	8.25E+00	2.23E+01	2.132
Chromium	–	23.5 – 80.7	5 / 5	3.95E+01	2.35E+01	6.19E+01	2.132
Cobalt	–	5.6 – 7.7	5 / 5	6.86E+00	8.50E-01	7.67E+00	2.132
Copper	–	43.7 – 65.5	5 / 5	5.32E+01	1.02E+01	6.29E+01	2.132
Lead	–	142 – 693	5 / 5	3.31E+02	2.16E+02	5.36E+02	2.132
Manganese	–	653 – 5480	5 / 5	1.75E+03	2.09E+03	3.75E+03	2.132
Mercury	0.11 – 0.13	0.35 – 0.38	2 / 5	1.82E-01	1.67E-01	3.42E-01	2.132

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TABLE 1
BACKGROUND DATA SUMMARY FOR SOILS (1)

Chemical	Range of Sample Quantitation Limits (mg/kg) (2)	Range of Detected Concentrations (mg/kg)	Frequency of Detection	Average Concentration (mg/kg) (3)	Standard Deviation (mg/kg)	Representative Concentration (mg/kg) (4)	Value of t or z (5)
Inorganics (cont'd)							
Nickel	--	22.8 - 79.5	5 / 5	3.60E+01	2.44E+01	5.92E+01	2.132
Silver	2.5 - 5.2	2.7 - 2.7	1 / 5	1.87E+00	7.19E-01	2.56E+00	2.132
Vanadium	--	18.8 - 38.6	5 / 5	2.57E+01	8.11E+00	3.34E+01	2.132
Zinc	--	341 - 1600	5 / 5	7.20E+02	5.01E+02	1.20E+03	2.132

(1) Detected chemicals only. NA = not applicable.
(2) For nondetects. If the analyte was detected in all samples, quantitation limits are not presented.
(3) Arithmetic average concentration based on untransformed data. Due to the small sample size, the data were assumed to be normally distributed. Nondetects were averaged in with detects using one-half the SQL.
(4) The 95% upper confidence limit (UCL) on the arithmetic mean, based on untransformed data. A double asterisk ("***") indicates that the value is the maximum concentration, rather than the 95% UCL, as the 95% UCL was greater than or equal to the maximum.
(5) The Student's t statistic ($n < 30$) or z statistic ($n > 30$).

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TABLE 2
LIST OF CHEMICALS IDENTIFIED AT THE SITE
SITE CONCENTRATIONS, BACKGROUND, AND CLEANUP GOALS (MG/KG)

Chemical	Maximum On-Site Concentrations (1)			Representative Background (4)	NYSDEC Site Cleanup Goals (5)
	Waste Materials	Shallow Fill/Soil (2)	Deep Soil (3)		
Volatiles					
Acetone	0.49	0.18	0.034	0.013 [a]	
Benzene	0.008	0.002		0.013 [a]	
2-Butanone	0.086	0.053		0.013 [a]	
Carbon Disulfide	0.013	0.007		0.013 [a]	
Chlorobenzene	0.012			0.013 [a]	
1,2-Dichloroethene	0.047			0.013 [a]	
Ethylbenzene	0.23	0.002		0.013 [a]	
2-Hexanone	0.026	0.052		0.013 [a]	
Methylene Chloride	0.004	0.006		0.013 [a]	
4-Methyl-2-Pentanone	0.033	0.044		0.013 [a]	
Styrene	0.16			0.013 [a]	
Tetrachloroethene	0.02			0.013 [a]	
Toluene	450	0.003		0.013 [a]	
Trichloroethene	0.007			0.013 [a]	
Xylenes	0.32	0.006		0.013 [a]	
Semivolatiles					
Acenaphthene	1.4	0.32		4.1	
Acenaphthylene	0.54	0.49		0.53	

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TABLE 2
LIST OF CHEMICALS IDENTIFIED AT THE SITE
SITE CONCENTRATIONS, BACKGROUND, AND CLEANUP GOALS (MG/KG)

Chemical	Maximum On-Site Concentrations (1)			Representative Background (4)	NYSDEC Site Cleanup Goals (5)
	Waste Materials	Shallow Fill/Soil (2)	Deep Soil (3)		
Semivolatiles (cont'd)					
Anthracene		1		27	
Benzo(a)anthracene		11		4.3	
Benzo(a)pyrene		5.5		26	
Benzo(b)fluoranthene		15		6.1	
Benzo(g,h,i)perylene	0.18	1.6		11	
Benzo(k)fluoranthene	1.2	5.7		2.3	
Bis(2-ethylhexyl)phthalate	350	78	0.79	6.4	
Butylbenzylphthalate	33	120	0.087	0.36	
Carbazole	0.11	0.77		33	
4-Chloro-3-methylphenol		0.047		0.43 [a]	
2-Chloronaphthalene	0.023			0.43 [a]	
Chrysene	2.6	9.7		2.7	
Dibenzo(a,h)anthracene		0.6		6.3	
Dibenzofuran	0.22	0.089		2.9	
1,4-Dichlorobenzene	0.026			0.43 [a]	
Diethylphthalate	0.51	0.067		0.43 [a]	
2,4-Dimethylphenol	2.9	2,200		0.43 [a]	
Dimethylphthalate	0.13	0.18		0.43 [a]	
Di-n-butylphthalate	3.1	3.5		0.12	

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TABLE 2
LIST OF CHEMICALS IDENTIFIED AT THE SITE
SITE CONCENTRATIONS, BACKGROUND, AND CLEANUP GOALS (MG/KG)

Chemical	Maximum On-Site Concentrations (1)			Representative Background (4)	NYSDEC Site Cleanup Goals (5)
	Waste Materials	Shallow Fill/Soil (2)	Deep Soil (3)		
Semivolatiles (cont'd)					
Di-n-octylphthalate	89			0.43 [a]	
Fluoranthene	1.2	16		72	
Fluorene	0.99	0.05		5.7	
Indeno(1,2,3-cd)pyrene		2.9		3.3	
2-Methylnaphthalene	0.9	0.43		0.70	
2-Methylphenol	0.95	370		0.43 [a]	
4-Methylphenol	2.2	530		0.10	
Naphthalene	0.91	0.29		0.51	
N-Nitrosodiphenylamine	0.25	0.046		0.45 [a]	
Phenanthrene	3	4.6		183	
Phenol	13	3,300		0.26	
Pyrene		16		50	
1,2,4-Trichlorobenzene	0.11	0.02		0.43 [a]	
Pesticides/PCBs					
Aroclor-1232		0.38		2.2 [a]	1 and 10 [b]
Aroclor-1242	25	28,000	0.56	39	1 and 10 [b]
Aroclor-1248		20	0.29	2.2 [a]	1 and 10 [b]
Aroclor-1254	9.9	140	0.47	2.2 [a]	1 and 10 [b]

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TABLE 2
LIST OF CHEMICALS IDENTIFIED AT THE SITE
SITE CONCENTRATIONS, BACKGROUND, AND CLEANUP GOALS (MG/KG)

Chemical	Maximum On-Site Concentrations (1)			Representative Background (4)	NYSDEC Site Cleanup Goals (5)
	Waste Materials	Shallow Fill/Soil (2)	Deep Soil (3)		
Pesticides/PCBs (cont'd)					
Aroclor-1260	11	34,000	0.67	100	1 and 10[b]
delta-BHC		0.0013		0.11[a]	
alpha-Chlordane	0.015	0.0004		0.11[a]	
Endosulfan II		0.0008		0.22[a]	
Endrin	0.013			0.22[a]	
Heptachlor		0.0019		0.11[a]	
Heptachlor Epoxide	0.017			0.017	
Inorganics					
Antimony	47.4	30.6		16	
Arsenic	57.7	43.1	11	18	
Barium	2,770	2,450	83	125	
Beryllium		3		2.4	
Cadmium	131	206	3.1	22	10
Chromium	923	1,260	950	62	50
Cobalt	50.6	45.5	5.7	7.7	
Copper	46,800	14,400	31.4	63	
Lead	34,100	4,400	261	536	500
Manganese	4,390	18,100	490	3,746	

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TABLE 2
LIST OF CHEMICALS IDENTIFIED AT THE SITE
SITE CONCENTRATIONS, BACKGROUND, AND CLEANUP GOALS (MG/KG)

Chemical	Maximum On-Site Concentrations (1)			Representative Background (4)	NYSDEC Site Cleanup Goals (5)
	Waste Materials	Shallow Fill/Soil (2)	Deep Soil (3)		
Inorganics (cont'd)					
Mercury	2.8	4.6	0.26	0.34	
Nickel	732	2,360	24.1	59	
Selenium	11.1	1.2		0.013 a	
Silver	7.8	3.7		2.6	
Vanadium	132	264	20.2	33	
Zinc	69,800	11,000	127	1,198	
Cyanide		1.8		0.00016 a	

(1) A shaded value exceeds the NYSDEC site cleanup goal.
(2) Includes shallow samples from "hot spots," as well as the trench sample.
(3) Includes deep samples from "hot spots."
(4) From Table 1. An "a" indicates that the value is the average background SQL, as the chemical was any background samples.
(5) NYSDEC, 1993. A "b" indicates that the value is for total PCBs for surface and subsurface soils, re

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TABLE 3
CHEMICALS OF CONCERN
FINAL LIST

Polychlorinated Biphenyls
Cadmium
Chromium
Lead

TABLE 4
MATRIX OF POTENTIAL EXPOSURE PATHWAYS
LEHIGH INDUSTRIAL PARK SITE
LACKAWANNA, NEW YORK

Potentially Exposed Population	Exposure Route, Medium and Exposure Point	Complete Exposure Pathway	Comment
Residents	Ingestion of or dermal contact with downgradient groundwater in home	No	The entire area surrounding the site relies on a municipal source.
Residents	Inhalation of volatiles from downgradient groundwater in home	No	The entire area surrounding the site relies on a municipal source.
Residents	Ingestion of, or dermal contact with surface water	No	The site does not appear to have any significant impact on perennial surface water bodies. On-site surface water is of a transient nature.
Residents	Ingestion of, or dermal contact with surface soils and waste on site	Yes	Contaminants were detected in site surface soils and waste. Access is partially restricted by a fence. Occasional trespassing occurs.

TABLE 4 (CONTINUED)
MATRIX OF POTENTIAL EXPOSURE PATHWAYS
LEHIGH INDUSTRIAL PARK SITE
LACKAWANNA, NEW YORK

Potentially Exposed Population	Exposure Route, Medium and Exposure Point	Complete Exposure Pathway	Comment
Residents	Inhalation of volatiles and dust at the site via outdoor air	Yes	Trespassers may inhale dust contaminated with PCBs and metals, although dust meters indicated levels near background. Volatiles are not present at soil concentrations likely to impact the air pathway. PID readings above background were not observed except during excavation. The prevailing wind blows away from nearby residences.