915022

ADDITIONAL SAMPLING AND ANALYSIS FEASIBILITY STUDY
U S METALSOURCE
CHEEKTOWAGA, NEW YORK
ATEC PROJECT NUMBER 21-04-92-00043

2

1992

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U S METALSOURCE
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Final Report
Additional Sampling and Feasibility Study
US Metalsource
1746 Walden Avenue
Cheektowaga, New York
ATEC PROJECT NUMBER 21-04-92-00043

1.0 FACILITY HISTORY

Located at 1746 Walden Avenue Cheektowaga, New York, this facility is on the registry on Inactive Hazardous Waste Sites (Site No. 915022). The New York Department of Environmental Conservation (NYDEC) has designated this site as classification 2-A, requiring further investigation to establish the risk this facility poses to human health and the environment. Records of communication and cursory investigations date back to 1976. The property immediately east of the project site was also placed on the registry for similar disposal practices. Both of these properties were at one time owned and operated by Ernst Steel Corporation. The eastern site has been the subject of numerous investigations and has undergone remedial action. Details of the investigation and closure are a matter of public record.

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In April, 1992, USM and the NYSDEC agreed upon a work plan for interim remedial measures and a Phase Two investigation at this site. A consent order was executed and ATEC mobilized to the site on April 27, 1992, to execute the project.

In accordance with the consent decree and the contract between ATEC and USM, approximately eighty (80) cu yds of paint contaminated soils were removed from the site and transported to the Browning-Ferris landfill in Niagara Falls, New York. Prior to this phase of the project, ATEC had collected and analyzed a sample from the area in question. This sample did not fail any of the parameters of the Toxic Characteristic Leachate Procedure and was permitted as special waste by NYDEC.

After removal of the surfical 80 cubic yards, orange/red staining which is indicative of the paint sludge contamination was still present in the base of the excavation. Because of this visual evidence of contamination, confirmatory sampling was not performed during this portion of the project. In an attempt to qualitatively delineate the area of impacted material, a series of test pits was excavated in the area of concern. Upon excavation of the first test pit, orange/red staining was discovered below the surface extending to the underlying natural soils. At the request of Mr. Jaspal Wallia of the NYDEC, further test pits were excavated in a more random fashion, concentrating on topographically low areas where dumping activities were more likely to occur. A total of twelve (12) pits was excavated throughout the site. Visual inspection of these test pits indicated the potential for up to 11,000 tons of impacted material at this site. The staining was sporadically present from immediately below the surface to a depth of 2.5 ft below ground surface (bgs) throughout the 2.5 acres in question. As a result of these observations, ATEC demobilized and proposed further investigation to establish the most cost effective and environmentally sound remedial options.

2.0 SAMPLING AND ANALYSIS

ATEC collected an additional fifteen (15) discreet samples and four (4) composite samples for further analysis at this site. The discreet samples were intended to establish the areal extent and volume of impacted materials. Composite samples were collected for laboratory treatability studies which are discussed later in this report. Figure one (1) illustrates the sampling locations utilized by ATEC.

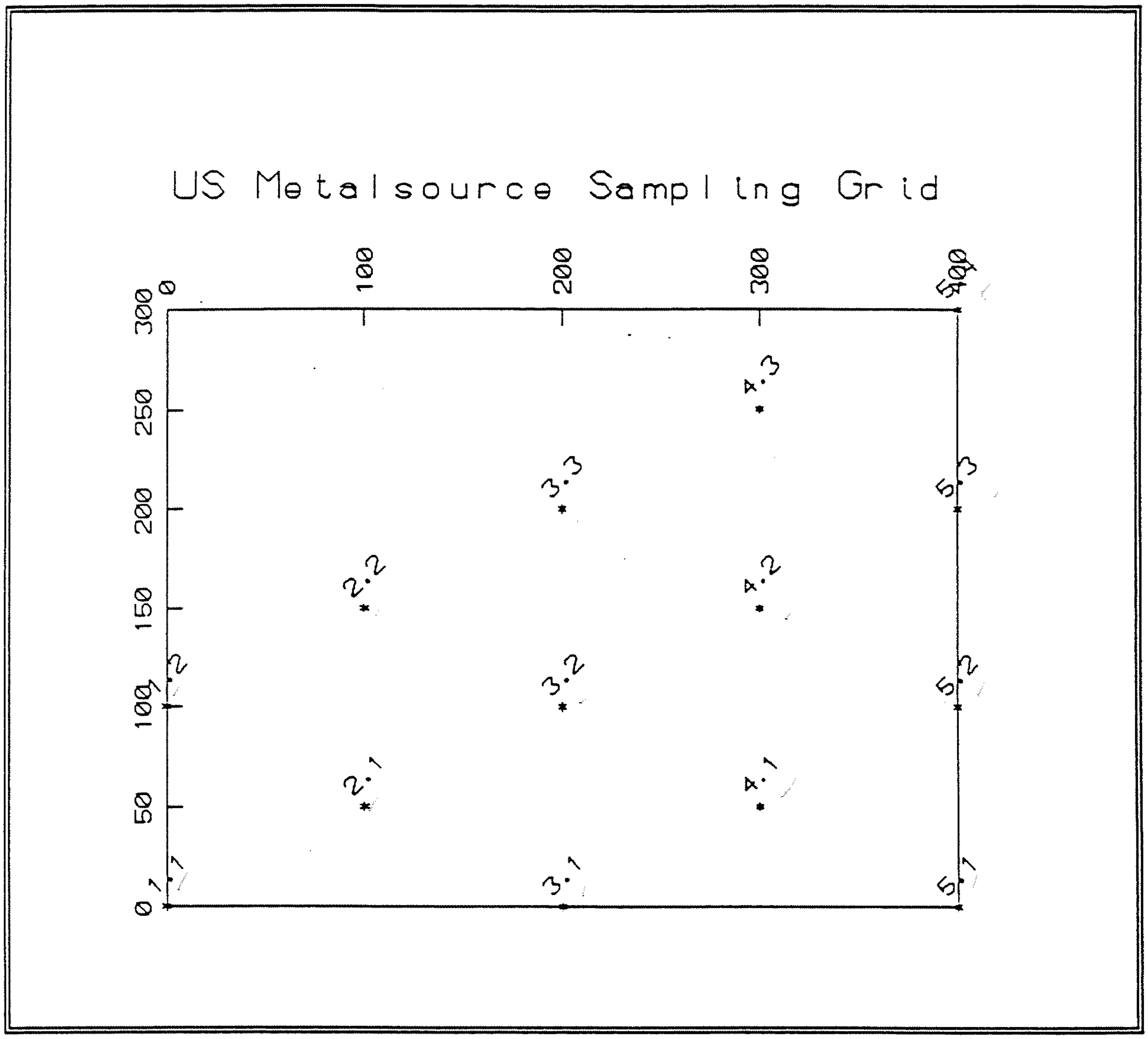

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Figure 1

All samples were collected utilizing a combination of push and screw type augers. Each auger was advanced until native soil was encountered (depths varied between 1.5 and 2.5 ft bgs). Samples were collected from the entire fill profile with a bias toward material that exhibited characteristics of contamination (staining). Sampling equipment was decontaminated between each station with a detergent wash and fresh water rinse. Decontamination water is contained on site in 55 gallon 17H DOT shippable drums.

Samples were submitted to ATEC's Indianapolis, Indiana Laboratory for analysis of Total lead (Pb), Total Chromium (Cr), Extraction Procedure Toxicity (EP-TOX) lead and chromium. All sample preservation and chain of custody documentation was strictly observed. Laboratory analysis were performed on a Thermo Jarrell Ash ICAP-61 and Perkin-Elemer 5100 Atomic Absorption Spectropothometer in accordance with protocols stipulated in SW846 TEST METHODS FOR EVALUATING SOLID AND HAZARDOUS WASTES PHYSICAL/CHEMICAL METHODS.

Table one (1) illustrates the laboratory results from the discreet samples.

Sample ID	East	North	Total Pb	Total Cr	EP-TOX Pb	EP-TOX CR
1.1	0	0	460	260	0	0
1.2	0	100	2700	190	4.8	0
2.1	100	50	4300	240	13	0
2.2	100	150	710	150	0.6	0
3.1	200	0	170	14	0.056	0
3.2	200	100	200	18	0.094	0
3.3	200	200	110	18	0	0
4.1	300	50	25000	3300	200	0.19
4.2	300	150	870	29	2.8	0
4.3	300	250	4400	140	18	0.054
5.1	400	0	140	28	0.97	0
5.2	400	100	35	18	0.65	0
5.3	400	200	310	23	0.81	0
5.4	400	300	330	21	0.79	0

* all concentrations in milligrams/kilogram

Copies of all laboratory data and documentation are included in Appendix A of this report.

3.0 AREAL EXTENT AND VOLUME OF IMPACTED MATERIAL

In order to determine the areal extent and volume of contamination, ATEC entered the data developed from the field investigation and laboratory analysis into Golden Graphics Surfer program to contour the results. Surfer mathematically grids the available data and calculates the geometry of the resultant surface. Plots were generated for Total Pb and Cr in addition to EP-TOX Pb. Figure Two (2) is a three dimensional plot of the Total lead concentrations greater than the 500 mg/Kg action level.

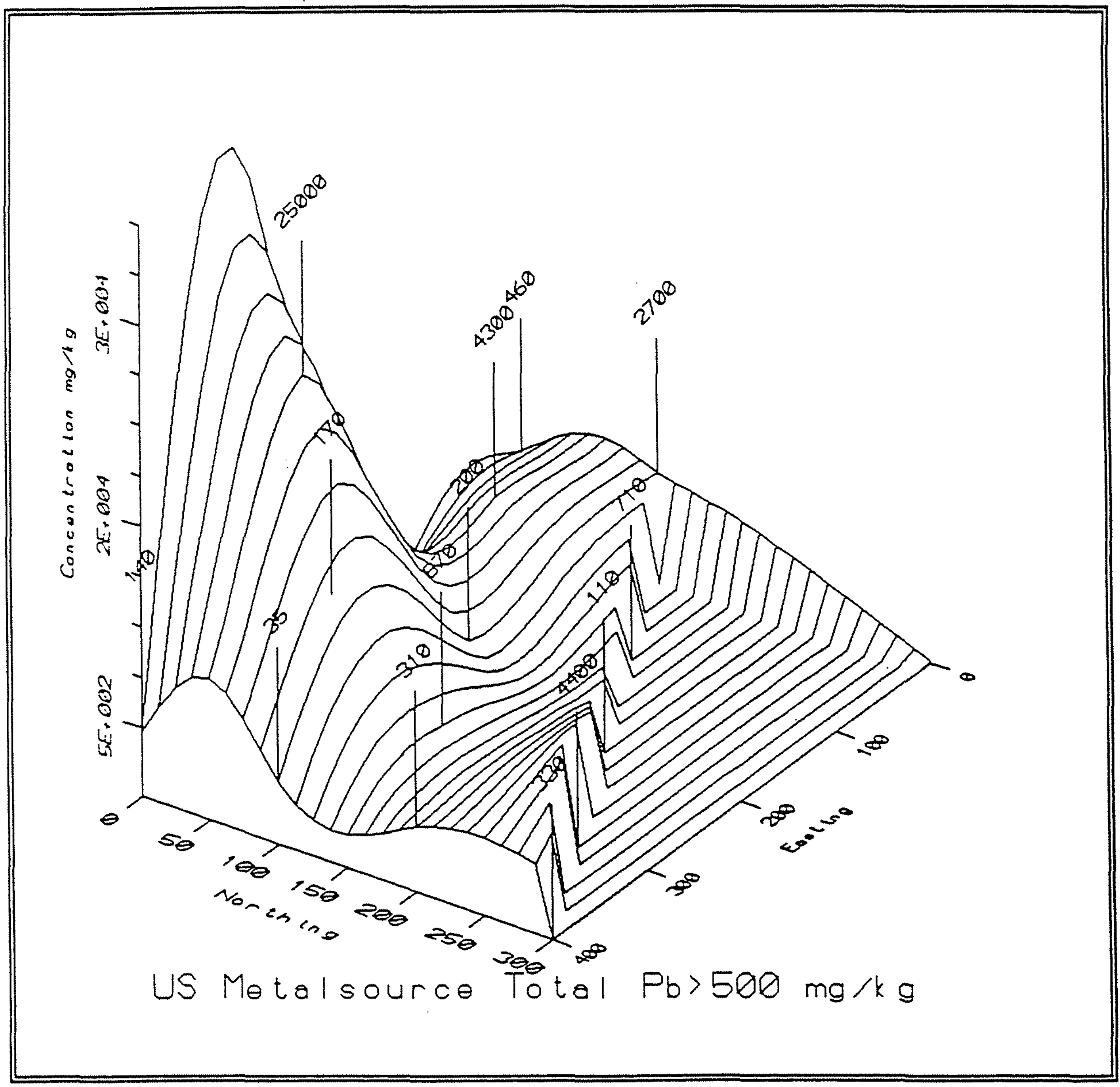

Figure 2

Similarly, Figure Three (3) illustrates the Chromium concentrations within the laboratory detection limits.

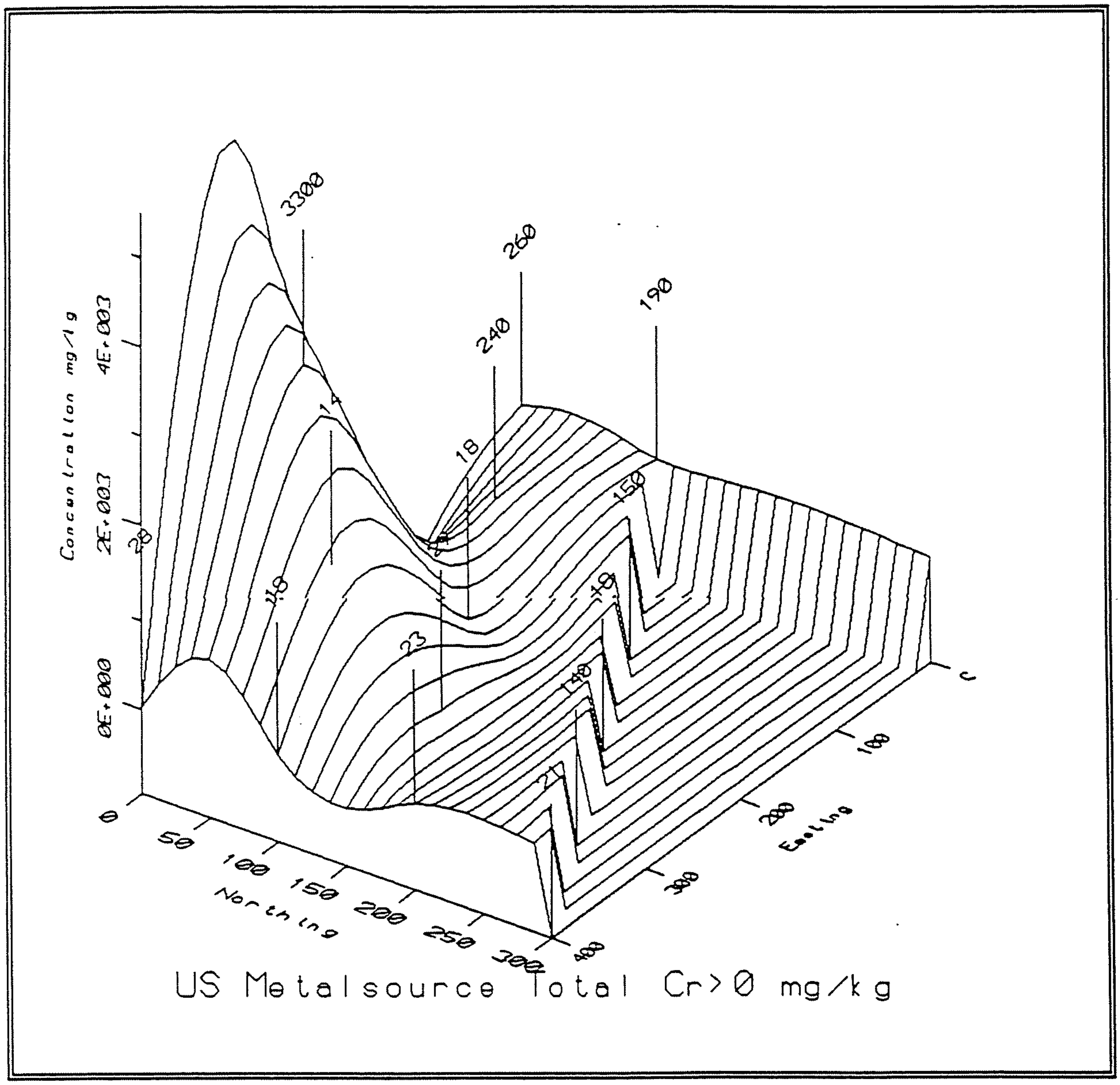

Figure 3

EP-TOX results were plotted for lead concentrations only. Until this sampling event, none of the metals concentrations had exceeded federal guidelines for either the EP-TOX or Toxic Characteristic Leachate Procedure (TCLP) action levels. Three (3) of the discreet samples did exceed the Federal five (5) mg/Kg action level. Figure Four (4) illustrates the areal extent of lead impacted soils above EP-TOX Action levels.

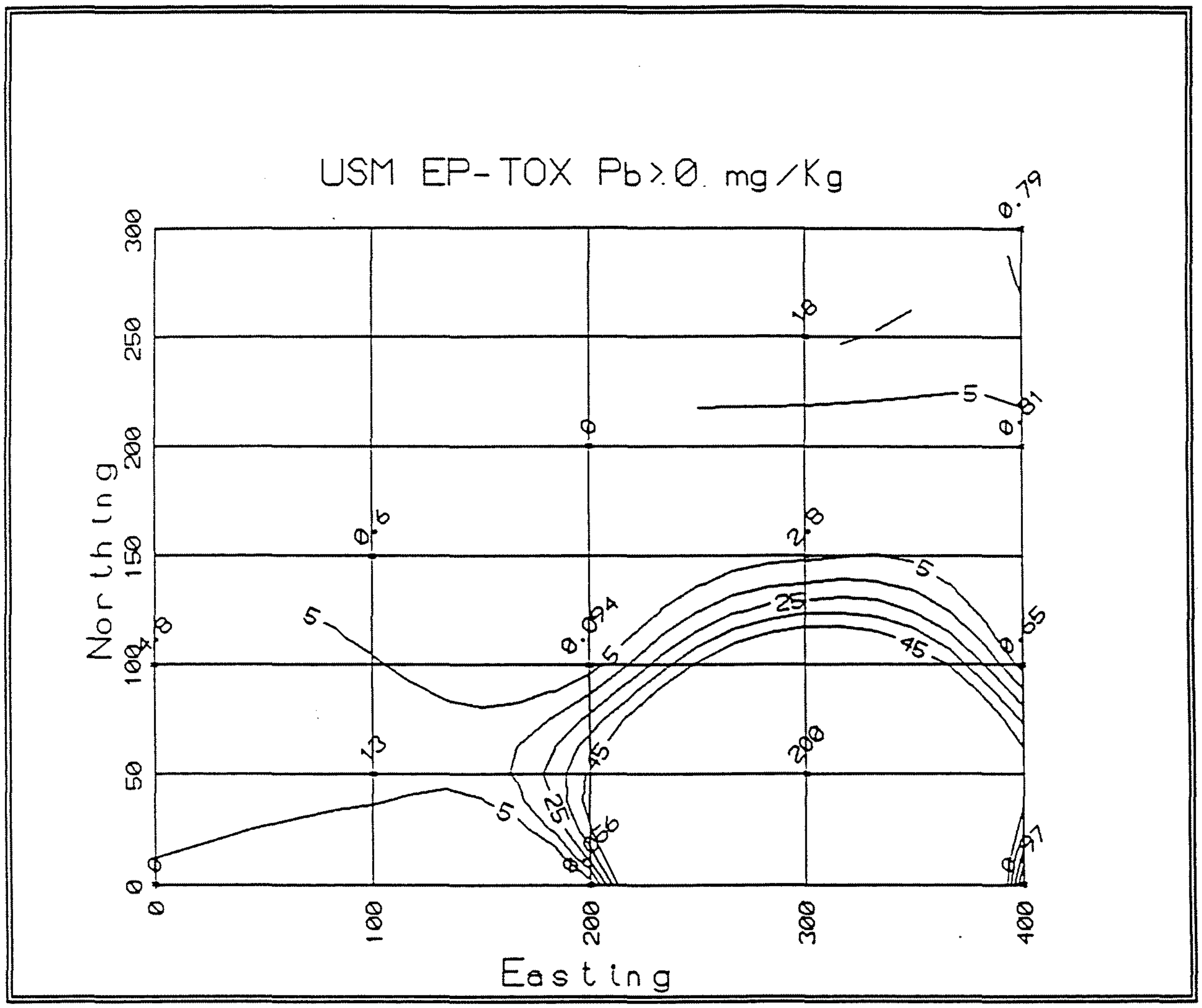

Figure 4

As previously noted in this report, the approximate depth of the fill material was established at each sampling point. The fill material is generally black aggregate with a large amount of organic material. Underlying soils are classified as till, (unsorted mixture of rock particles) with a large percentage of clays. Using the same methods as described previously, ATEC generated computer plots of the depth of fill for this tract.

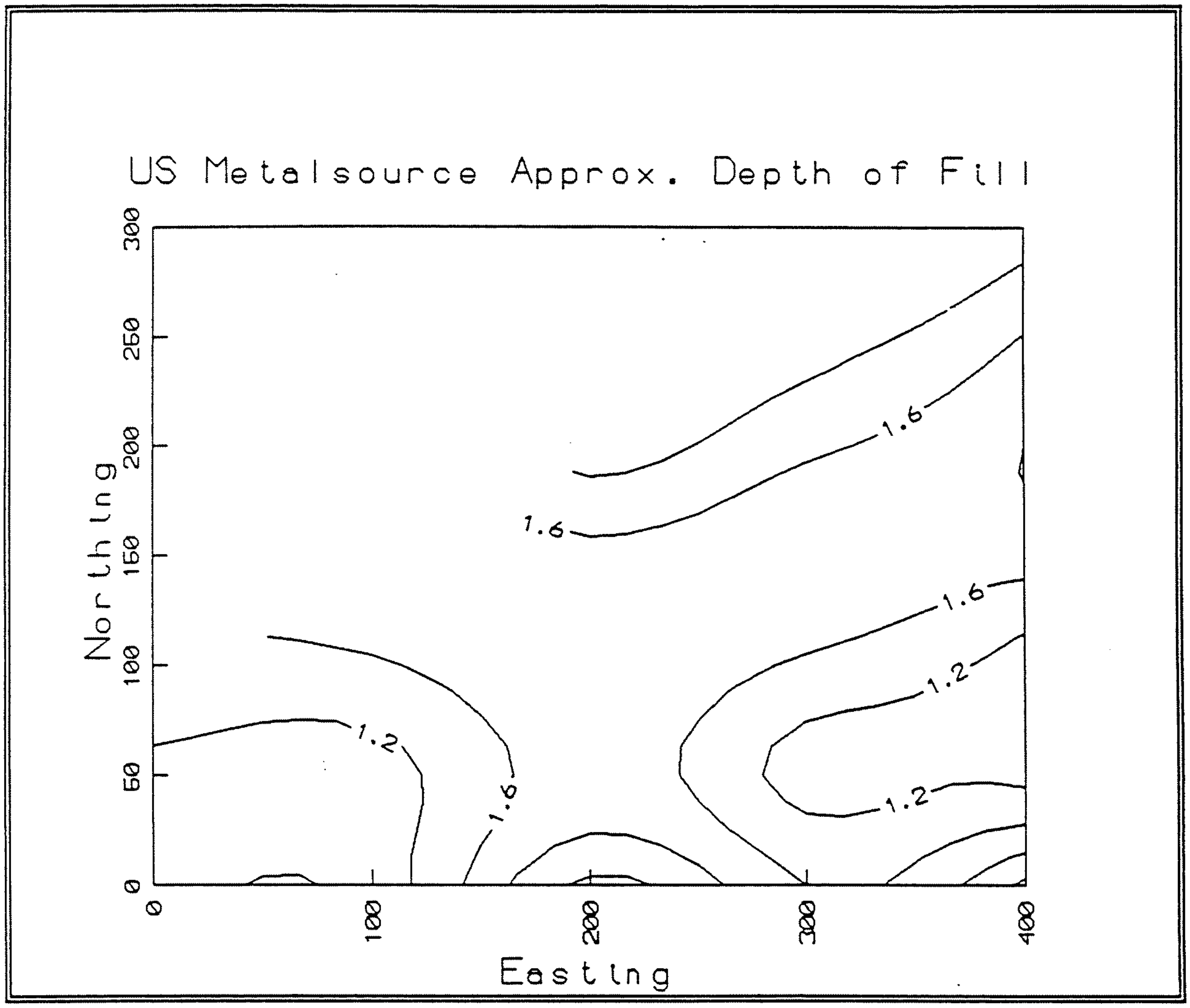

Fig. 5

Utilizing this data, the volume of total fill material is calculated at approximately 6,400 cubic yards in place or 7,600 cubic yards including the expansion factor. This equates to 11,500 tons of fill material in the 2.5 acre area of concern.

As shown in the prior figures, not all 11,000 tons are above either total lead or EP-TOX action levels. ATEC estimates 2800 tons of material is classified as a hazardous waste and an additional 3375 tons is above the 500 mg/Kg action level stipulated in the consent order.

4.0 CHARACTERISTICS OF THE FILL MATERIAL

In order to conduct a limited scale feasibility study at this facility, several physical and chemical characteristics of the impacted material were established. These laboratory analyses help define the in-situ chemical reactions of the material and fluid migration through the material. All laboratory data for this phase of the project is included in appendix B of this document.

4.1 Grain Size Analysis

A standard grain size distribution was performed on one (1) composite sample. contains the result of this analysis. Interpretation of this data indicates the fill material will classify a poorly graded sand and gravel. The effective grain size (D_{10})is .1365 mm with a uniformity coefficient (Cu) of 81.3. The coefficient of curvature (C_z) is .35. Both the C_u and C_z values fall well outside the ranges expected for naturally deposited materials. These values indicate a random distribution of grain size and would lead to the conclusion that inhomogeneity would be present in the fill.

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4.2 Specific Gravity of Fill

To establish density and porosity of the fill material, an ASTM D854 Specific Gravity test was conducted (Appendix B). Specific gravity for this material is 2.688 (water = .9991). Mathematically, the specific gravity can be utilized to establish the soil density. This manipulation approximates the soil density (dry) at 1.68 gm/cm^3. This yields an approximate porosity for the material of 37 percent.

4.3 Atterberg Limits

The Atterberg test defines the liquid limit (W_l) and plastic limit (W_p) of a soil water mixture. Above W_l the soil-water system is suspension. Above the W_p, but below the W_l, the system is in a plastic (deformable) state. Below the plastic range, the soil is defined as being within the shrinkage limit (W_s). In essence, W_s defines the point at which the soil-water system becomes under saturated and air encroaches into the voids.

Atterberg limits vary according to the amount and types of clay in the system and the chemical nature of the ions adsorbed onto the clay. This specimen illustrates the following Atterberg parameters:

$W_l = 55$
$W_p = 26$
$Pi = Wl-Wp = 29$

This indicates the sample is has a minor amount of cohesive silt and clay fraction.

4.4 Cation Exchange Capacity

Cation Exchange Capacity (CEC) is a measure of the capacity of clays in a given sample to adsorb factors positively changed ions (Cations). Commonly, this is used as an index of the sorption capacity of a given material. Limiting factors of CEC are the mineralogy and percentage of clays present and the amount of organic material (humus) present. Clays have a net negative charge on the exterior surface; thus, cations will electrically bond to clay surfaces.

One (1) sample was analyzed for CEC at ATEC's Indianapolis laboratory. Sodium (NA^+) in a fluid media was utilized as the displacing cation. Results of this analysis indicate that the fill material has a low capacity for cation exchange at 9.9 meq/100 grams. This test indicates the soils have a low capacity to sorb ions which is consistent with the small amount of clays present in the grain size analysis discussed previously in this report.

4.5 Permeability

Direct quantitative analysis of the permeability (K) of the fill material was not attempted in the field or laboratory. The fill material was not sufficiently cohesive to allow for valid samples. Alternatively, the Hazen method was applied to previously discussed grain size distribution analysis to provide an empirical estimate of K. The Hazen method is:

$$K = C\,(D_{10})^2$$

where C is a coefficient established experimentally. For this case, C=80 to 120, therefore, the estimate of K ranges from 1.49 X 10 -2 to 2.235 X 10 -2 cm/sec.

5.0 EVALUATION OF ALTERNATIVE REMEDIAL ACTIONS

Pursuant to the objectives of this phase of the project, ATEC conducted two (2) distinct treatability studies and prepared costs for five (5) separate types of remedial actions. Those actions considered were:

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- Construction of a Resource Conservation & Recovery Act (RCRA) style Cap
- Excavation, transportation and disposal of Hazardous and non-Hazardous material
- Stabilization of the material by addition of buffering capacity to the material
- Electro Kinetic removal of the contaminants
- A combination of stabilization and removal of the material

Estimates of costs and project performance times were prepared for each type of action. Also conclusions and recommendations pertaining to the treatability studies are presented along with the data developed by ATEC.

5.1 RCRA Stvle Cap

This method of closure has been applied to Solid Waste Management Units and "Superfund" sites for several years. In essence, this Cap consists of a low permeability (10^{-6}cm/sec) barrier placed over the impacted soils. Construction materials range from synthetic liners to compacted clay.

Because of the disparity of grain size in the fill material, ATEC recommends that the following construction methods be utilized at this site:

- Removal of all trees and vegetation (clearing and grubbing)
- Grading of the 2.5 acres to control runoff
- Placement of 18" of compacted clay over the liner in 6" lifts
- Placement of six (6) inches of top soil over clay
- Final Grade
- Seeding

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Installation of both the liner and clay cap is critical to the success of this method. Standard inspection of the liner installation (particularly seams) will be required. During the installation of clay cap, one (1) density test will be required for each 500 ft^2 of Cap and one (l) permeability tests for each 5000 ft^2 of Cap.

With a cap installation, it is likely that an ongoing operation and maintenance program will be required. It is probable that this program would be as defined in RCRA (40CFR 276). This includes quarterly groundwater monitoring. Included in the cost estimates presented by ATEC are operations and maintenance costs.

5.2 Excavation - Transportation and Disposal

Evaluation of this remedial action is essentially unchanged from prior work plans submitted by ATEC (Appendix D). As the tonnage estimate of material to be removed has changed, the cost per yard figure has been reduced for non-hazardous materials. As noted in Section 2.0 of this report, three (3) of the samples failed the E-P toxicity test for lead. This material will require disposal as a hazardous waste.

Figure Five (5) illustrates the areas to be excavated and disposed of as RCRA Waste.

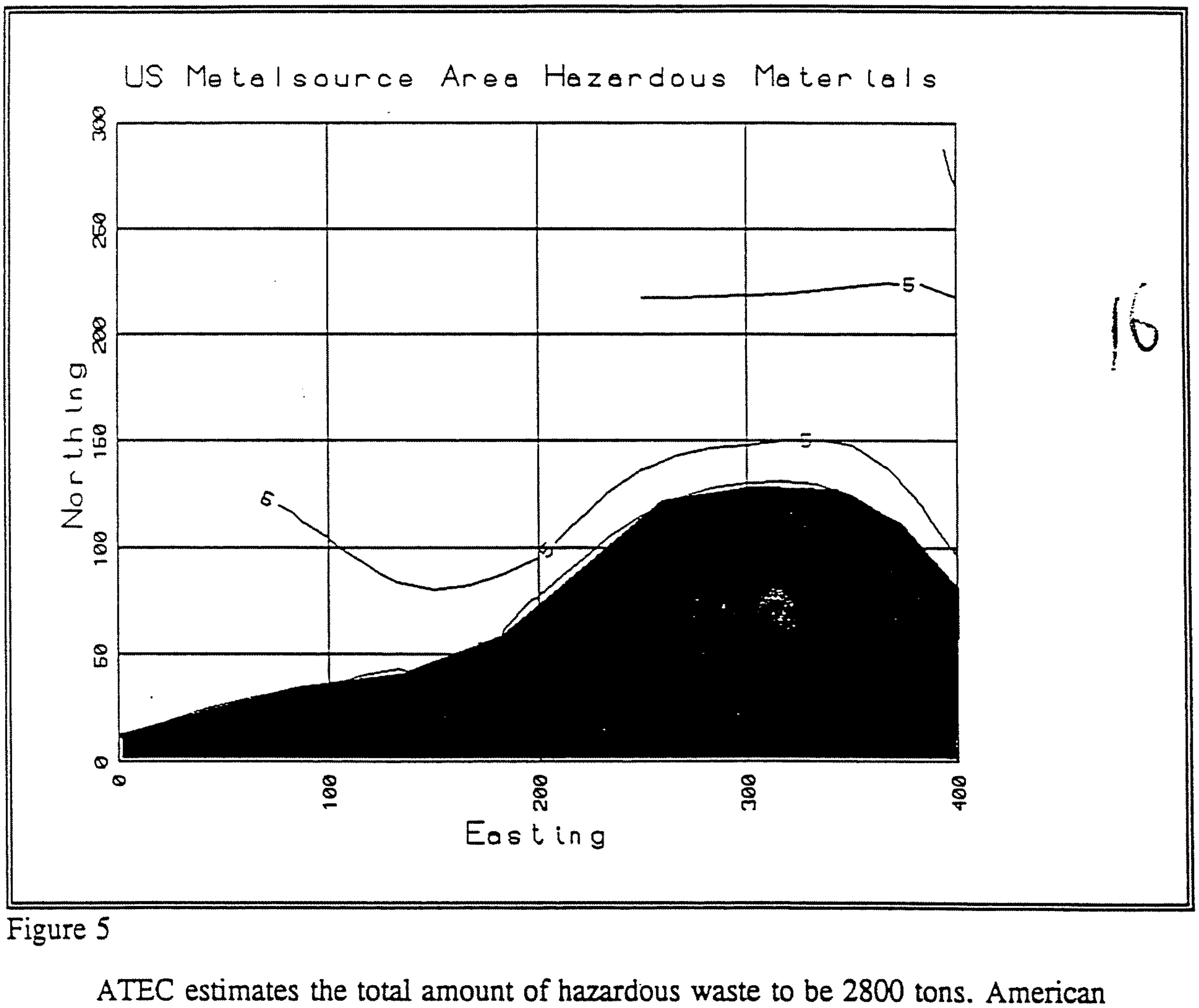

Figure 5

ATEC estimates the total amount of hazardous waste to be 2800 tons. American Wastes systems will provide the transportation and disposal of this material.All decontamination, sampling and manifesting procedures will be identical to ATEC's prior work plan with the exception of ultimate disposal facility.

5.3 Stabilization

ATEC has experienced success with stabilizing hourly metals in-place by altering the pH of the geochemical system to level where the targeted element is least soluble. In order for this method to be successful and site specific, geochemical parameters must be established.

As the element of primary concern at this site is lead (Pb), it is fundamental to establish which mineralogy of the Pb currently in the system in order to ascertain solubility controls. Commonly, Pb precipitates take the form of Anglesite ($PbSO_4$) or Cerrusite ($PbCO_3$) contingent upon the abundance of anions in the natural waters.

Total aqueous metals concentrations are generally limited by the solubilities of minerals or amorphous substances. The solubility product (K_{so})is defined as

$$K_{so} = (M^{b+})^a (B^{a-})^b$$

where M^{b+} = Metal cation

B^{a-} = Anion

The activity of the solid phase ($m_aB_b(s)$) is unity by convention, therefore as K_{so} is exceeded, precipitates begin to form.

The solubility of lead is controlled by the pH of the water and the concentration of anions which lead from precipitates. The total soluble lead concentration is equal to the sum of various Pb species. Details of the geochemical derivation of Pb solubilities are provided in Appendix D of this report.

To establish which anion is controlling lead precipitation at this site, ATEC collected one (1) sample from the existing monitoring well. This sample was analyzed for pH, alkalinity and sulfide concentration.

The following documents ATEC's results of the water analysis:

pH	7.8
Carbonate	520 mg/l
Sulfate	390 mg/l

With these values, it is possible to determine which precipitate is dominating the natural water system and the optimal pH required to minimize the solubility. Table 2 illustrates these calculations.

K1=	2.00e-08		K4=	1.9953e-13
K2=	7.94e-18		K5=	7.9433e-14
K3=	7.94e-29		K6=	1.5849e-08
pH	7.80e+00		Ka1=	5.01e-07
H	6.31e+07		Ka2=	5.01e-11
SO4	3.90e+02	mg/l	Ks1=	1.00e+03
CO2	5.20e+02	mg/l	Ks2=	1.02e-02
Gamma	1.00e+00		St=	4.06e+00
Alpha2	6.31e-33		Ct=	6.84e+00
Beta2	2.57e-15		Log M=	6.09e-01
			Log M=	8.35e-01
Pbt Oxide	1.21e-11	moles/liter		
Pbt Carb.	1.84e+18	moles/liter		
Pbt Sulfide	1.52e+06	moles/liter		

Results of this calculation indicate that the dominate geochemistry is carbonate as illustrated in Figure Seven (7).

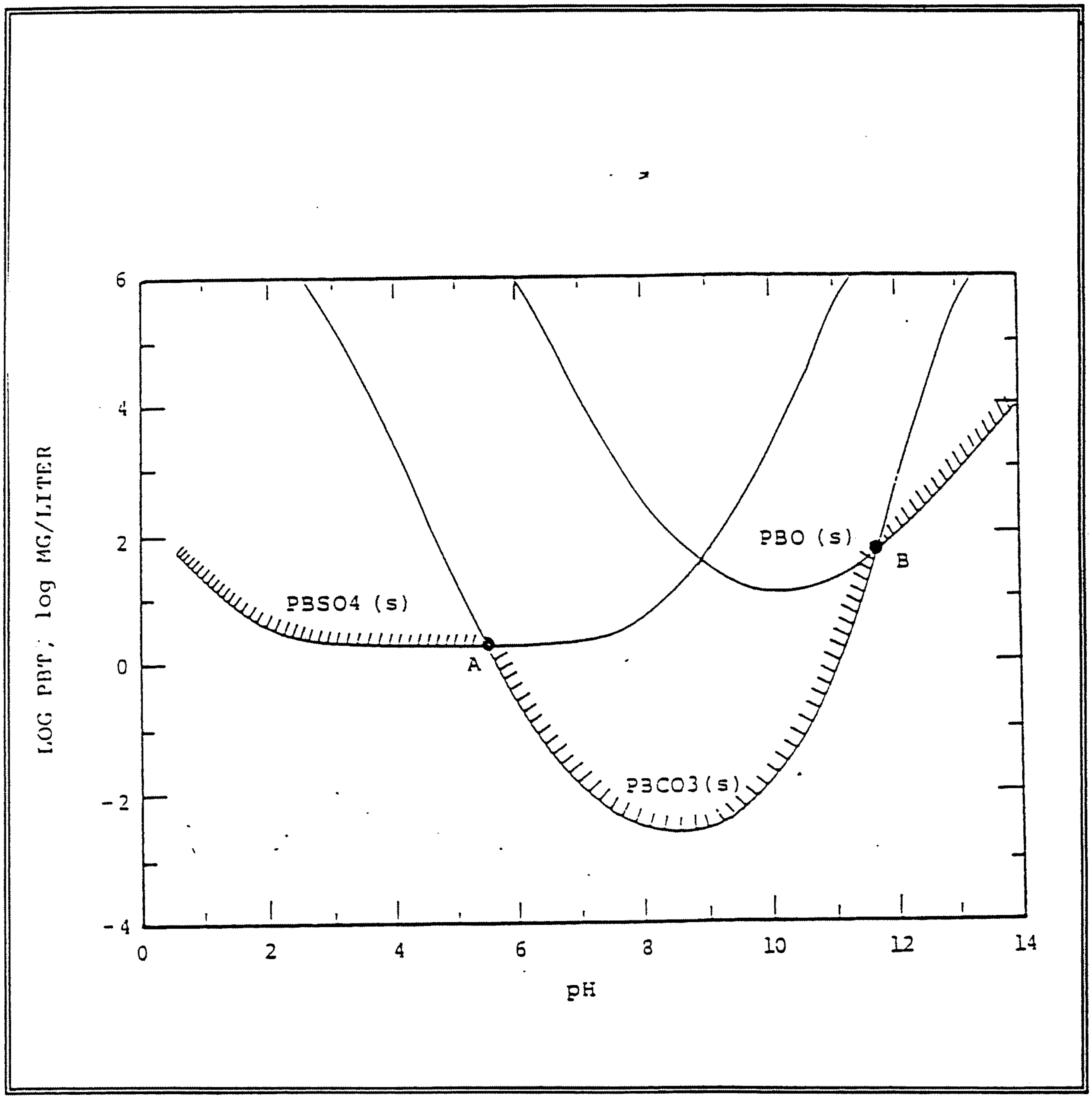

Figure 7

As a result of this information, it is apparent that the material in question can be stabilized by the addition of buffering capacity to the soils. Various compounds have been utilized for this including agricultural lime, portland cement and fly ash. In order to test this hypothesis, ATEC performed a series of EP-Toxicity tests, with varying additions of $CaCO_3$ by weight. Included in these tests is a control group with no lime addition. Table 3 summarizes these results.

Table 3

%$CaCO_3$ Addition	EPTOX CR	EPTOX Pb
0	.23	22
2	.14	16
5	.08	9
15	.26	16

In addition to the EP-TOX testing ATEC performed a column leaching test on three (3) samples. Solutions of pH of 4,6 and 8 were passed through a column of fill material with a known total lead concentration of 20,000 mg/kg lead. As expected with decreasing pH, the mobility of lead was enhanced. At a pH value of 8, lead leachate values were one mg/liter.

Although the addition of calcium carbonate during the EP-Tox testing did not bring the levels below the federal guidelines, significant decreases in leachate concentration were illustrated with the exception of the 25 percent addition. It is likely that this amount of CaCO3, in fact raised the pH level above the carbonate window, and mobilized the lead. From the information attached in Appendix D, the optimal pH value is 8.5. Approximatley 10 percent $CACO_3$ addition by weight should stabilize these soils.

5.4 Electro Kenetics

Recent research has indicated that the application of low amperage direct currents can effectively remove both metals and organic compounds for soils. Electro-Kenetics has been used for a considerable period of time for construction dewatering and stabilization projects. Electro Kinetic (EK) removal of contaminates from a soil or slurry is accomplished by the primary electrode reactions of:

$$2H_2O - 4_{e-} \rightarrow O_{2\uparrow} = 4H^+ \text{ (anode }^+\text{)}$$

$$4H_2O - 4_{e-} 2H_2\uparrow + 4OH^- \text{ (cathode }^-\text{)}$$

The production of water at the anode increases the pH in the aqueous phase, establishes an acid front which moves through the solid media by advection or hydraulic gradients. Migration of this low pH front solubilizes the metal anions which are then precipitated at the high pH cathode.

Limiting factors for this reaction are:

1. Permeability of the material
2. Electro osmotic of the material conductivity

ATEC performed three (3) discreet bench studies to establish if this technology was appropriate for this site. Results of these tests indicate that this technology is not applicable due to the high hydraulic conductivity of the fill material, negating the acid front migration.

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Laboratory experiments have indicated that a hydraulic conductivity of 1×10^{-5} $^{cm}/_{sec}$ is the limiting factor. As mentioned previously in this report, the fill material is three (3) orders of magnitude greater than this value.

Atec attempted to negate this parameter by performing one (1) bench test designed to emulate field conditions. An open top cell was leaded with 2500 cm^3 of the fill material. Total lead concentration for this sample was established at 2100 mg/kg. De-ionized water was added to the saturation point (ponding) and a total current of 4.84 mA @ 12.25V was introduced through graphite anodes/cathodes. After 36 hours, samples were collected at the anode and cathode and analyzed for total Pb. Table 4 documents these results.

Table 3

Sample	Total Pb (mg/kg)	Comments
S-1	2100	Base line
S-2	1600	Anode
S-3	1500	Cathode

Throughout this test, pH was intermittently tested with no statistically valid change. While a reduction of pH values was realized, it is apparent that the variation is not likely a function of the inhomogeneity of the Pb concentrations, not a result of the EK treatment.

Separate from the permeability, a large amount of metallic debris was noted in many of the samples. The presence of solid metals in the fill material will significantly modify current flow paths and render the system inefficient if not ineffective. ATEC's study indicates that EK is not a viable alternative for this site.

6.0 CONCLUSIONS

Several remedial alternative are present for this site. By far, the most cost effective is the stabilization of the material in place. ATEC recommends this course of action. As this methodology for lime stabilization is similar to excavation, transportation and disposal, the work plan as previously presented to the NYSDEC is still valid. This work plan includes public notification, site safety and health and equipment decontamination.

This method demonstrates several advantages to both US Metalsource and the State of New York. As this site is industrial and continued usage of the facility as an industrial complex is anticipated, the probability of direct exposure to the lead at this site is low.

The stabilization process will render the metals non-leachable and preclude migration into either surface or groundwater. Landfill capacity is not utilized and the liability of a hazardous waste stream is not an issue.

7.0 QUALIFICATIONS

Our professional services have been performed, our findings obtained and our recommendations prepared in accordance with customary principles and practices in the fields of environmental science and engineering, and all work procedures were conducted in accordance with standard guidelines. This warranty is in lieu of all other warranties either express or implied. This company is not responsible for the independent conclusions, opinions or recommendations made by others based on the field exploration and laboratory test data presented in this report.

APPENDIX A

CHEMICAL ANALYSIS

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ATEC Environmental Consultants
Division of ATEC Associates, Inc.
5150 East 65th Street
Indianapolis, Indiana 46220-4871
[317] 849-4990. FAX # [317] 849-4278

Solid & Hazardous Waste Site Assessments
Remedial Design & Construction
Underground Tank Management
Asbestos Surveys & Analysis
Hydrogeologic Investigations & Monitoring
Analytical Testing / Chemistry
Industrial Hygiene / Hazard Communication
Environmental Audits & Permitting
Exploratory Drilling & Monitoring Wells

July 29, 1992

Mr. Kevin Hopkins
ATEC Environmental Construction Division
5150 E. 65th St.
Indianapolis, IN 46220

Re: Fourteen Soil Samples for Total Chromium Lead
Fourteen Soil Samples for EP-Tox RCRA Metals
U.S. Metal Source
ATEC Project Number 21-04-92-00043

Dear Mr. Hopkins:

Enclosed is a thirty page report of results for the Chemical Analyses for the fourteen soil samples which were submitted to the ATEC Environmental/Analytical Testing Division on July 16, 1992. Metals were analyzed on a Thermo Jarrell Ash ICAP-61 and on a Perkin-Elmer 5100 Atomic Absorption Spectrophotometer according tc SW 846 Methods 6010 and 7000 Series.

The analytical procedures are performed in accordance with the ATEC Analytical Standard Operating Procedures, which are based on the methods referenced in this report. These SOPs are available for your review upon request.

All soil results are reported on "as received" basis unless otherwise specified. The associated Quality Control information has been included with this report. A copy of these records will also be maintained in the Testing Division files.

A Definition of LIMS Terms is included in this report for your convenience. Two copies of this Analytical Report are being provided for your records. Additional copies can be provided at a minimum cost of $30.00 per copy. It has been a pleasure serving you and, as always, if there are any questions concerning these results or the ATEC policies, please feel free to contact me.

Respectfully submitted,
ATEC Associates, Inc.

John D. Dwenger
Inorganic Group Leader
Environmental/Analytical
Testing Division

JDD/rss

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Materials Engineers

ATEC ENV. CONSTRUCTION DIV.
5150 E. 65TH ST.
Indianapolis, IN 46220

Attn: Kevin Hopkins
Invoice Number:

Order #: 92-07-160
Date: 07/29/92 10:48
Work ID: US Metal Source(2104-9200043)
Date Received: 07/16/92
Date Completed: 07/29/92

SAMPLE IDENTIFICATION

ATEC Sample Number	Client Sample Description	ATEC Sample Number	Client Sample Description
01	1-1	02	1-2
03	2-1	04	2-2
05	3-1	06	3-2
07	3-3	08	4-1
09	4-2	10	4-3
11	5-1	12	5-2
13	5-3	14	5-4

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Certified By
John D. Dwenger

Received: 07/16/92

SAMPLE ID	1-1	TEST CODE	EPM8	NAME	EP TOX METALS
FRACTION	01A	Date & Time Collected	07/14/92	Category	SOIL

DATE ANALYZED	07/20 to 07/24/92
ANALYST	EVS, TLB
VERIFIED BY	JDD
UNITS	mg/L
COMMENTS	

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EPTOX METALS

PARAMETER	RESULT	LIMIT	METHOD
EPTOX METALS			
Arsenic	<0.050	0.050	7060
Barium	1.4	1.0	6010
Cadmium	<0.010	0.010	6010
Chromium	<0.050	0.050	6010
Lead	<0.050	0.050	6010
Mercury	<0.002	0.002	7470
Selenium	<0.010	0.010	6010
Silver	<0.050	0.050	6010

Analytical Method: SW 846

SAMPLE ID 1-1 TEST CODE MET11S NAME TOTAL METALS-SOIL
FRACTION 01A Date & Time Collected 07/14/92 Category SOIL

DATE ANALYZED	07/17 to 07/20/92
ANALYST	TLB, MAV
VERIFIED BY	JDD
UNITS	mg/Kg
COMMENTS	

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TOTAL METALS

PARAMETER	RESULT	LIMIT	METHOD
Total Metals			
Chromium	260	2.0	6010
Lead	460	2.0	6010

Analytical Method: SW 846

Received: 07/16/92

SAMPLE ID 1-2 TEST CODE EPM8 NAME EP TOX METALS
FRACTION 02A Date & Time Collected 07/14/92 Category SOIL

DATE ANALYZED	07/20 to 07/24/92
ANALYST	EVS, TLB
VERIFIED BY	JDD
UNITS	mg/L
COMMENTS	

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EPTOX METALS

PARAMETER	RESULT	LIMIT	METHOD
EPTOX METALS			
Arsenic	<0.050	0.050	7060
Barium	1.1	1.0	6010
Cadmium	0.012	0.010	6010
Chromium	<0.050	0.050	6010
Lead	4.8	0.050	6010
Mercury	<0.002	0.002	7470
Selenium	<0.010	0.010	6010
Silver	<0.050	0.050	6010

Analytical Method: SW 846

Received: 07/16/92

SAMPLE ID 1-2 TEST CODE MET11S NAME TOTAL METALS-SOIL

FRACTION 02A Date & Time Collected 07/14/92 Category SOIL

DATE ANALYZED	07/17 to 07/20/92
ANALYST	TLB, MAV
VERIFIED BY	JDD
UNITS	mg/Kg
COMMENTS	

30

TOTAL METALS

PARAMETER	RESULT	LIMIT	METHOD
Total Metals			
Chromium	190	2.0	6010
Lead	2700	2.0	6010

Analytical Method: SW 846

Received: 07/16/92

SAMPLE ID 2-1 TEST CODE EPM8 NAME EP TOX METALS

FRACTION 03A Date & Time Collected 07/14/92 Category SOIL

DATE ANALYZED	07/20 to 07/24/92
ANALYST	EVS, TLB
VERIFIED BY	JDD
UNITS	mg/L
COMMENTS	

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EPTOX METALS

PARAMETER	RESULT	LIMIT	METHOD
EPTOX METALS			
Arsenic	<0.050	0.050	7060
Barium	3.0	1.0	6010
Cadmium	<0.010	0.010	6010
Chromium	<0.050	0.050	6010
Lead	13	0.050	6010 ✓
Mercury	<0.002	0.002	7470
Selenium	<0.010	0.010	6010
Silver	<0.050	0.050	6010

Analytical Method: SW 846

ATEC Associates REPORT Work Order # 92-07-160
Received: 07/16/92

SAMPLE ID 2-1 TEST CODE MET11S NAME TOTAL METALS-SOIL
FRACTION 03A Date & Time Collected 07/14/92 Category SOIL

DATE ANALYZED	07/17 to 07/20/92
ANALYST	TLB, MAV
VERIFIED BY	JDD
UNITS	mg/Kg
COMMENTS	

32

TOTAL METALS

PARAMETER	RESULT	LIMIT	METHOD
Total Metals			
Chromium	240	2.0	6010
Lead	4300	2.0	6010

Analytical Method: SW 846

Received: 07/16/92

SAMPLE ID 2-2 TEST CODE EPM8 NAME EP TOX METALS

FRACTION 04A Date & Time Collected 07/14/92 Category SOIL

DATE ANALYZED	07/20 to 07/24/92
ANALYST	EVS, TLB
VERIFIED BY	JDD
UNITS	mg/L
COMMENTS	

EPTOX METALS

33

PARAMETER	RESULT	LIMIT	METHOD
EPTOX METALS			
Arsenic	<0.050	0.050	7060
Barium	1.8	1.0	6010
Cadmium	<0.010	0.010	6010
Chromium	<0.050	0.050	6010
Lead	0.60	0.050	6010
Mercury	<0.002	0.002	7470
Selenium	<0.010	0.010	6010
Silver	<0.050	0.050	6010

Analytical Method: SW 846

Received: 07/16/92

SAMPLE ID 2-2 TEST CODE MET11S NAME TOTAL METALS-SOIL
FRACTION 04A Date & Time Collected 07/14/92 Category SOIL

DATE ANALYZED	07/17 to 07/20/92
ANALYST	TLB, MAV
VERIFIED BY	JDD
UNITS	mg/Kg
COMMENTS	

34

TOTAL METALS

PARAMETER	RESULT	LIMIT	METHOD
Total Metals			
Chromium	150	2.0	6010
Lead	710	2.0	6010

Analytical Method: SW 846

Received: 07/16/92

SAMPLE ID	3-1	TEST CODE	EPM8	NAME	EP TOX METALS
FRACTION	05A	Date & Time Collected	07/14/92	Category	SOIL

DATE ANALYZED	07/20 to 07/24/92
ANALYST	EVS, TLB
VERIFIED BY	JDD
UNITS	mg/L
COMMENTS	

EPTOX METALS

PARAMETER	RESULT	LIMIT	METHOD
EPTOX METALS			
Arsenic	<0.050	0.050	7060
Barium	<1.0	1.0	6010
Cadmium	<0.010	0.010	6010
Chromium	<0.050	0.050	6010
Lead	0.056	0.050	6010
Mercury	<0.002	0.002	7470
Selenium	<0.010	0.010	6010
Silver	<0.050	0.050	6010

Analytical Method: SW 846

Received: 07/16/92

SAMPLE ID 3-1 TEST CODE MET11S NAME TOTAL METALS-SOIL

FRACTION 05A Date & Time Collected 07/14/92 Category SOIL

DATE ANALYZED	07/17 to 07/20/92
ANALYST	TLB, MAV
VERIFIED BY	JDD
UNITS	mg/Kg
COMMENTS	

TOTAL METALS

PARAMETER	RESULT	LIMIT	METHOD
Total Metals			
Chromium	14	2.0	6010
Lead	170	2.0	6010

36

Analytical Method: SW 846

SAMPLE ID 3-2 TEST CODE EPM8 NAME EP TOX METALS
FRACTION 06A Date & Time Collected 07/14/92 Category SOIL

DATE ANALYZED	07/20 to 07/24/92
ANALYST	EVS, TLB
VERIFIED BY	JDD
UNITS	mg/L
COMMENTS	

EPTOX METALS

PARAMETER	RESULT	LIMIT	METHOD
EPTOX METALS			
Arsenic	<0.050	0.050	7060
Barium	<1.0	1.0	6010
Cadmium	<0.010	0.010	6010
Chromium	<0.050	0.050	6010
Lead	0.094	0.050	6010
Mercury	<0.002	0.002	7470
Selenium	<0.010	0.010	6010
Silver	<0.050	0.050	6010

Analytical Method: SW 846

Received: 07/16/92

SAMPLE ID 3-2 TEST CODE MET11S NAME TOTAL METALS-SOIL
FRACTION 06A Date & Time Collected 07/14/92 Category SOIL

DATE ANALYZED	07/17 to 07/20/92
ANALYST	TLB, MAV
VERIFIED BY	JDD
UNITS	mg/Kg
COMMENTS	

TOTAL METALS

PARAMETER	RESULT	LIMIT	METHOD
Total Metals			
Chromium	18	2.0	6010
Lead	200	2.0	6010

Analytical Method: SW 846

38

SAMPLE ID 3-3 TEST CODE EPM8 NAME EP TOX METALS
FRACTION 07A Date & Time Collected 07/14/92 Category SOIL

DATE ANALYZED	07/20 to 07/24/92
ANALYST	EVS, TLB
VERIFIED BY	JDD
UNITS	mg/L
COMMENTS	

39

EPTOX METALS

PARAMETER	RESULT	LIMIT	METHOD
EPTOX METALS			
Arsenic	<0.050	0.050	7060
Barium	<1.0	1.0	6010
Cadmium	<0.010	0.010	6010
Chromium	<0.050	0.050	6010
Lead	<0.050	0.050	6010
Mercury	<0.002	0.002	7470
Selenium	<0.010	0.010	6010
Silver	<0.050	0.050	6010

Analytical Method: SW 846

Received: 07/16/92

SAMPLE ID 3-3 TEST CODE MET11S NAME TOTAL METALS-SOIL
FRACTION 07A Date & Time Collected 07/14/92 Category SOIL

DATE ANALYZED	07/17 to 07/20/92
ANALYST	TLB, MAV
VERIFIED BY	JDD
UNITS	mg/Kg
COMMENTS	

TOTAL METALS

40

PARAMETER	RESULT	LIMIT	METHOD
Total Metals			
Chromium	18	2.0	6010
Lead	110	2.0	6010

Analytical Method: SW 846

ATEC Associates REPORT Work Order # 92-07-160

Received: 07/16/92

SAMPLE ID 4-1 TEST CODE EPM8 NAME EP TOX METALS

FRACTION 08A Date & Time Collected 07/14/92 Category SOIL

DATE ANALYZED	07/20 to 07/24/92
ANALYST	EVS, TLB
VERIFIED BY	JDD
UNITS	mg/L
COMMENTS	

EPTOX METALS

41

PARAMETER	RESULT	LIMIT	METHOD
EPTOX METALS			
Arsenic	<0.050	0.050	7060
Barium	3.3	1.0	6010
Cadmium	0.028	0.010	6010
Chromium	0.19	0.050	6010
Lead	200	0.050	6010 ✓
Mercury	<0.002	0.002	7470
Selenium	<0.010	0.010	6010
Silver	<0.050	0.050	6010

Analytical Method: SW 846

SAMPLE ID 4-1 TEST CODE MET11S NAME TOTAL METALS-SOIL
FRACTION 08A Date & Time Collected 07/14/92 Category SOIL

DATE ANALYZED	07/17 to 07/20/92
ANALYST	TLB, MAV
VERIFIED BY	JDD
UNITS	mg/Kg
COMMENTS	

TOTAL METALS

42

PARAMETER	RESULT	LIMIT	METHOD
Total Metals			
Chromium	3300	2.0	6010
Lead	25000	2.0	6010

Analytical Method: SW 846

SAMPLE ID 4-2 TEST CODE EPM8 NAME EP TOX METALS
FRACTION 09A Date & Time Collected 07/14/92 Category SOIL

DATE ANALYZED	07/20 to 07/24/92
ANALYST	EVS, TLB
VERIFIED BY	JDD
UNITS	mg/L
COMMENTS	

EPTOX METALS

PARAMETER	RESULT	LIMIT	METHOD
EPTOX METALS			
Arsenic	<0.050	0.050	7060
Barium	<1.0	1.0	6010
Cadmium	<0.010	0.010	6010
Chromium	<0.050	0.050	6010
Lead	2.8	0.050	6010
Mercury	<0.002	0.002	7470
Selenium	<0.010	0.010	6010
Silver	<0.050	0.050	6010

Analytical Method: SW 846

Received: 07/16/92

SAMPLE ID 4-2 TEST CODE MET11S NAME TOTAL METALS-SOIL
FRACTION 09A Date & Time Collected 07/14/92 Category SOIL

DATE ANALYZED	07/17 to 07/20/92
ANALYST	TLB, MAV
VERIFIED BY	JDD
UNITS	mg/Kg
COMMENTS	

TOTAL METALS

44

PARAMETER	RESULT	LIMIT	METHOD
Total Metals			
Chromium	29	2.0	6010
Lead	870	2.0	6010

Analytical Method: SW 846

Received: 07/16/92

SAMPLE ID 4-3 TEST CODE EPM8 NAME EP TOX METALS
FRACTION 10A Date & Time Collected 07/14/92 Category SOIL

DATE ANALYZED	07/20 to 07/24/92
ANALYST	EVS, TLB
VERIFIED BY	JDD
UNITS	mg/L
COMMENTS	

45

EPTOX METALS

PARAMETER	RESULT	LIMIT	METHOD
EPTOX METALS			
Arsenic	<0.050	0.050	7060
Barium	1.5	1.0	6010
Cadmium	0.017	0.010	6010
Chromium	0.054	0.050	6010
Lead	18	0.050	6010 ✓
Mercury	<0.002	0.002	7470
Selenium	<0.010	0.010	6010
Silver	<0.050	0.050	6010

Analytical Method: SW 846

Received: 07/16/92

SAMPLE ID 4-3 TEST CODE MET11S NAME TOTAL METALS-SOIL

FRACTION 10A Date & Time Collected 07/14/92 Category SOIL

DATE ANALYZED	07/17 to 07/20/92
ANALYST	TLB, MAV
VERIFIED BY	JDD
UNITS	mg/Kg
COMMENTS	

45

TOTAL METALS

PARAMETER	RESULT	LIMIT	METHOD
Total Metals			
Chromium	140	2.0	6010
Lead	4400	2.0	6010

Analytical Method: SW 846

Received: 07/16/92

SAMPLE ID 5-1 TEST CODE EPM8 NAME EP TOX METALS

FRACTION 11A Date & Time Collected 07/14/92 Category SOIL

DATE ANALYZED	07/20 to 07/24/92
ANALYST	EVS, TLB
VERIFIED BY	JDD
UNITS	mg/L
COMMENTS	

EPTOX METALS

47

PARAMETER	RESULT	LIMIT	METHOD
EPTOX METALS			
Arsenic	<0.050	0.050	7060
Barium	1.0	1.0	6010
Cadmium	<0.010	0.010	6010
Chromium	<0.050	0.050	6010
Lead	0.97	0.050	6010
Mercury	<0.002	0.002	7470
Selenium	<0.010	0.010	6010
Silver	<0.050	0.050	6010

Analytical Method: SW 846

Received: 07/16/92

SAMPLE ID 5-1 TEST CODE MET11S NAME TOTAL METALS-SOIL

FRACTION 11A Date & Time Collected 07/14/92 Category SOIL

DATE ANALYZED	07/17 to 07/20/92
ANALYST	TLB, MAV
VERIFIED BY	JDD
UNITS	mg/Kg
COMMENTS	

47

TOTAL METALS

PARAMETER	RESULT	LIMIT	METHOD
Total Metals			
Chromium	28	2.0	6010
Lead	140	2.0	6010

Analytical Method: SW 846

Received: 07/16/92

SAMPLE ID 5-2 TEST CODE EPM8 NAME EP TOX METALS
FRACTION 12A Date & Time Collected 07/14/92 Category SOIL

DATE ANALYZED	07/20 to 07/24/92
ANALYST	EVS, TLB
VERIFIED BY	JDD
UNITS	mg/L
COMMENTS	

EPTOX METALS

49

PARAMETER	RESULT	LIMIT	METHOD
EPTOX METALS			
Arsenic	<0.050	0.050	7060
Barium	<1.0	1.0	6010
Cadmium	<0.010	0.010	6010
Chromium	<0.050	0.050	6010
Lead	0.65	0.050	6010
Mercury	<0.002	0.002	7470
Selenium	<0.010	0.010	6010
Silver	<0.050	0.050	6010

Analytical Method: SW 846

Received: 07/16/92

SAMPLE ID 5-2 TEST CODE MET11S NAME TOTAL METALS-SOIL

FRACTION 12A Date & Time Collected 07/14/92 Category SOIL

DATE ANALYZED	07/17 to 07/20/92
ANALYST	TLB, MAV
VERIFIED BY	JDD
UNITS	mg/Kg
COMMENTS	

TOTAL METALS

50

PARAMETER	RESULT	LIMIT	METHOD
Total Metals			
Chromium	18	2.0	6010
Lead	35	2.0	6010

Analytical Method: SW 846

Received: 07/16/92

SAMPLE ID 5-3 TEST CODE EPM8 NAME EP TOX METALS

FRACTION 13A Date & Time Collected 07/14/92 Category SOIL

DATE ANALYZED	07/20 to 07/24/92
ANALYST	EVS, TLB
VERIFIED BY	JDD
UNITS	mg/L
COMMENTS	

EPTOX METALS

PARAMETER	RESULT	LIMIT	METHOD
EPTOX METALS			
Arsenic	<0.050	0.050	7060
Barium	<1.0	1.0	6010
Cadmium	<0.010	0.010	6010
Chromium	<0.050	0.050	6010
Lead	0.81	0.050	6010
Mercury	<0.002	0.002	7470
Selenium	<0.010	0.010	6010
Silver	<0.050	0.050	6010

Analytical Method: SW 846