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ENTACT

REMOVAL ACTION WORKPLAN

PHASE II - STAGE A

for the:

INDUSTRIAL PROPERTY

AVANTI SITE

Indianapolis, Indiana

Prepared by:

ENTACT, INC.

August 18, 1995
(Revised November 17, 1995)

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AVANTI SITE
INDIANA
PHASE II

PROJECTED SCHEDULE OF PHASE II STAGE A OPERATIONS

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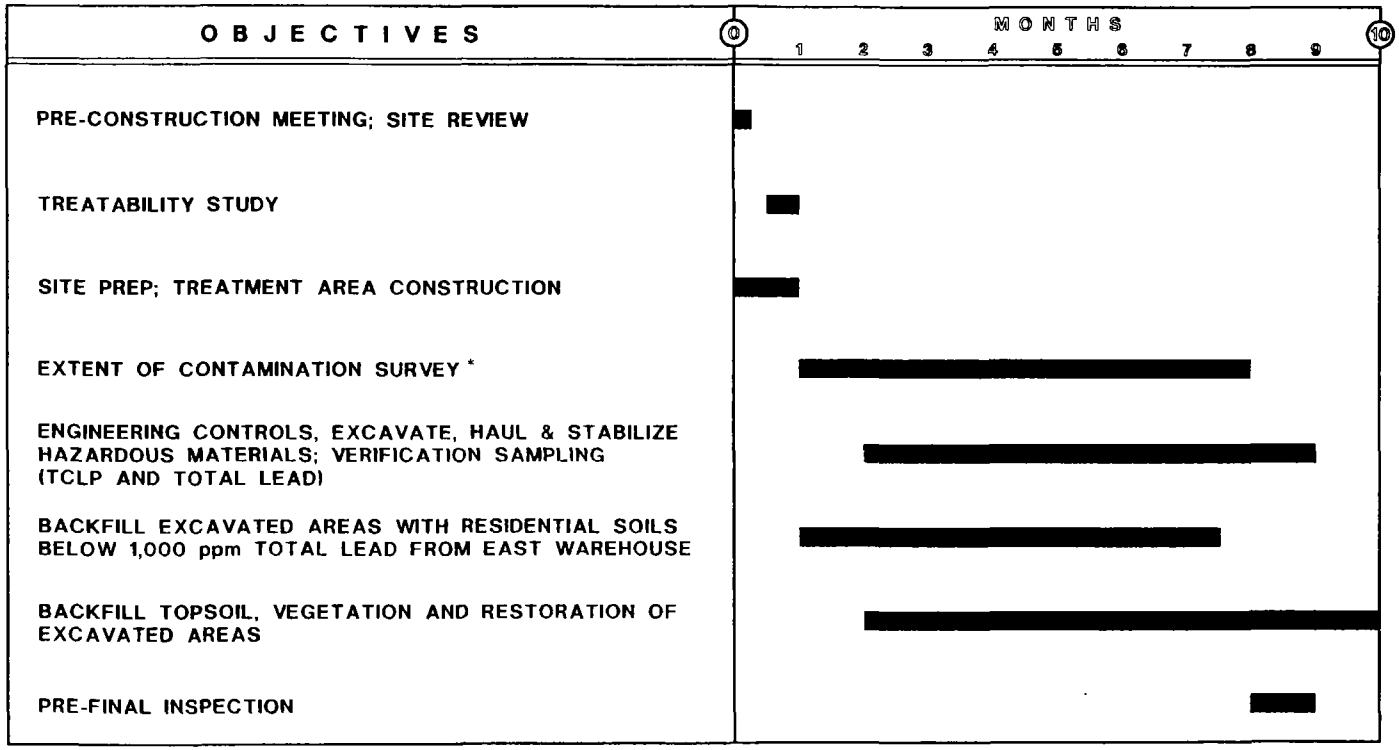

* EXACT EXTENT OF SURVEY WILL BE CONDUCTED AS EXCAVATION PROCESS UNFOLDS

FIGURE 1-3

1289-24A

AVANTI SITE
INDIANA

SCOPE OF ADMINISTRATIVE 106 ORDER

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PHASE I
RESIDENTIAL

- REMOVAL ACTION WORK PLAN FOR RESIDENTIAL PROPERTIES
- HEALTH AND SAFETY PLAN
- CONTINUOUS AIR MONITORING
- 24 HOUR SECURITY FOR THE INDUSTRIAL PORTION OF THE SITE DURING REMOVAL ACTIVITY
- SAMPLE, REMOVE AND DISPOSE OF DRUMS
- DECONTAMINATE BUILDINGS AND STRUCTURES IN PREPARATION FOR STAGING OF RESIDENTIAL SOILS
- CONDUCT AN EXTENT OF CONTAMINATION (EOC) SURVEY TO IDENTIFY RESIDENTIAL SOILS THAT EXCEED 400 PPM TOTAL LEAD
- EXCAVATE RESIDENTIAL SOILS WITH LEAD CONTAMINATION GREATER THAN 400 PPM
- DUST CONTROL MEASURES
- BACKFILL RESIDENTIAL EXCAVATION AREAS WITH CLEAN TOP SOIL AND RESTORE PROPERTIES TO PRE-EXCAVATION CONDITION
- SAMPLE INTERIOR OF NEARBY RESIDENTIAL HOMES AND ADVISE OCCUPANTS ON LEAD ABATEMENT PROCEDURES AS NECESSARY
- RESIDENTIAL INDOOR HEPA VACUUM AVAILABILITY

PHASE II
INDUSTRIAL

GENERAL ACTIVITIES

- HEALTH AND SAFETY PLAN
- QUALITY ASSURANCE PROJECT PLAN
- 24 HOUR SECURITY FOR THE INDUSTRIAL PORTION OF THE SITE

STAGE A ACTIVITIES:

- SUBMITTAL OF THIS REMOVAL ACTION WORK PLAN
- SEAL CRITICAL BARRIERS ON ON-SITE BUILDINGS
- PRIORITIZE REMOVAL AREAS
- SAMPLE & EXCAVATE 30,000 c.y OF MATERIAL WITH THE HIGHEST POTENTIAL FOR DISTURBANCES IMPACT TO HUMAN HEALTH AND THE ENVIRONMENT.
- VERIFICATION SAMPLING OF EXCAVATED AREAS & TREATED MATERIAL
- TRANSPORT & STABILIZE SOIL IN INDUSTRIAL BUILDING
- STORE STABILIZED SOIL IN INDUSTRIAL BUILDING (20,000 c.y.)
- BACKFILL EXCAVATION AREAS WITH STOCKPILED RESIDENTIAL SOIL WITH TOTAL LEAD LEVELS LESS THAN 1000 ppm.
- DUST SUPPRESSION
- AIR MONITORING
- RESIDENTIAL INDOOR HEPA VACUUM AVAILABILITY

STAGE B ACTIVITIES:

- SUBMITTAL OF REMOVAL ACTION WORK PLAN
- FINALIZE EOC SURVEY
- EXCAVATE & STABILIZE REMAINING LEAD CONTAMINATED INDUSTRIAL SOIL TO 1000 ppm.
- VERIFICATION SAMPLING OF EXCAVATED AREAS & TREATED MATERIAL
- SAMPLE, EXCAVATE AND DISPOSE OF MATERIALS IMPACTED BY THE BURIED DRUMS, UST'S AND CONTAINERS.
- BACKFILL EXCAVATION AREAS WITH STOCKPILED RESIDENTIAL SOIL WITH TOTAL LEAD LEVELS LESS THAN 1000 ppm.
- DISPOSE OF STABILIZED SOILS IN COMPLIANCE WITH RCRA OR IDEM SPECIAL WASTE DISPOSAL REGULATIONS.
- DUST SUPPRESSION
- AIR MONITORING
- DECONTAMINATE BUILDINGS FOR RELEASE TO FUTURE LANDUSE
- DECONTAMINATE METAL DEBRIS AND RECYCLE AS APPROPRIATE

STAGE C ACTIVITIES:

- SUBMITTAL OF REMOVAL ACTION WORK PLAN
- REVIEW RESIDENTIAL WATERWELL DATA
- PERFORM HYDROGEOLOGIC STUDY.
- PROVIDE MUNICIPAL WATER CONNECTIONS TO RESIDENCES WHERE PRIVATE WATER SYSTEMS CURRENTLY EXCEED OR ARE LIKELY TO EXCEED RAL'S.

FIGURE 1-1

1299-015

AVANTI SITE
INDIANA

AVANTI PHASED REMEDIAL APPROACH

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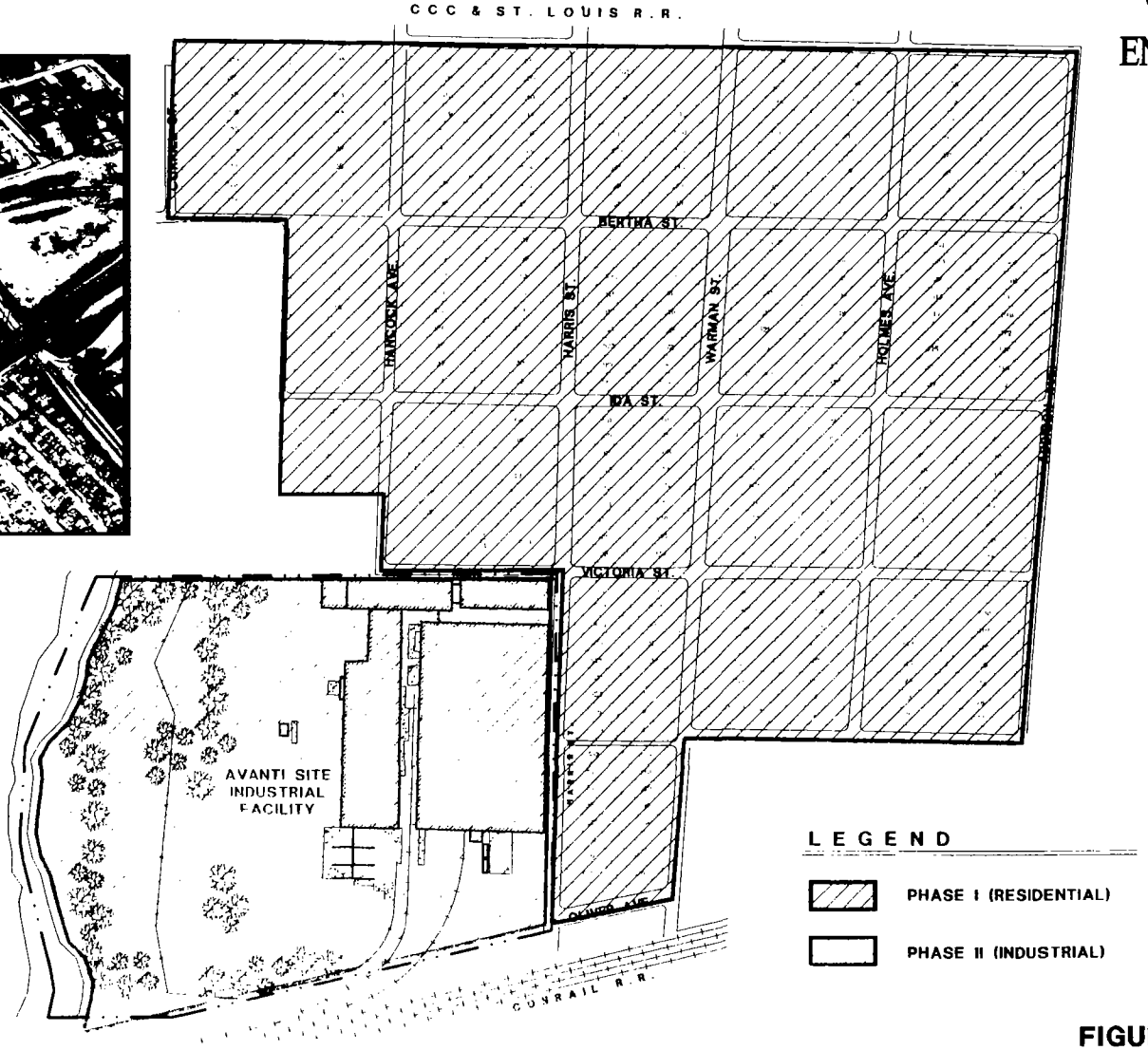

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1299-022

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1.0 INTRODUCTION

On March 29, 1994, the U.S. EPA issued an Administrative Order, Docket No. V-W-94-C-231 pursuant to Section 106(a) of CERCLA, to the following Respondents:

O & C Corporation,
Indiana Oxide Corporation,
RSR Corporation,
RSR-Quemetco, Inc., and
Avanti Development, Inc.

The Order pertains to the Indianapolis, Indiana, Avanti Site including the Industrial property located at 502-566 Harris Street and the surrounding Residential properties. The Order requires the Respondents to conduct removal activities to abate an imminent and substantial endangerment to the public health, welfare or the environment that may be presented by the actual or threatened release of hazardous substances at or from the Site. A copy of the Administrative Order is included as Appendix A of this Work Plan.

The scope...was separated into two phases in order to quickly respond to the residential properties....

The scope, as defined in the Order, was separated into two phases in order to quickly respond to the residential properties and to install security measures around the Industrial portion of the Site. ***The Phase II Work Plan outlines the remaining items defined in the Order including the Extent of Contamination investigation and subsequent removal of impacted materials.*** The scope of the Order as separated into Phase I and Phase II activities is shown on Figure 1-1. The areas of the site addressed by each phase are shown on Figure 1-2.

Phase II activities are further divided into stages for the purpose of expediting EPA approval and ensuring an efficient and timely transition from the residential activities of Phase I to the industrial site activities of Phase II. The Phase II Stage A activities are described in detail in this workplan. Phase II Stage B and C activities are outlined in this plan and work plans will be submitted for these activities prior to their implementation.

1.1 PHASE II SCOPE OF WORK

The scope of work for Phase II activities as shown on Figure 1-1, includes the items in the Order not addressed in the Phase I Work Plan. The following documents have been or will be prepared and submitted to detail the Phase II remedial activities, the associated health and safety protocols, and the quality assurance procedures:

- Phase II Stage A Work Plan, Health and Safety Plan and Phase II Quality Assurance Project Plan
- Phase II Stage B Work Plan
- Phase II Stage C Work Plan

Stages A, B, and C are generally defined as follows:

Stage A

- Prioritizing excavation areas based on current site knowledge,
- Excavate and segregate 30,000 cubic yards of smelter related materials,
- Verification sampling of excavated areas,
- Treatment of the smelter-related materials,
- Store the treated material in the on-site buildings,
- Segregate residential soils with total lead concentration less than 1,000 ppm, and
- Backfill and restore excavated areas using residential soils (<1,000 ppm total lead and ≤5.0 mg/l TCLP lead).

Stage B

- Finish excavation and segregation of smelter related materials (>1,000 ppm total lead),
- Verification sampling of excavated areas,
- Finalize the Extent of Contamination Survey,
- Treatment of segregated smelter-related materials,
- Segregate residential soils with total lead concentration less than 1,000 ppm,
- Disposal of smelter related materials and residential soils (>1,000 ppm total lead),
- Backfill and restore excavated areas using residential soils (<1,000 ppm total lead and ≤5.0 mg/l TCLP lead),
- Investigate and remediate, if necessary, the on-site USTs and
- Decontaminate buildings.

Stage C

- Review residential water well data,
- Perform a hydrogeologic investigation, and
- Address residential water supply connections.

The remainder of this section outlines specifics of Stages A, B and C.

Stage A Activities

Industrial site security was established as part of Phase I activities. The security system consists of a six feet tall chain link fence topped by barbed wire, two locked gates, as well as an electronic perimeter monitoring system designed to notify authorities when site perimeter has been breached. These security measures will be maintained throughout all stages of Phase II activities.

A preliminary EOC survey was performed at the site in July 1995 and details of the findings are presented in Section 4 of this workplan. This EOC survey was used to prioritize the areas of the site that posed the most potential endangerment to human health and the environment.

In the prioritized areas, 30,000 cubic yards of smelter related materials will be excavated. Achievement of the cleanup criteria of 1,000 ppm total lead will be verified by laboratory analysis. The excavated material will be transported into the industrial building for segregation and treatment. All critical barriers in the industrial building will be sealed to prevent any emissions release.

The excavated material will be segregated by visual inspection, XRF screening and verified by TCLP lead analysis. All segregated smelter-related waste will be sized and stabilized. Stabilization to non-hazardous levels will be confirmed with TCLP lead analysis. The treated material will be stored in the on-site building during Stage A activities and disposed of with the remainder of waste material during Stage B activities.

Following the removal of these highly contaminated materials the excavation area will be backfilled with stockpiled residential soil with total lead levels less than 1,000 ppm and less than 5.0 mg/l TCLP lead. During sampling, excavation, treatment and associated activities, ENTACT will employ strict dust suppression controls to prevent airborne emissions that may impact surrounding properties.

Air monitoring activities will be maintained to monitor for potential particulate lead emissions from remedial activities and for worker health and safety. This will be accomplished by maintaining the current practices of high volume air sampling stations located around the site as well as low volume air samplers and real-time particulate monitors in the work zone. Lead concentrations in the air will be maintained below 1.5 ug/m^3 averaged over 3 months. The dust suppression controls and air monitoring programs will be conducted throughout Stage A and Stage B activities.

Stage B Activities

Stage B activities will consist of the excavation, segregation, stabilization and disposal of the remaining industrial soils with lead contamination above 1,000 ppm. ENTACT will prepare and submit to EPA Stage B Work plan which will specifically address disposal of the materials above the level as well as the methodology for determining the extent of contamination on the Industrial property.

The Extent of Contamination (EOC) Survey and Field Investigation will be completed on the Industrial property to determine the horizontal and vertical extent of additional contamination associated with the following:

- *underground storage tanks (USTs),*
- *buried drums, and*
- *containers.*

Other Stage B activities will consist of investigation and remediation, if necessary, of the on-site UST's. Current information regarding the Industrial Property indicates that two USTs are present in a location immediately south of the East Storage Building. No information exists indicating the presence of buried drums or other containers. The USTs will be investigated in accordance with State of Indiana guidance and ARARs. If corrective action is warranted based on that investigation, it will also be conducted in accordance with the appropriate state regulations.

The extent of contamination will be determined...as excavation progresses.

If additional drums or containers are identified during excavation, they will be characterized in order to determine contents. The surrounding soils will be sampled and analyzed for the appropriate constituents to determine if a release occurred.

If a release is identified, the impacted soils will be removed and properly managed. The Field Investigation will be conducted as necessary when buried drums and/or containers are discovered. Regarding the USTs, field investigation and remediation measures will be taken if a release has occurred. Following removal and treatment of impacted materials, site restoration activities will be implemented. These will include backfilling the excavation(s), providing adequate grading and drainage, and revegetation of the disturbed areas.

Upon completion of all treatment and disposal activities within the industrial buildings, final building decontamination procedures will begin. This will include removal of residual soils in the building by sweep, high pressure hydro-

decontamination of the walls and floors and collection and disposal of the decontamination water.

Stage C Activities

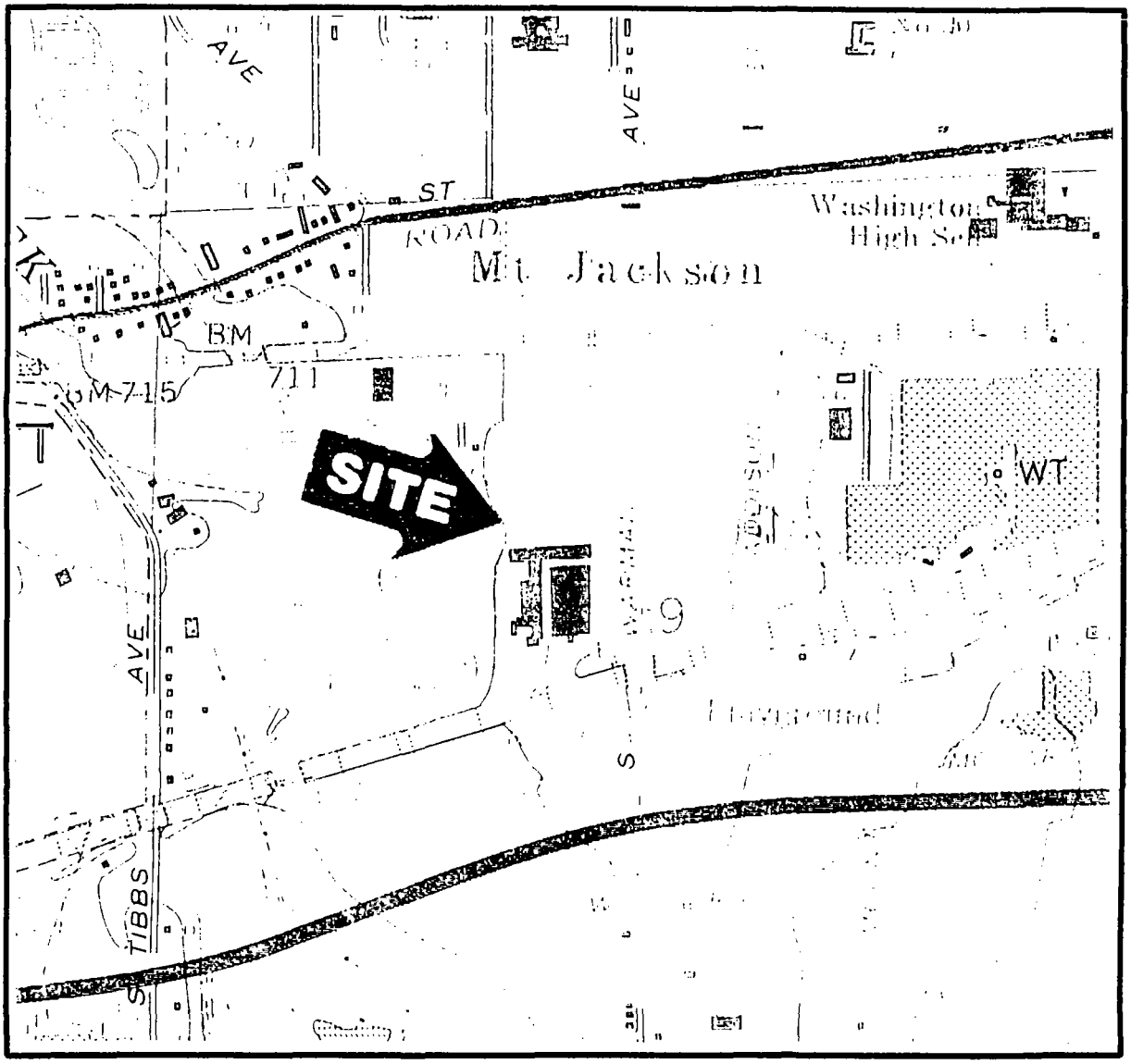
Private well samples taken by the Marion County Health Department, the Indiana Department of Environmental Management, and the Environmental Protection Agency will be reviewed and evaluated by RSR. These independent well samples will form the basis for RSR's evaluation of the private water supplies in the area surrounding the Avanti site. To the best of RSR's knowledge, no wells since January 1992 have reported lead levels above the 106 Order's Removal Action Level ("RAL") of 30 parts per billion. Also included in the Stage C activities will be the performance of a hydrogeologic investigation. As part of Phase II activities, RSR will reach conclusions regarding the need for municipal water supply.

1.2 PHASE II PROJECT SCHEDULE

A project schedule has been prepared to include all Phase II items required by the Administrative Order. The project schedule, shown in Figure 1-3, is an approximation of the time required to complete Phase II activities based on EPA estimations of volume of contamination, and as the exact extent of contamination is realized, the schedule will be modified accordingly. ***Currently, it is estimated that the project can be completed in an eleven month time frame.***

1.3 SITE HISTORY AND DESCRIPTION

The history and environmental setting of the Avanti Site have been thoroughly documented and are included in the Administrative Order attached as Appendix A to this Work Plan. The proximity of the site is shown on a general vicinity map on Figure 1-4.



AFTER U.S.G.S. 7.5 MIN. TOPO QUAD., INDIANAPOLIS WEST

SCALE

0 1/2 1 MILE

INDIANA

FIGURE TITLE: **GENERAL FACILITY LOCATION**	CLIENT:
DOCUMENT TITLE: **PHASE II REMOVAL ACTION WORKPLAN**	LOCATION: **MARION COUNTY INDIANAPOLIS, INDIANA**

ENTACT
1616 CORPORATE CT., STE. 150
IRVING, TEXAS 75038
(214) 580-1323

DATE: 1/5/95	PREPARED BY: LC
SCALE:	CHECKED BY: RR
PROJECT NO: 1299-026	FIGURE NUMBER: 1-4

ENTACT

Section two

Section 2

AVANTI SITE
INDIANA
PHASE II

SITE SECURITY

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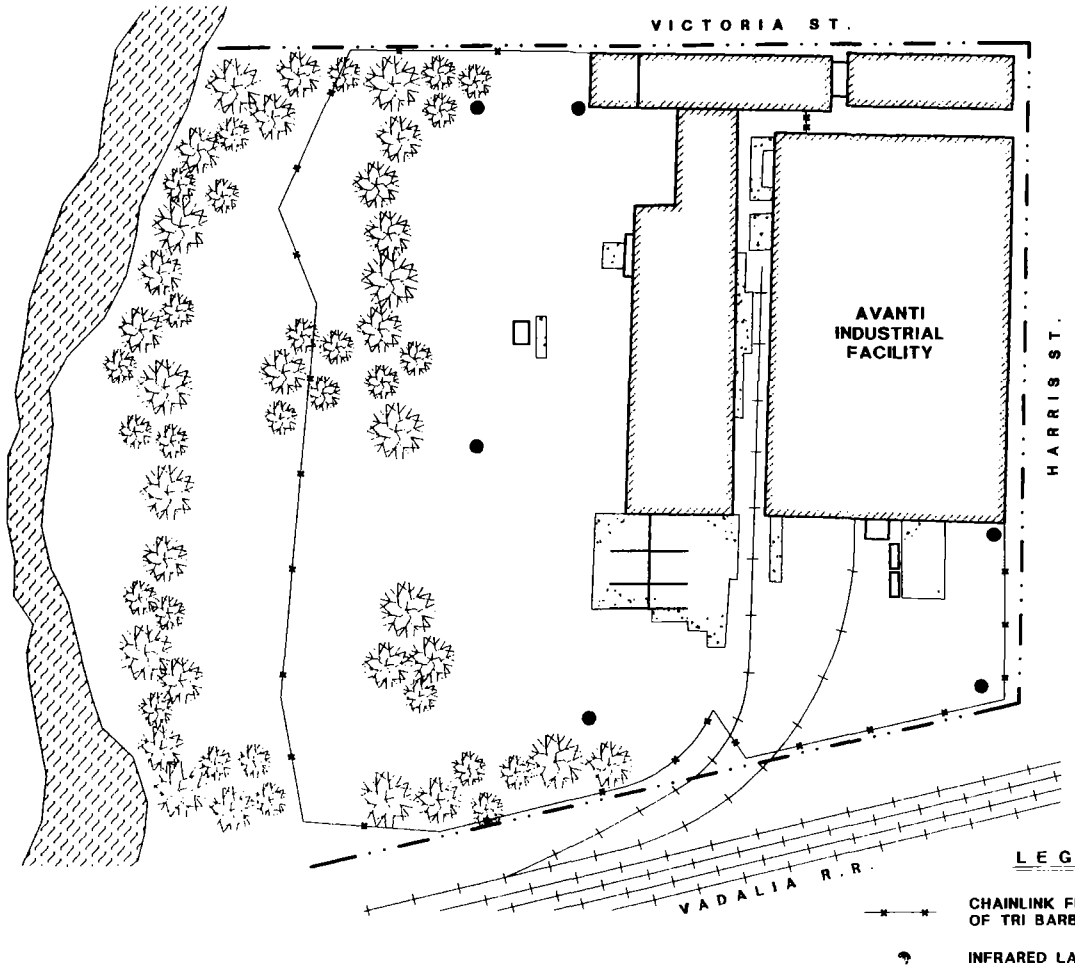


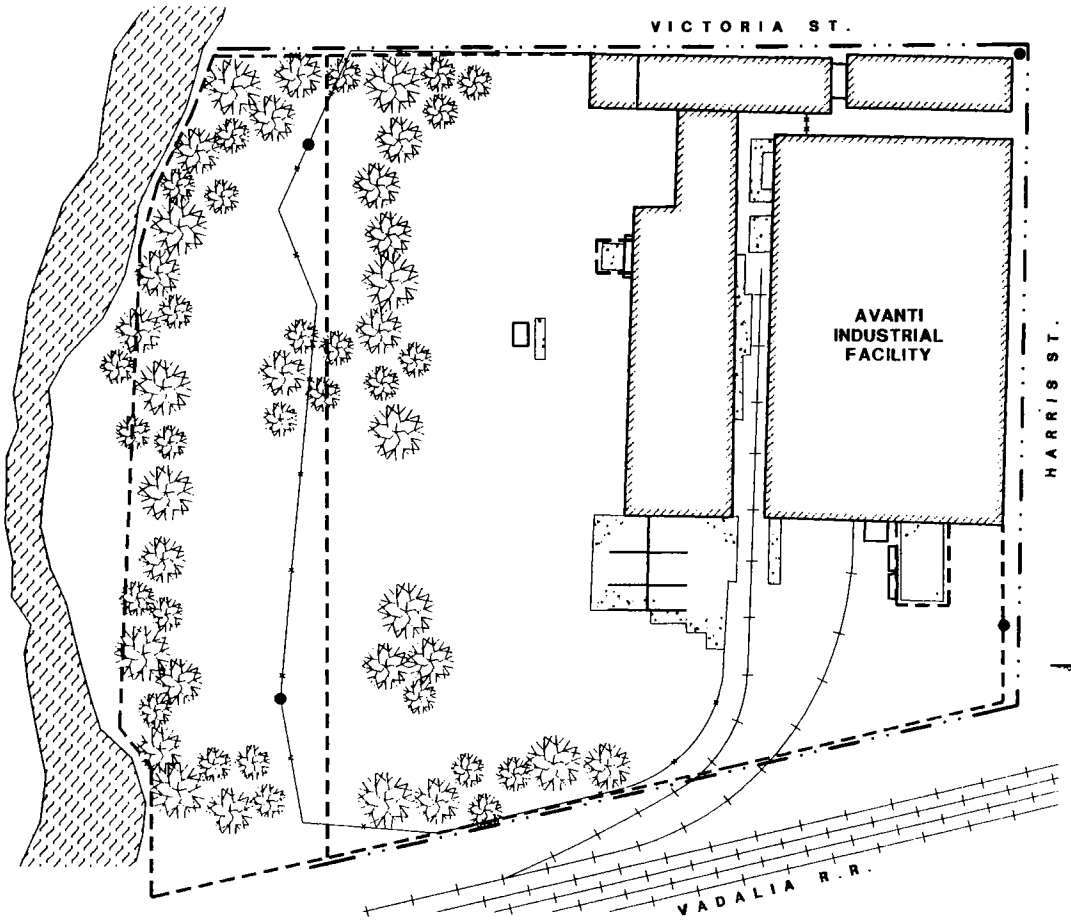
FIGURE 2-1

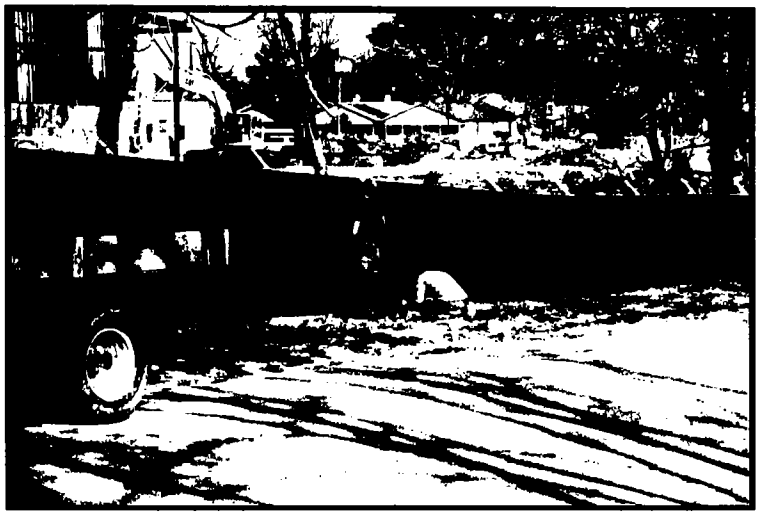
1299-023

AVANTI SITE
INDIANA
PHASE II

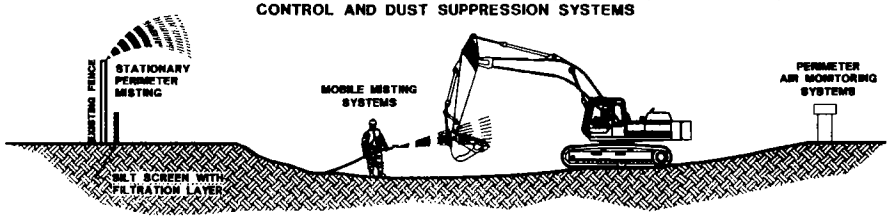
SITE CONTROLS

ENTACT





INSTALLATION OF SECURITY FENCES, STORMWATER CONTROL AND DUST SUPPRESSION SYSTEMS



LEGEND

- SILT FENCE OR OTHER STORMWATER RUNOFF CONTROL DEVICE
- CHAINLINK FENCE
- LOCATION OF TSP's AND PM10 AIR MONITORS

FIGURE 2-2

1298-011

2.0 MOBILIZATION AND SITE PREPARATION

2.1 SITE SAFETY AND HEALTH PLAN

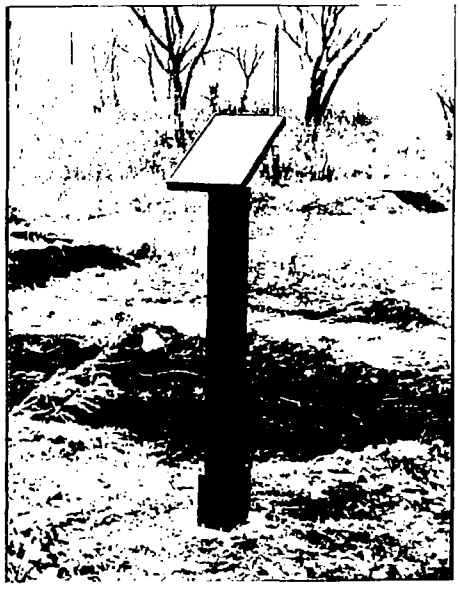
Mobilization to the Avanti Site will begin with the implementation of the Phase II Site Safety and Health Plan (SSHP). The Phase II SSHP is the same plan as presented in Volume II of the Phase I Workplan, with the addition of a supplement on trench and excavation safety. The SSHP will be implemented by the Project Manager prior to any removal activities.

2.2 SITE SECURITY

Site security and access control will be maintained 24 hours a day by a perimeter fence and an intrusion detection system. The site perimeter is fenced by a six foot chain link fence topped with three strands of tri-barbed wire as shown on Figure 2-1. This perimeter fence will be maintained, monitored and inspected throughout the removal action. In the event that sections of fence have to be removed to accommodate excavation activities, a temporary chain link fence will be installed. The temporary fence will be maintained until excavation activities in that area are complete, at which time the perimeter fence will be re-installed. Care will be taken during all removal activities to maintain and ensure the integrity of the perimeter fence to eliminate possible entry by unauthorized individuals.

This system consists of six wireless stations positioned around the site...that emit an infrared beam that detects violation of the perimeter.

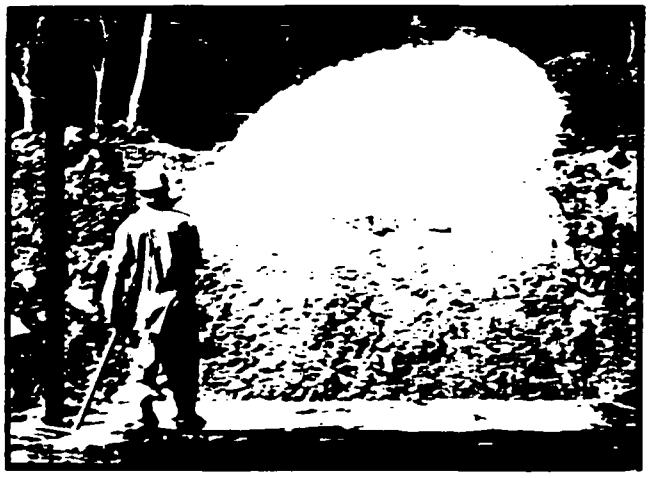
Site security will also be controlled by the aid of an intrusion detection system (IDS). This system consists of six wireless stations positioned around the site, (see Figure 2-1), that emit an infrared beam that detects violation of the perimeter. With a violation, an alarm signal is sent via supervised RF signal to the receiver/processor which processes the alarm and automatically contacts the security company. The security company then dispatches a security officer and contacts the project manager.



Solar Security Laser System

2.3 SITE CONTROL MEASURES

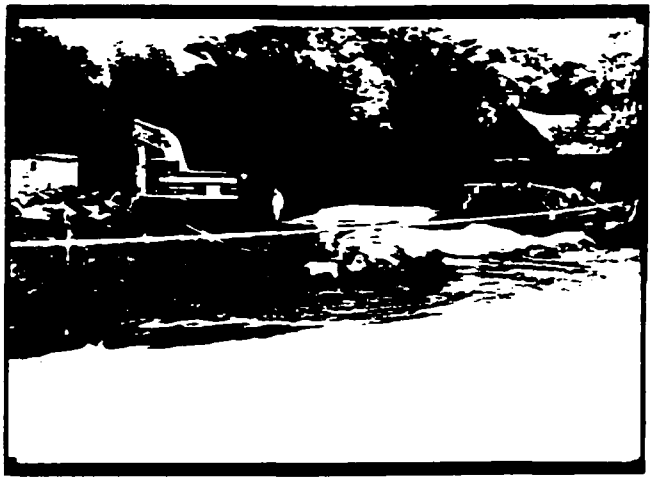
Site control measures will consist of stormwater runoff control, emission control, and the establishment of work zones. Stormwater runoff will be controlled by the use of silt fences and other sediment controlling devices. These devices will be installed in any location were possible stormwater runoff may leave the industrial property. The locations of these control devices are shown in Figure 2-2.



Misting to control emissions

Dust and fugitive emissions will be controlled and monitored by the use of engineering controls and air monitoring. Engineering controls will consist of perimeter water misters, water misting in excavation areas, misters installed on treatment equipment and the application of a dust suppressant on stockpile areas. Perimeter water misters will be installed along prevailing wind fences during handling of any potentially contaminated material. In the event of stockpiling soil for long periods or during high wind periods, the project manager may elect to apply a dust suppressing agent. The agent is a water soluble polymer acrylic which is typically diluted with water and will reduce wind and rain erosion.

Work zones will be established and enforced in the industrial property. The Safe Zone will be



Establishment of work zones

designated as the area away from primary contamination and operations. An Exclusion Safety Zone will be established in the area surrounding the actual excavation operations Approximately fifty feet in front, fifty feet in rear, and twenty feet on each side of the excavation equipment will be included in the Exclusion Safety Zone. The primary reason for increased exclusion in this area is to prevent incidental entry into the path of the excavation equipment. An Exclusion Zone will also be established around the treatment and processing area. Personnel decontamination zones will be established to facilitate decontamination of personnel after leaving the exclusion safety zone. These areas will be designated by the project manager.

2.4 OFFICE TRAILER

ENTACT will maintain the Phase I office trailers complete with electricity, phone, and fax capabilities and a controlled environment for computer terminals and printers. A separate trailer has been provided for

Office trailers with adjacent restroom facilities

the EPA On-Scene Coordinator to facilitate interaction, cooperation and communication. Restroom facilities will also be maintained near the office trailer.

2.5 SITE PREPARATION

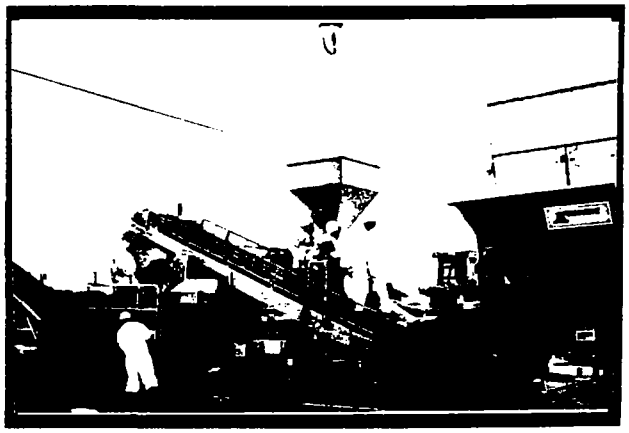
Preparing the industrial property for removal activities will consist of the following:

- clearing and grubbing vegetation,
- removing existing debris,
- surveying, and
- identification of buried utilities.

Trees and vegetative cover located inside the work zones will be removed, sized, classified and disposed. These activities are shown on Figure 2-3. Currently known hazards and utility right-of-ways will also be identified prior to any disturbance of the soils. All equipment operators will be notified prior to any excavation of all possible hazards in regard to utilities (i.e., electric, gas, communications, water, sewer, and cable). ENTACT will notify all appropriate utility companies prior to excavation to identify and mark all known utilities. If utilities are identified in areas to be excavated, then the excavation procedures will be coordinated with the utility companies prior to breaking ground. Hand excavation around utilities will be performed as necessary to insure appropriate safety protocol.

A site survey will also be performed to establish property boundaries and to mark a grid system for excavation and verification sampling. Permanent grid markers will be staked and labeled at the fence line on all four corners of the property so that the grid can be re-established during excavation activities.

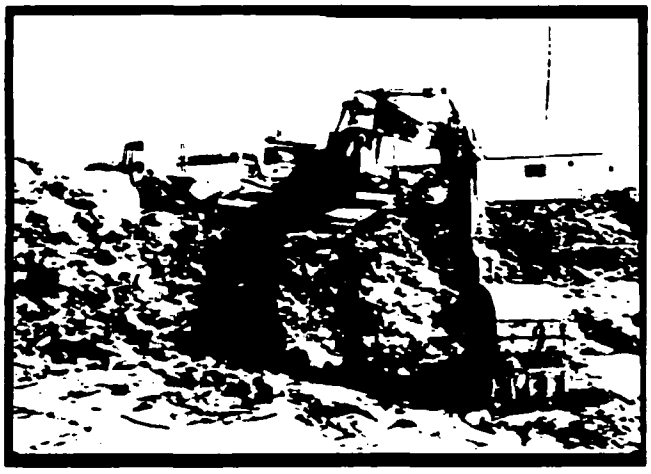
2.6 PERSONNEL AND EQUIPMENT ESTIMATES



Equipment set-up

ENTACT is committing approximately eight OSHA 29 CFR 1910.120-trained hazardous material technicians to handle operations on site. ENTACT participates in a RED CROSS CPR training program and several of the on-site personnel will be trained in first aid and CPR operations.

Equipment will consist of excavators, front end loaders, stabilization equipment, dump trucks, rubber tire backhoes and engineering controls such as misters for dust suppression. Additional equipment will include XRF instruments, sampling equipment, and decontamination equipment.



Excavation equipment

2.7 AIR MONITORING

Air monitoring will be performed on-site to ensure that all personnel and residents are not exposed to levels of particulate matter or airborne lead concentrations in excess of the regulated limits, and to confirm that re-contamination of the Phase I Residential Properties does not occur.

Air monitoring will be performed on-site to ensure that all personnel and residents are not exposed to elevated levels of particulate matter or airborne lead concentrations

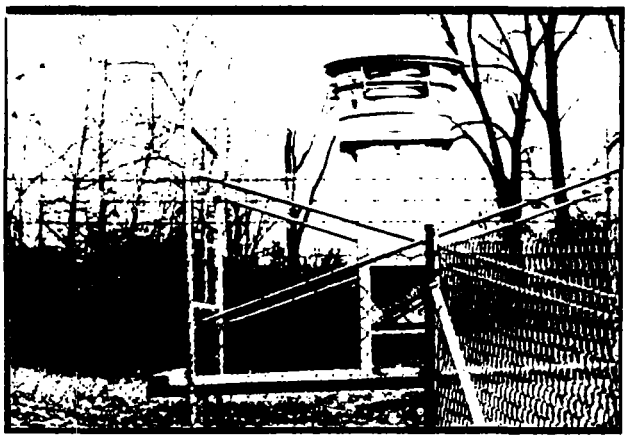
For this project, Clean Air Act monitoring methodologies will be employed to monitor for respirable dust and lead emissions in addition to the OSHA defined air monitoring. The ENTACT air monitoring program is detailed on Table 2-1.

Three types of air samples will be collected at the site, respirable dust (particle matter less than 10 micrometers), total suspended particle matter (TSP) and personal low volume air quality samples. Respirable dust will be measured using PM10 samplers. Samples will be collected to determine the quantity of dust in the air that can be entrained in the human respiratory system, i.e. particles smaller than or equal to 10 micrometers. TSP samples will be collected to measure total suspended particulates (as large as 40 micrometers) in the air. The samples will be analyzed for mass of particles collected as well as total lead. The air monitoring methodologies described above will dictate engineering controls to ensure worker safety and that recontamination of the Phase I Residential properties does not occur.

The air monitoring methodologies...will dictate engineering controls to ensure worker safety and that recontamination of the Phase I Residential properties does not occur.

Four TSP and PM10 monitors will be strategically positioned upwind and downwind on the Industrial property of the site, (see Figure 2-2), and will be operated over 24 hour periods. Local wind data has been reviewed to determine the optimum locations for these TSP and PM10

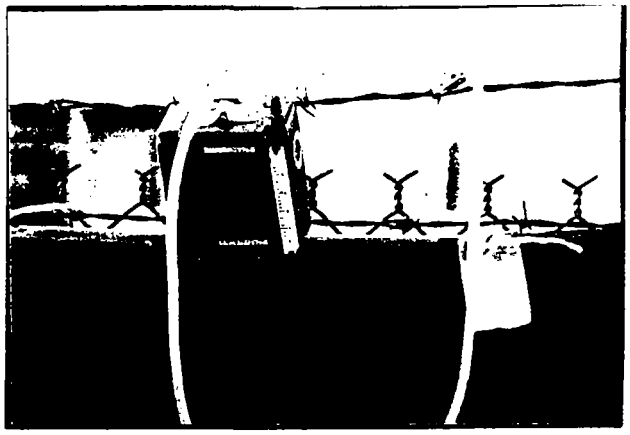
monitors. Historically, the strongest prevailing winds blow toward the northeast. This data is presented in Appendix B.



PM10- Perimeter Air Monitoring Station

A weather station has been established at the site to measure wind speed and direction, temperature, and rainfall data. This data will be correlated with sample results to determine if further engineering controls are necessary to maintain the required air quality standards.

Air quality samples will be collected to determine the amount of lead particles and respirable dust in the air and will ensure that construction activities are protective for workers safety. Air Quality samples will be collected with low volume samplers on personnel and potential generation areas. Potential generation areas will consist of the excavation area, treatment area and any other contaminated material handling area. Low volume air monitors will be positioned upwind and downwind inside of these areas. One person within the potential generation area will also be monitored. The personal samplers will be placed such that the sample will be taken from the breathing zone of the worker. Daily monitoring of wind directional information will be utilized to position air monitors.



Area low-volume air sampler

A hand held random air monitor (RAM) will be utilized to measure particulate matter continuously throughout the work period each day in and around the work zone. If any average reading for the daily work period exceeds 150 micrograms per cubic meter, dust suppression measures will be elevated. If RAM monitoring indicates elevated levels, excavation activities may be suspended while additional dust suppression controls are implemented.

For the project's duration, TSP, PM10 and low volume air samples will be sent in for analysis every fifth working day. If the RAM unit indicates elevated ambient air particulate matter (>150 micrograms per cubic meter averaged over the work day) levels on a specific day, the samples taken that day will also be sent in for analysis. PM10 filters will be analyzed for respirable dust. Low volume area and personnel monitors will be analyzed for total lead. The remaining samples will be archived.

Conditions will be maintained such that the national primary and secondary ambient air quality standards for particulate matter of 150 micrograms per cubic meter of air (based on a 24-hour average concentration) and 1.5 micrograms per cubic meter for lead (based on a quarterly average) are not violated....

Copies of all air monitoring results will be sent on a monthly basis to Marion County Health Department and to the EPA and shall become part of the Administrative Record. Conditions will be maintained such that the national primary and secondary ambient air quality standards for particulate matter of 150 micrograms per cubic meter of air (based on a 24-hour average concentration) and 1.5 micrograms per cubic meter for lead (based on a quarterly average) are not violated at the work zone boundary. Personnel will not be exposed to greater than 50 micrograms per cubic meter of lead over an 8-hour period in accordance with 29 CFR 1910.1025.

AVANTI SITE
INDIANA
PHASE II

SITE SECURITY

ENTACT

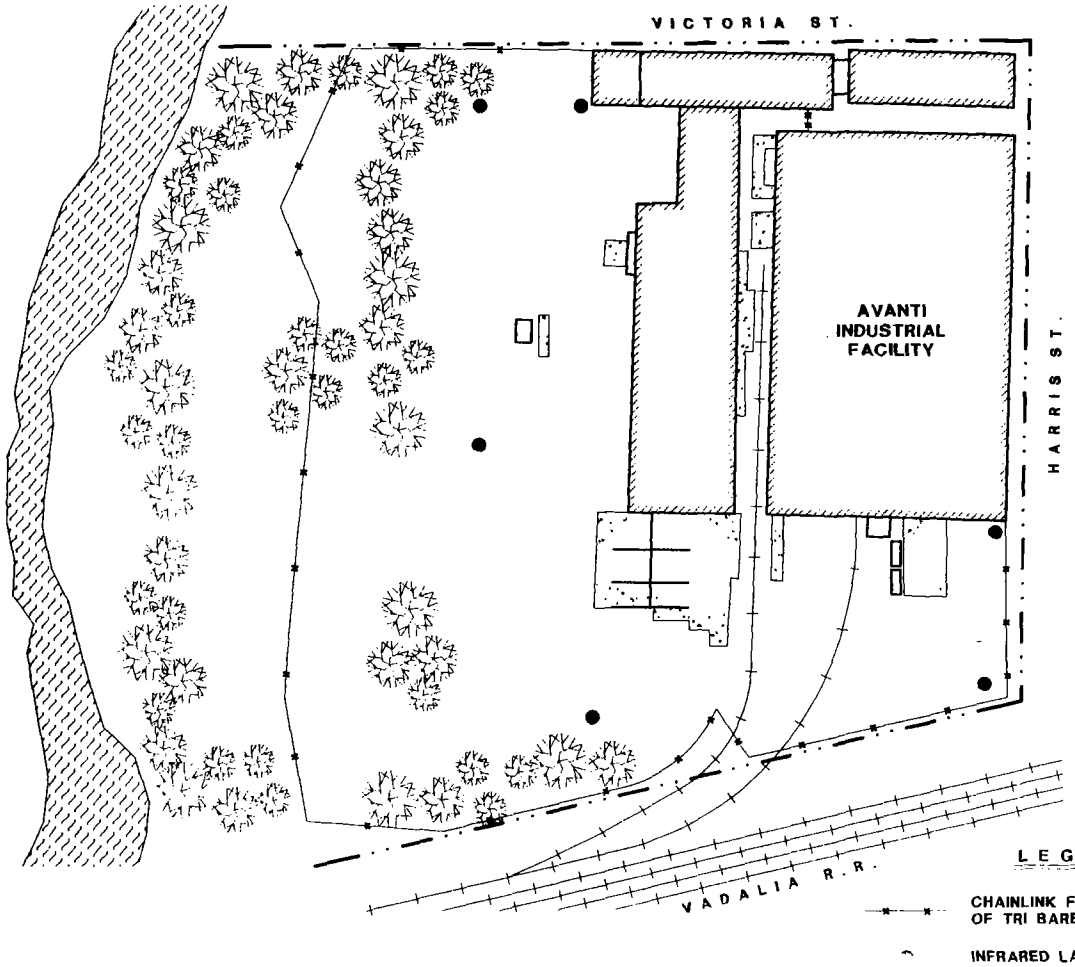


FIGURE 2-1

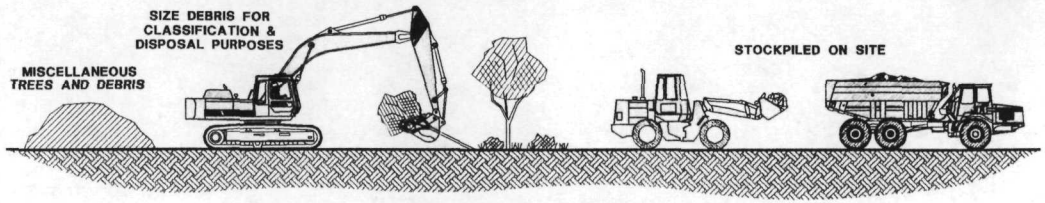
1298-023

AVANTI SITE
INDIANA
PHASE II

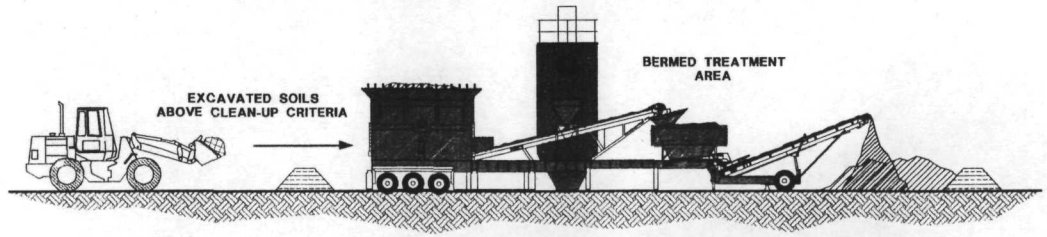
SITE PREPARATION

ENTACT

REMOVE VEGETATION, CONSTRUCT DECONTAMINATION AREA AND PREPARE TREATMENT AREA



CONSTRUCT SOIL STAGING, TREATMENT AND STOCKPILE AREAS



Implement site specific health and safety plan.

Provide 24 hour site security.

Locate on-site utilities.

Personnel monitoring for lead pursuant to OSHA regulations will be conducted.

Maintain PM10, TSP & lead air monitors.

On-site management controls (i.e. computer systems, facsimile, telephone, etc.) will be incorporated for record-keeping purposes.

Existing on-site debris (i.e. tires, empty, drums, trees, etc.) will be consolidated and segregated for on-site/off-site disposition.

Establish exclusion zones and work zones.

Trees and vegetative cover located inside the work zones will be removed, sized, classified and disposed.

Stormwater management controls will be constructed along the perimeter fence. Perimeter misting systems will be installed to prevent particulate emissions.

Facility inspections will be conducted to consolidate miscellaneous waste materials (i.e. contaminated wastes, etc.) for proper storage and disposition.

Staging areas will be prepared for soils containing elevated lead levels inside the Avanti warehouse building on the industrial portion of the site.

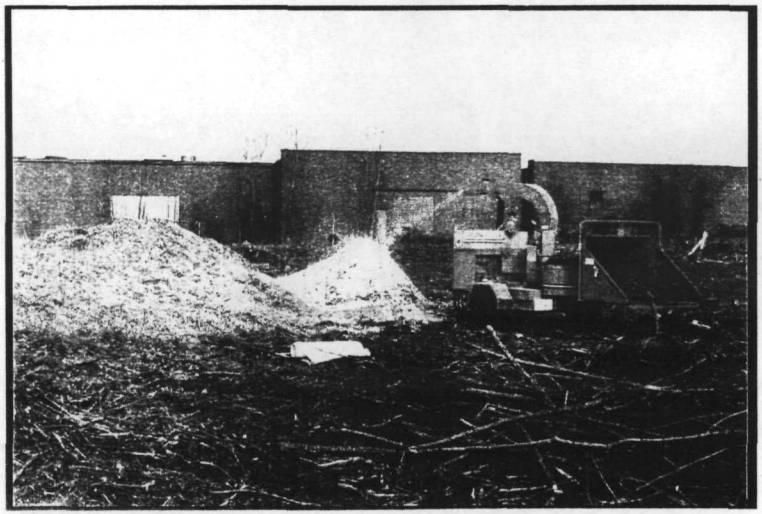


FIGURE 2-3

1299-001

ENTACT

Section three

Section 3

3.0 SAMPLING AND ANALYSIS PLAN

3.1 STATEMENT OF OBJECTIVES

This Sampling and Analysis Plan for Phase II will be implemented at the Avanti Site for following types of samples:

Solid Media and Soil Samples;
Treated Material Samples;
Backfill Samples;
Decontamination Rinse Water Samples; and
Air Quality Samples.

The objectives of these sampling activities include :

Field profile extent of contamination;
Assist in field investigation tasks;
Direct Removal Action tasks;
Verify that removal criteria has been achieved;
Classify untreated and treated soils for disposal;
Characterize backfill material; and
Verify control of air emissions during removal action tasks.

Sampling activities will commence during the site preparation activities....

The extent of the contamination at the Avanti site has been partially delineated by the Indiana Department of Environmental Management (IDEM) and the Marion County Health Department (MCHD) through surface samples collected in April of 1993. Further delineation of the site was performed by the U.S.EPA and its contractor Technical Assistance Team (TAT) during a Site Assessment and supplemental Site Assessment conducted August and December of 1993. This information will be utilized to compliment the Removal Action sampling effort described in this plan.

3.2 SAMPLING ACTIVITIES IMPLEMENTATION SCHEDULE

Sampling activities will commence during the site preparation activities described in Section 2.0 and will continue throughout the project as described in the following sections.

3.3 SAMPLE IDENTIFICATION SYSTEM

A sample identification system will be implemented in order to properly track sampling activities. The sampling activities and examples of the identification coding system associated with each type are listed below with a following explanation:

Solid Media and Soil Sampling

X-Ray Fluorescence Extent of Contamination	X-04-3
Analytical Extent of Contamination	E-07-3
Analytical Verification	V-07-3
Non-Treated Material-Soil Classification (TCLP)	US-000
Treated Material-Confirmation (TCLP)	TS-000
Residential Backfill Material	RBF-000
Offsite Backfill Material	OBF-000

Containerized Waste Sampling

Containerized Material	CM-000

Waste Water Sampling

Waste Water	WW-000

Air Sampling

PM10 Samples	HV-000
TSP Samples	T-000
Personal/Area Air Monitoring	AS-000

Quality Control Samples

Field Rinsate Blanks	FB-000
Duplicate samples [example of V-07-3]	V-07-3-D

All numbering sequences shown above with "000" will begin with the number "001" and will continue upward by one unit (i.e., FB-001, FB-002, FB-003, etc.) until the final samples for the Removal Action are collected.

X-Ray Fluorescence (XRF) extent of contamination (EOC) samples will be numbered for incorporation into the XRF log-in database. The samples will be numbered with the grid identification number and the depth from ground surface. The grid system is explained in Section 3.5. For example, an XRF sample obtained from an excavation in Grid 7, from 3 feet below ground surface, will be designated X-07-3.

The EOC samples to be sent to the laboratory will be obtained as a single grab sample from within a grid. Single samples will be numbered with the unique grid identification number, and the sampling depth from ground surface. For example, an EOC laboratory sample obtained from the excavation in Grid 7, at 3 feet below ground surface, will be designated E-07-3.

Verification samples to be sent to the laboratory will be labeled similar to the EOC nomenclature. For example, a verification obtained from the excavation in Grid 7 from 3 feet below ground surface, will be designated V-07-3.

3.4 ESTABLISHMENT OF COORDINATE GRID SYSTEM

A coordinate grid system (CGS) has been devised in order to provide a coordinate system for tracking sampling and excavation activity in the field. The CGS uses approximately square grids of 50 feet by 50 feet superimposed completely over the Industrial Property boundary. Additional information concerning the perimeter extent of the boundary may result in adjustment of the grid configuration along the boundary edges.

The configuration of the CGS is presented on Figure 3-1. All grids overlaying areas to be investigated were assigned a unique coordinate number. A total of 246 grids have been numbered. Grids which are predominately occupied by buildings are not included on Figure 3-1. Due to inaccessibility these grids areas will not be investigated at this time. Those grid areas partially occupied by buildings but also having accessible ground areas will be investigated to the extent practicable. Small, uneven areas along the Industrial Property perimeters will be incorporated into neighboring grids so that all accessible areas within the Industrial Property boundary are addressed.

A series of numbers and letters have also been placed along the grid axis to provide a easy means of locating each grid.

During site preparation the grid will be established by surveying. Permanent grid markers will be established on the perimeter of the site. In practice, the grid will be marked in the field by stakes, iron pins, flagging, or other similar means in order to provide a visual point of reference during the removal activities. The permanent perimeter markers will facilitate grid re-construction during excavation activities.

3.5 SAMPLING PROCEDURES - SOLID MEDIA SAMPLING

3.5.1 Extent of Contamination and Verification Sampling

The purpose of the extent of contamination (EOC) sampling is to determine the vertical and horizontal extent of soils and other solid media within the Industrial Property boundary which contain total lead concentrations greater than the clean-up criteria of 1,000 ppm. This will be accomplished by using a combination of visual indications, XRF measurements, and laboratory analyses. Investigation will continue until native soils are encountered to eliminate the possibility of clean fill overlaying contaminated fill. Achievement of the clean-up criteria will be demonstrated by obtaining verification samples.

During the initial stages of excavations, ENTACT will provide a geologist to identify native materials. The ENTACT geologist will train project personnel to identify native soils from fill material (foundry sand, smelter related debris and waste, slag, battery components and construction debris). Following appropriate training, on-site personnel will identify native soils during the remainder of the excavation with oversite by the geologist.

The parameters for analysis were determined by the following rational. During the initial site assessment activities, representatives of the U.S. EPA TAT collected 18 soil samples and conducted total and TCLP analyses for the following metals: arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver.

The results of the EPA site assessment sampling showed that lead was the metal found at greatest concentrations, with one sample result up to 230,000 mg/kg. Other metals found at detectable concentrations included arsenic (470 mg/kg), barium (350 mg/kg), cadmium (110 mg/kg), chromium (57 mg/kg) and mercury (60 mg/kg). Selenium and silver were not detected.

The only metals detected above TCLP limits were lead in 13 samples and cadmium in 1 sample. The TCLP maximum allowable concentrations for lead and cadmium are 5.0 mg/l and 1.0 mg/l, respectively. All other metals were non-detectable for TCLP.

EPA's site assessment data shows that lead is the primary metal of concern. At EPA's request, the following additional metals (besides lead) will be analyzed as part of the EOC and verification sampling: arsenic, barium, cadmium, chromium, and mercury.

The following procedures describe the overall sampling process during the EOC and verification sampling. Specific XRF and soil sampling procedures are described in subsequent sections.

1. The sampling team will adhere to health and safety protocols defined in the Health and Safety Plan.

2. A grid will be selected as the area in which to begin the EOC sampling. Once located the grid boundary will be marked for visual reference. A photographic and/or video

record will be made of each grid's location relative to site perimeter landmarks.

3. A visual reconnaissance of the grid will be made and observations recorded pertaining to the surface presence of obvious battery chips, debris, and other surface cover material potentially impacted by lead.

4. The XRF will be used to obtain at least two measurements per each grid. The XRF sampling procedures are presented later in this Section.

5. If visual indications reveal potential lead-impacted material and/or XRF readings above the clean-up criteria of 1,000 ppm then excavation of the grid will be initiated.

6. EOC samples for laboratory analyses will be collected during the early stages of excavation to develop a site specific correlation between XRF, total and TCLP lead concentrations. These samples will be single grab samples obtained at the same locations as the XRF EOC measurements. The lab analysis will be used to further calibrate the XRF for site-specific conditions. An explanation of the soil sampling procedures are presented later in this Section.

7. Excavation in conjunction with the XRF analysis will continue until the XRF analyses indicates total lead concentrations below 1,000 ppm. XRF readings will be collected from the center of the grid. Also, at least one test pit per grid will be opened to native soils to ensure that all contaminated fill is removed. The excavated soil will be removed to the staging area as described in Section 4.0.

8. A verification grab sample will then be obtained from each grid and submitted to the laboratory in order to provide confirmation that the clean-up criteria has been achieved for that grid.

9. The above procedures are to be repeated for each numbered grid shown on Figure 3-1 until the extent of contamination in all grids has been determined and all material exceeding the clean-up criteria has been removed.

3.5.2 XRF Sampling Procedures

XRF analysis for total lead on soil and solid media will be performed as follows:

a. Sampling teams will adhere to health and safety protocols defined in the Health and Safety Plan.

b. The sample location will be identified, typically on the ground surface or upon the excavation sidewall.

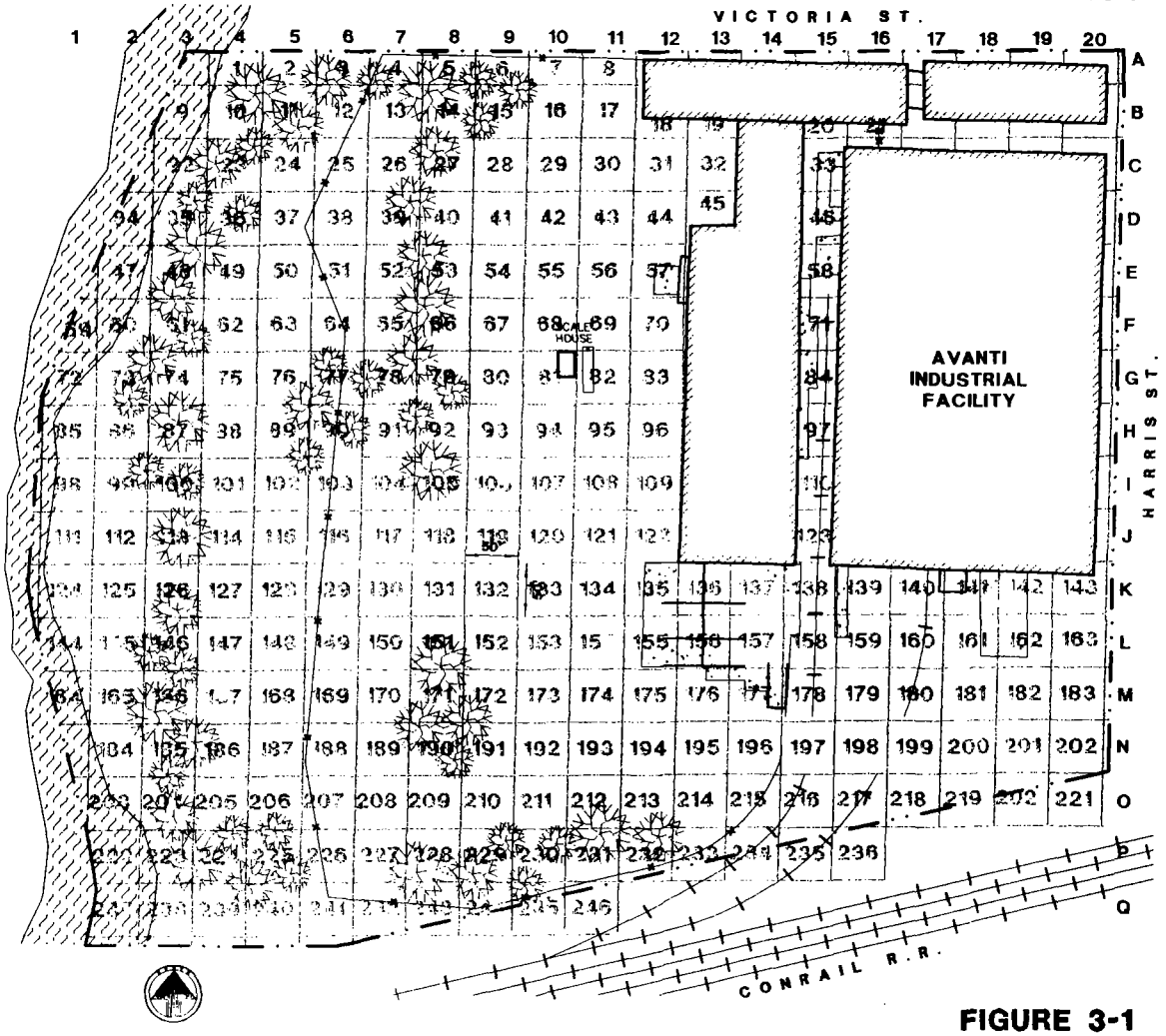
c. For ground surface samples, an approximate 6 inch by 6 inch square area will be cleared of vegetation and debris, with care being taken to remove as little surficial soil as possible, to provide a flat area for XRF analysis.

d. For excavation and sidewall samples a sufficient amount of soil will be retrieved by an extension pole and scoop or by the excavation equipment and placed upon a clean, prepared surface.

AVANTI SITE
INDIANA
PHASE II

SITE COORDINATE GRID SYSTEM

ENTACT



LEGEND

- INDUSTRIAL PROPERTY BOUNDARY AS CURRENTLY KNOWN
- SECURITY FENCE
- GRID LOCATION AND NUMBER GRIDS ARE 50'x50'

* DURING SITE PREPARATION ACTUAL GRID WILL BE SURVEYED AND A PERMANENT GRID MARKER WILL BE IDENTIFIED AND OR ESTABLISHED

FIGURE 3-1

1299-004

e. The XRF probe will be placed on the flat, compacted soil surface, activated and held in place for the 60-second scanning period.

f. The sample identification number will be entered into the unit's computer memory and saved along with the result. This data is downloaded into the master database at the end of each day.

3.5.3 Soil and Solid Media Sampling Procedures for Laboratory Analysis

Soil and solid media sampling for samples to be submitted for EOC and verification laboratory analysis will be performed as follows:

a. The sampling team will adhere to health and safety protocols defined in the Health and Safety Plan.

b. Designated sampling locations will be identified. Photographs and/or a video record will be maintained to document sample locations.

c. Staging areas for sample collection will be established. Polyethylene sheeting will be placed adjacent to the areas to be sampled during sample collection. The following tools and supplies will be prepared for use:

Field Logbook;
Plastic or glass laboratory-supplied sample containers;
Stainless steel or plastic disposable trowels;
Stainless steel or plastic bowls;
Extension pole;
Measuring tape;
Distilled water and gloves; and
3 - 5 gallon buckets for decontamination liquids.

d. A sufficient amount of soil will be retrieved by either the excavation equipment, by extension pole and scoop, or by sample trowel and placed into clean sample containers. The sample will be a grab sample

e. Field notes will be completed and will include identification of the soil being sampled, soil color, condition and other pertinent information.

f. Chain-of-custody documents will be prepared. Sample containers will be labeled in accordance with the predetermined sample numbering system, sealed in a plastic bag and preserved on ice for shipment to the laboratory for analysis.

g. All sampling equipment will be decontaminated utilizing a detergent wash and potable water rinse, followed by a distilled water rinse and drying with disposable towels between each sampling event. All disposable sampling media will be placed into designated site containers.

All EOC and verification samples submitted to the laboratory will be analyzed for total lead. Also, during the early stages of the project, a sufficient number of EOC and verification samples will be analyzed for TCLP lead to develop XRF, total lead, and TCLP lead correlations. The XRF total lead to TCLP lead correlation will be used to segregate those excavated soils requiring treatment.

Finally, 10% of all EOC and verification samples for laboratory analysis will be analyzed for arsenic, barium, cadmium, chromium, and mercury.

Table 3-1 contains a listing of EOC and verification samples to be taken, test method to be utilized, matrix being sampled, frequency of sampling, notes regarding handling and or sample containers and amount of sample material to be collected.

Table 3-1 also includes additional parameters for use during field investigations due to the presence of buried containers, drums, or underground storage tanks.

3.6 TCLP Soil Classification Sampling

Excavated soils will be segregated immediately after excavation into two piles, those expected to exhibit a lead Toxicity Characteristic Leachate Procedure test result (TCLP) of less than 5 mg/l and those expected to exhibit a lead TCLP of 5 mg/l or greater. This initial segregation will be accomplished by using an XRF total lead vs. TCLP lead correlation. The correlation will be developed through sample results from the initial stages of the project. Based on data from other battery recycling and lead smelter facilities, a total lead vs. TCLP lead correlation of approximately 1500 mg/kg : 5 mg/l will be used until the site specific data generates a more accurate correlation factor.

The frequency of classification sampling will be one (1) grab sample from every 200 cubic yards of segregated soil for at least the first 2,000 cubic yards.

The soil which indicates total lead concentrations of less than 1500 mg/kg (or other developed correlation factor) will be segregated and stockpiled for classification sampling. The frequency of classification sampling will be one (1) grab sample from every 200 cubic yards of soil for at least the first 2,000 cubic yards. If 5% or less variability is observed in these sample results, the frequency will be reduced to one grab sample every 500 cubic yards for the next 2,000 cubic yards of segregated soil. The frequency will then be reduced to one grab sample every 1,000 cubic yards for the remainder of segregation activities if sample variability is less than or equal to 5%. ***If results from a sample indicate TCLP lead at or above 5 mg/l, the batch will be moved to the treatment staging area for stabilization.***

The laboratory parameters for soil classification sampling are total lead and TCLP lead. Analytical parameter methods are listed on Table 3-1.

The following field methods will be utilized for these sampling efforts:

a. The sampling team will adhere to health and safety protocols defined in the Health and Safety Plan.

b. Staging areas for sample collection will be established. Polyethylene sheeting will be placed adjacent to the areas to be sampled during sample collection. The following tools and supplies will be prepared for use:

Field Logbook;
Plastic or glass laboratory-supplied sample containers;
Stainless steel trowels or plastic disposable scoops;
Stainless steel or plastic bowls;
Distilled water;
Disposable towels and gloves; and
3-5 gallon buckets for decontamination liquids.

c. A sufficient amount of soil will be retrieved by sample trowel and placed into a clean, stainless steel or plastic bowl and homogenized. The sample will then inserted into the sample container.

d. Field notes will be completed and will include identification and location of the batch being sampled, soil color, condition and other pertinent information.

e. Chain-of-custody documents will be prepared, sample containers will be labeled in accordance with the predetermined identification system and samples will be sealed then placed in plastic bags and shipped to laboratory for analysis.

f. All sampling equipment will be decontaminated utilizing a detergent wash and potable water rinse, followed by a distilled water rinse and drying with disposable towels between each sampling event. All disposable sampling media will be placed into designated site containers.

3.7 TREATMENT CONFIRMATION SAMPLES

As previously discussed, an XRF total lead vs. TCLP lead correlation factor will be used to segregate excavated soil.

Upon completion of contaminated soil removal and verification analysis... areas will be backfilled....

Excavated soils which exhibit a total lead concentration of 1500 mg/kg (or other developed correlation factor) or greater based on XRF analysis will be taken directly to the treatment staging area. These soils will be treated as described in Section 4.0. Following treatment the material will be sampled and analyzed for TCLP lead.

The frequency of sampling will be one (1) grab sample from every 200 cubic yards of treated material for at least the first 2,000 cubic yards. If 5% or less variability is observed in these sample results, the frequency will be reduced to one grab sample every 500 cubic yards for the next 2,000 cubic yards of treated material. The

Following treatment the material will be sampled and analyzed for TCLP lead.

frequency will then be reduced to one grab sample every 1,000 cubic yards for the remainder of treatment activities if sample variability is less than or equal to 5%. If a sample indicates that treatment to less than 5 mg/l TCLP was not accomplished, the entire batch will be retreated.

The treated soils will be sampled and analyzed for TCLP lead. A list of analytical methods is presented on Table 3-1.

The following field methods will be utilized for these sampling efforts:

a. The sampling team will adhere to health and safety protocols defined in the Health and Safety Plan.

b. Staging areas for sample collection will be established. Polyethylene sheeting will be placed adjacent to the areas to be sampled during sample collection. The following tools and supplies will be prepared for use:

Field Logbook;
Plastic or glass laboratory-supplied sample containers;
Stainless steel trowels or plastic disposable scoops;
Stainless steel or plastic bowls;
Distilled water;
Disposable towels and gloves; and
3-5 gallon buckets for decontamination liquids.

c. A sufficient amount of soil will be retrieved by sample trowel and placed into a clean, stainless steel or plastic bowl and homogenized. The sample will then be inserted into the sample containers.

d. Field notes will be completed and will include identification and storage location of the batch being sampled, sample number, data and other pertinent information.

e. Chain-of-custody documents will be prepared, sample containers will be labeled in accordance with the predetermined identification system and samples will be sealed and shipped to the laboratory for analysis.

f. All sampling equipment will be decontaminated utilizing a detergent wash and potable water rinse, followed by a distilled water rinse and drying with disposable towels between each sampling event. All disposable sampling media will be placed into designated site containers.

3.8 BACKFILL MATERIAL

Upon completion of contaminated soil removal and verification analysis of excavated grid areas, designated areas will be backfilled utilizing residential soils containing less than 1,000 ppm total lead.

Residential soil used as backfill will be tested for total lead and TCLP lead every 200 cubic yards. A list of analytical methods is presented on Table 3-1.

The following field methods will be utilized to obtain each sample:

a. The sampling team will adhere to health and safety protocols defined in the Health and Safety Plan.

b. The following tools and supplies will be prepared for use:

Field Logbook;
Plastic or glass laboratory-supplied sample containers;
Stainless steel trowels or plastic disposable scoops;
Stainless steel or plastic bowls;
Distilled water;
Disposable towels and gloves; and
3-5 gallon buckets for decontamination liquids.

c. A sufficient amount of soil will be retrieved by sample trowel and placed into a clean, stainless steel or plastic bowl and homogenized. The sample will then be inserted into the sample containers.

d. Field notes will be completed and will include identification and storage location of the batch being sampled,

sample number, data and other pertinent information.

e. Chain-of-custody documents will be prepared, sample containers will be labeled in accordance with the predetermined identification system and samples will be sealed and shipped to the laboratory for analysis.

f. All sampling equipment will be decontaminated utilizing a detergent wash and potable water rinse, followed by a distilled water rinse and drying with disposable towels between each sampling event. All disposable sampling media will be placed into designated site containers.

In addition to residential soils, if an outside backfill source is required during site restoration activities on the industrial property the following steps will be performed:

1. The backfill source location will be visited and inspected to ensure the source area can supply the type of clean backfill soil and volumes required. Directly involved governmental agencies will be notified in writing of the location from which backfill soils will be obtained and site visits may be conducted by those agencies and split samples may be collected.

2. Grab samples will be obtained directly from a clean backfill source location. Each sample will be located within the areas that, as indicated by the backfill source operator, will supply the backfill soil for the Avanti Phase II removal action. Samples will be collected from various depths during the sampling activity. The samples will be obtained as follows:

a. No PPE is deemed necessary for this sampling task except for the wearing of disposable, latex gloves.

b. The following tools and supplies will be prepared for use:

   Field Logbook;
   Laboratory-supplied plastic and/or glass sample containers, as appropriate;
   Stainless steel trowels or disposable scoops;
   Decontaminated stainless steel bowl;
   Distilled water;
   Disposable towels and gloves; and
   3-5 gallon buckets for decontamination liquids.

c. A sufficient amount of soil will be retrieved from a discrete sample location by sample trowel and placed into a clean, stainless steel and briefly homogenized. The sample will then be inserted into the sample containers.

d. Samples to be analyzed for TPH and Pesticides are to be filled to the top of the jar and packed in with no substantial air voids and no headspace.

e. Field notes will be completed and will include a description of the soil being sampled, soil color, condition, photographs of each sample location and other pertinent information.

f. Chain-of-custody documents will be prepared, sample containers will be labeled in accordance with the predetermined identification system and samples will be sealed then placed in plastic bags and

placed on ice for shipment to the laboratory for analysis.

g. All sampling equipment will be decontaminated utilizing a detergent wash and potable water rinse, followed by a distilled water rinse and drying with disposable towels between each sampling event. All disposable sampling media will be placed into designated site containers.

Each off-site backfill soil sample will be analyzed for total metals arsenic, barium, cadmium, chromium, lead, selenium, silver, and mercury, pH, total petroleum hydrocarbons, and pesticides. A list of analytical parameters is shown on Table 3-1.

Typical, native soil concentration ranges for the above parameters will be determined from literature-based background ranges for the area and compared to the laboratory results to determine the acceptable chemical characteristics of the backfill soil.

...native soil concentration ranges for the above parameters will be determined from literature-based background ranges....

Finally, an affidavit will be prepared for the backfill soil owner/operator to attest that all backfill soils to be supplied to the Avanti project will be from the inspected and sampled barrow source area.

3.9 WASTE WATER SAMPLING

3.9.1 Waste Water

Representative liquid samples will be collected from the on-site temporary storage area which will store decontamination waters generated during the project. Representative samples will be collected to define water quality parameters as required for disposal or discharge. Samples will be analyzed for total arsenic, total cadmium, total lead and total mercury. A list of analytical methods is shown on Table 3-1.

a. The sampling team will adhere to health and safety protocols defined in the Health and Safety Plan.

b. A staging area for sample collection will be established. Polyethylene sheeting will be placed adjacent to the tank. Tools and supplies will be prepared. Sampling equipment will typically include:

Field Logbook;
Decontamination equipment;
Hollow glass sampling tube or dipper;
Decontaminated sample transfer container; and
Laboratory-supplied glass sample containers.

c. Using the sampling device obtain a representative column of sample from the tank and place into the sample transfer container. Several samples may be required to satisfy the sample volume requirements. The sample will be briefly stirred and then poured into the appropriate sample containers.

d. All sample containers will be closed and labeled in accordance with container identification markings. Chain-of-custody

documents will be prepared and samples will be placed on ice immediately.

e. All sampling equipment will be decontaminated utilizing a detergent wash, rinsed with potable water followed by a distilled water rinse and dried with disposable wipes between each sampling event. All disposable media will be placed into designated site containers.

3.10 SAMPLING PROCEDURES - AIR SAMPLES

3.10.1 PM10 Samples

Four PM10 samplers were placed around the Industrial Property during Phase I activities. These monitors will remain operational throughout the Phase II removal action. Air monitoring is further discussed in Section 2.8 of the Work plan.

Every attempt will be made to maintain the following siting recommendations regarding location of samplers during Phase II:

1. Sampler should be at least 20 meters (m) from trees, buildings or other large obstacles. A general placement rule is that the sampler should be located at least twice as far away from the obstacle as the height of the obstacle.

2. Sampler inlet should be 2 to 7 m above the ground.

3. Sampler must have unrestricted air flow.

4. Sampler inlet should be at least 2 m from any other high-volume sampler inlet.

5. Do not place the sampler directly upon the ground or gravel roof top.

6. Do not place sampler near exhaust flues or vents.

The sampling unit will be assembled according to manufacturers instructions and bolted or otherwise attached to a stand. Samples will be taken over 24 hour periods. Samples will be sent to the laboratory for routine analysis every fifth working day. If Random Air Monitoring (RAM) data indicates elevated ambient particulate matter (>1.5 micrograms per cubic meter) on a specific day, the sample collected on that day will also be sent in for analysis.

3.10.2 Total Suspended Particulate Samplers

Four total suspended particulate (TSP) samplers will be positioned adjacent to each of the PM10 samplers. TSP samples will be obtained at the sample frequency as the PM10 samples. The TSP samplers are discussed in more detail in Section 2.8 of the Work plan.

3.10.3 Personal/Area Samplers

Two area/personal air monitors will be placed within the perimeter boundaries of the Industrial Property, one upwind and one downwind of the support zone. These monitors consist of low volume air pumps with preloaded filter cassettes. Filter cassettes will be removed from the units and packaged according to the manufacturer's instructions for transportation to the laboratory (manufacturer's instructions have been included in the appendices).

Three area/personal air monitors will also be used in the excavation work area in the Industrial Property. One will be placed as an area monitor upwind of the excavation area and one will be placed downwind. The third

monitor will be placed on a person working in the excavation area.

Wind direction will be monitored on a daily basis to determine appropriate siting of area monitors.

All area personal air samples will be analyzed every fifth day and on days that RAM readings appear elevated.

3.10.4 Random Air Monitoring (RAM)

To assist with daily monitoring, a hand-held Random Air Monitor (RAM) will be utilized to record periodic ambient air conditions during Phase II removal action activities. An 8 hour Time Weighted Average will be collected in and around the work zone. If a reading exceeds 1.5 micrograms per cubic meter (a conservative approach which assumes that all dust is lead dust), then corrective measures regarding dust suppression will be increased and the PM10 samples and area samples will be sent for laboratory analysis.

3.11 DATA QUALITY OBJECTIVES

3.11.1 Data Quality Needs

A combination of two levels of data quality objectives will be utilized in this project to address field screening and laboratory analytical data. Data Quality Objective Level 1, Field screening methods (XRF and organic vapor analyzer) will be used during the EOC and field investigation. Data Quality Objective Level 2 samples will be taken and analyzed in the laboratory for EOC, for verification that no greater than 1,000 ppm

A combination of two levels of data quality objectives will be utilized in this project to address field screening and laboratory analytical data.

of total lead remains in each excavated Industrial Property grid, for confirmation of treatment, waste classification for proper disposal, and air monitoring. Samples will be analyzed for the parameters listed on Table 3-1. Field duplicates and rinsate blanks will be taken for field quality assurance (QA) and quality control (QC), as well as laboratory QA and QC to be performed for all samples submitted to the laboratory. A complete description of all QA and QC procedures is presented in the Phase II Quality Assurance Project Plan (QAPP), presented in Appendix F of this Work Plan.

3.11.2 Detection Limit Requirements

The level of concern for each parameter directly affects the data quality requirements. Therefore, the sampling and analysis methods must be accurate at the level of concern. Furthermore, it is necessary that the analytical technique chosen has a detection limit well below the level of concern.

Analytical methods that can accurately quantify constituents below their levels of concern will be used for the Avanti Phase II sample analyses. The detection limits will generally be much less than the levels of concern.

It is necessary that data quality objectives be consistent with clean-up levels or other

Analytical methods that can accurately quantify constituents below their levels of concern will be used....

levels. Therefore, analytical detection limits should be less than the level of concern for each constituent and will be selected so that any analyzed parameter result can be compared to the appropriate level.

The QAPP discusses the planned detection limits for analyses along with the methods to be used for this investigation in order to address the various levels for comparison.

3.11.3 Chain-of-Custody Procedures

Proper documentation of sample collection and the methods used to control these documents are referred to as Chain-of-Custody (COC) procedures. COC procedures are essential for presentation of sample analytical results as evidence in litigation or at administrative hearings conducted by regulatory agencies. COC procedures also serve to minimize loss or misidentification of samples and to ensure that unauthorized persons do not tamper with collected samples. The QAPP describes all COC procedures for both field use and laboratory use. An example COC record form is also presented in the QAPP.

3.12 SAMPLE SHIPPING

For shipping, all samples will be stored on ice and packaged in such a manner as to prevent damage or breakage during shipment or transport. Samples not delivered to the laboratory will be shipped through an overnight parcel service by sampling personnel. Samples will be placed into suitable containers, labeled and sealed in such a manner that tampering with the seal would be obvious. All sample holding times will be tracked and a copy of the Chain-of-Custody form will accompany the samples in a sealed plastic bag. Sample shipping is discussed in the QAPP.

3.13 FIELD INSTRUMENT OPERATION AND CALIBRATION

X-Ray Fluorescence Analyzer

The Spectrace 9000 energy dispersive X-Ray Fluorescence analyzer will be the instrument utilized for Removal Action tasks. The Spectrace 9000 utilizes three radioisotope sources. Each source emits a different energy (wavelength) of radiation which provides efficient analysis of specific ranges of elements. A 60-second scan time will be utilized for the duration of the Removal Action. Only qualified analysts trained in the proper use, theory, and safety of XRF analysis will operate this system.

...the XRF will be standardized daily utilizing referenced standards ....

The principle of XRF analysis is based on electron excitation. Elemental atoms in a soil sample are irradiated with a beam of X-Rays. Electrons in the atoms'at lower lying energy

levels are excited to higher energy levels. The vacancies left in the inner electron orbitals make the atom unstable. Relaxation to the ground state occurs, resulting in the emission of X-Rays characteristic of the excited elements. Thus, by examining the energies of the X-Rays emitted by the irradiated soil sample, identification of elements present in the sample is possible. Comparing the intensities of the X-Rays emitted from a given sample to those emitted from reference standards with known analyte concentrations allows quantification of the elements present in the samples.

Prior to any on-site activities, the Spectrace 9000 will be properly calibrated in order to allow for accurate sample analysis. During on-site activities, the XRF will be standardized daily utilizing referenced standards for quality assurance and quality control.

PM10 Air Monitoring Equipment

PM10 samples will be collected from an Anderson General Metal Works PM10 sampler, model 321-B MFC HVPM10. The units will be calibrated weekly in accordance with the manufacturers recommendations. Assembly, operation, and calibration procedures can be found in "Instruction and Operation Manual High Volume PM10 Sampler".

TSP Air Monitoring Equipment

TSP samples will be collected by a General Metal Works Model 2000 sampler. The units will be calibrated weekly in accordance with the manufacturers recommendations. Assembly, operation, and calibration procedures can be found in "Instruction and Operation Manual for the GMW 2000 TSP Sampler".

Personal/Area Air Monitors

An air sampling pump kit utilizing a Sensodyne BDX 530 Heavy Duty Super Sampler Pump and preloaded filter cassettes will be used for personal and area air monitoring. These units will be calibrated before each use and adjusted, as necessary, in accordance with manufacturer's instructions.

Random Air Monitors

PCD-1 Respirable Dust Monitor manufactured by Measurement Systems, Inc. will be used for random air monitoring. This unit measures respirable dust concentrations from 0.001 to 100 mg/m^3. Concentration data is displayed on a LCD readout and stored in the instruments memory.

TABLE 3-1: LIST OF PHASE II PARAMETERS AND TEST METHODS BY INVESTIGATION TASK
REMOVAL ACTION WORKPLAN
AVANTI SITE, INDIANAPOLIS, INDIANA

Test Description	Test Method	Extraction Method	Matrix	Frequency	Container	Preservation	Sample Size	Maximum Holding Time
Extent of Contamination								
Total Arsenic	SW-6010[1]	SW-3050	Soil	1 per grid cell (10% of samples)	P/G	None	25 g	6 months
Total Barium	SW-6010	SW-3050	Soil	1 per grid cell (10% of samples)	P/G	None	25 g	6 months
Total Cadmium	SW-6010	SW-3050	Soil	1 per grid cell (10% of samples)	P/G	None	25 g	6 months
Total Chromium	SW-6010	SW-3050	Soil	1 per grid cell (10% of samples)	P/G	None	25 g	6 months
Total Lead	SW-6010	SW-3050	Soil	1 per grid cell	P/G	None	25 g	6 months
Total Mercury	SW-7471	SW-3050	Soil	1 per grid cell (10% of samples)	P/G	None	25 g	28 days
Total Lead	XRF[3]	na	Soil	Lateral extent determinations	Field Test	na[4]	na	na
Excavation Verification								
Total Arsenic	SW-6010	SW-3050	Soil	1 per grid cell (10% of samples)	P/G	None	25 g	6 months
Total Barium	SW-6010	SW-3050	Soil	1 per grid cell (10% of samples)	P/G	None	25 g	6 months
Total Cadmium	SW-6010	SW-3050	Soil	1 per grid cell (10% of samples)	P/G	None	25 g	6 months
Total Chromium	SW-6010	SW-3050	Soil	1 per grid cell (10% of samples)	P/G	None	25 g	6 months
Total Lead	SW-6010	SW-3050	Soil	1 per grid cell	P/G	None	25 g	6 months
Total Mercury	SW-7471	SW-3050	Soil	1 per grid cell (10% of samples)	P/G	None	25 g	28 days
Soil Classification and Treatment Confirmation								
TCLP Lead[5]	SW-6010	SW-1311	Soil	Initially 1 per 200 c.y., then incremental to 1 per 1000 c.y.	P/G	None	250 g	6 months
Total Lead	SW-6010	SW-3050	Soil	Initially 1 per 200 c.y., then incremental to 1 per 1000 c.y.	P/G	None	25 g	6 months

Notes:
[1] Sample Test Method designated as SW-xxxx is from EPA SW-846.
[2] P/G - Plastic or Glass
[3] XRF - X-Ray Fluorescence Analyzer
[4] na - not applicable
[5] TCLP - Toxicity Characteristic Leaching Procedure.

TABLE 3-1 (Continued): LIST OF PHASE II PARAMETERS AND TEST METHODS BY INVESTIGATION TASK
REMOVAL ACTION WORKPLAN
AVANTI SITE, INDIANAPOLIS, INDIANA

Test Description	Test Method	Extraction Method	Matrix	Frequency	Container	Preservation	Sample Size	Maximum Holding Time
Air Monitoring								
Total Suspended Particulate	40 CFR Part 50, App. B	40 CFR Part 50, App. B	Air	daily [1] (4 per Industrial Perimeter)	Filter	na	na	na
Respirable Dust by PM-10	40 CFR Part 50, App. J	40 CFR Part 50, App. J	Air	daily [1] (4 per Industrial Perimeter)	Filter	na	na	na
Total Lead by PM-10	40 CFR Part 50, App. G	40 CFR Part 50, App. G	Air	daily [1] (4 per Industrial Perimeter)	Filter	na	na	na
Total Lead by low-vol Sampler	NIOSH 7300	NIOSH 7300	Air	daily [1] (5 per Industrial Perimeter and Work Areas)	Filter Cassette	na	na	na

Notes:
[1] Analyze 1 every 5 days and, additionally, if Random Air Monitor indicates an elevated daily level.

TABLE 3-1 (Continued): LIST OF PHASE II PARAMETERS AND TEST METHODS BY INVESTIGATION TASK
REMOVAL ACTION WORKPLAN
AVANTI SITE, INDIANAPOLIS, INDIANA

Test Description	Test Method	Extraction Method	Matrix	Frequency	Container	Preservation	Sample Size	Maximum Holding Time
Decontamination Wastewater								
Total Arsenic	E-200.7[1]	E-4.1.3[1]	Water	1 per Tank	P/G[3]	HNO_3 pH <2	1000 ml	6 months
Total Cadmium	E-200.7	E-4.1.3	Water	1 per Tank	P/G	HNO_3 pH <2	1000 ml	6 months
Total Lead	E-200.7	E-4.1.3	Water	1 per Tank	P/G	HNO_3 pH <2	1000 ml	6 months
Total Mercury	E-245.1	E-4.1.3	Water	1 per Tank	P/G	HNO_3 pH <2	1000 ml	28 days
Underground Storage Tanks								
Total Petroleum Hydrocarbons	SW-8015[2] Modified	SW-3500	Soil	7 per Tank	P/G	ice to 4°C	250 g	14 days

Notes:
[1] Sample Test Method designated as E-xxx.x is from EPA 600/4-79-020 Water Methods.
[2] Sample Test Method designated as SW-xxxx is from EPA SW-846.
[3] P/G - Plastic or Glass.

TABLE 3-1 (Continued): LIST OF PHASE II PARAMETERS AND TEST METHODS BY INVESTIGATION TASK
REMOVAL ACTION WORKPLAN
AVANTI SITE, INDIANAPOLIS, INDIANA

Test Description	Test Method	Extraction Method	Matrix	Frequency	Container	Preservation	Sample Size	Maximum Holding Time
Residential Backfill Material								
TCLP Lead[4]	SW-6010	SW-1311	Soil	1 per 200 c.y.	P/G	None	250 g	6 months
Total Lead	SW-6010	SW-3050	Soil	1 per 200 c.y.	P/G	None	25 g	6 months
Off Site Backfill Material								
Total Arsenic	SW-6010[1]	SW-3050	Soil	12 per source	P/G[2]	None	25 g	6 months
Total Barium	SW-6010	SW-3050	Soil	12 per source	P/G	None	25 g	6 months
Total Cadmium	SW-6010	SW-3050	Soil	12 per source	P/G	None	25 g	6 months
Total Chromium	SW-6010	SW-3050	Soil	12 per source	P/G	None	25 g	6 months
Total Lead	SW-6010	SW-3050	Soil	12 per source	P/G	None	25 g	6 months
Total Mercury	SW-7471	SW-3050	Soil	12 per source	P/G	None	25 g	28 days
Total Selenium	SW-6010	SW-3050	Soil	12 per source	P/G	None	25 g	6 months
Total Silver	SW-6010	SW-3050	Soil	12 per source	P/G	None	25 g	6 months
pH	SW-9045	SW-9045	Soil	12 per source	P/G	None	25 g	ASAP[3]
Total Petroleum Hydrocarbons	SW-8015 Modified	SW-3500	Soil	12 per source	P/G	Ice to 4°C	250 g	14 days
Pesticides	SW-8080	SW-3540/50	Soil	12 per source	P/G	Ice to 4°C	250 g	14 days

Notes:
[1] Sample Test Method designated as SW-xxxx is from EPA SW-846.
[2] P/G - Plastic or Glass.
[3] ASAP - These samples should be analyzed as soon as possible.
[4] TCLP - Toxicity Characteristic Leaching Procedure.

TABLE 3-1 (Continued): LIST OF PHASE II PARAMETERS AND TEST METHODS BY INVESTIGATION TASK
REMOVAL ACTION WORKPLAN
AVANTI SITE, INDIANAPOLIS, INDIANA

Test Description	Test Method	Extraction Method	Matrix	Frequency	Container	Preservation	Sample Size	Maximum Holding Time
Containerized Waste Material								
TCLP[1] Arsenic	SW-6010[2]	SW-1311	Waste	Waste specific	P/G[3]	None	250 g	6 months
TCLP Barium	SW-6010	SW-1311	Waste	Waste specific	P/G	None	250 g	6 months
TCLP Cadmium	SW-6010	SW-1311	Waste	Waste specific	P/G	None	250 g	6 months
TCLP Chromium	SW-6010	SW-1311	Waste	Waste specific	P/G	None	250 g	6 months
TCLP Lead	SW-6010	SW-1311	Waste	Waste specific	P/G	None	250 g	6 months
TCLP Mercury	SW-7471	SW-1311	Waste	Waste specific	P/G	None	250 g	28 days
TCLP Selenium	SW-6010	SW-1311	Waste	Waste specific	P/G	None	250 g	6 months
TCLP Silver	SW-6010	SW-1311	Waste	Waste specific	P/G	None	250 g	6 months
TCLP Volatiles	SW-8240	SW-1311	Waste	Waste specific	P/G	ice to 4°C	250 g	14 days
TCLP Semivolatiles	SW-8270	SW-1311	Waste	Waste specific	P/G	ice to 4°C	250 g	14 days
TCLP Pesticides	SW-8080	SW-1311	Waste	Waste specific	P/G	ice to 4°C	250 g	14 days
TCLP Herbicides	SW-8150	SW-1311	Waste	Waste specific	P/G	ice to 4°C	250 g	14 days
pH	SW-9040/41	SW-9040/41	Waste	Waste specific	P/G	None	25 g	ASAP[4]

Notes:
[1] TCLP - Toxicity Characteristic Leaching Procedure.
[2] Sample Test Method designated as SW-xxxx is from EPA SW-846.
[3] P/G - Plastic or Glass.
[4] ASAP - These samples should be analyzed as soon as possible.

ENTACT

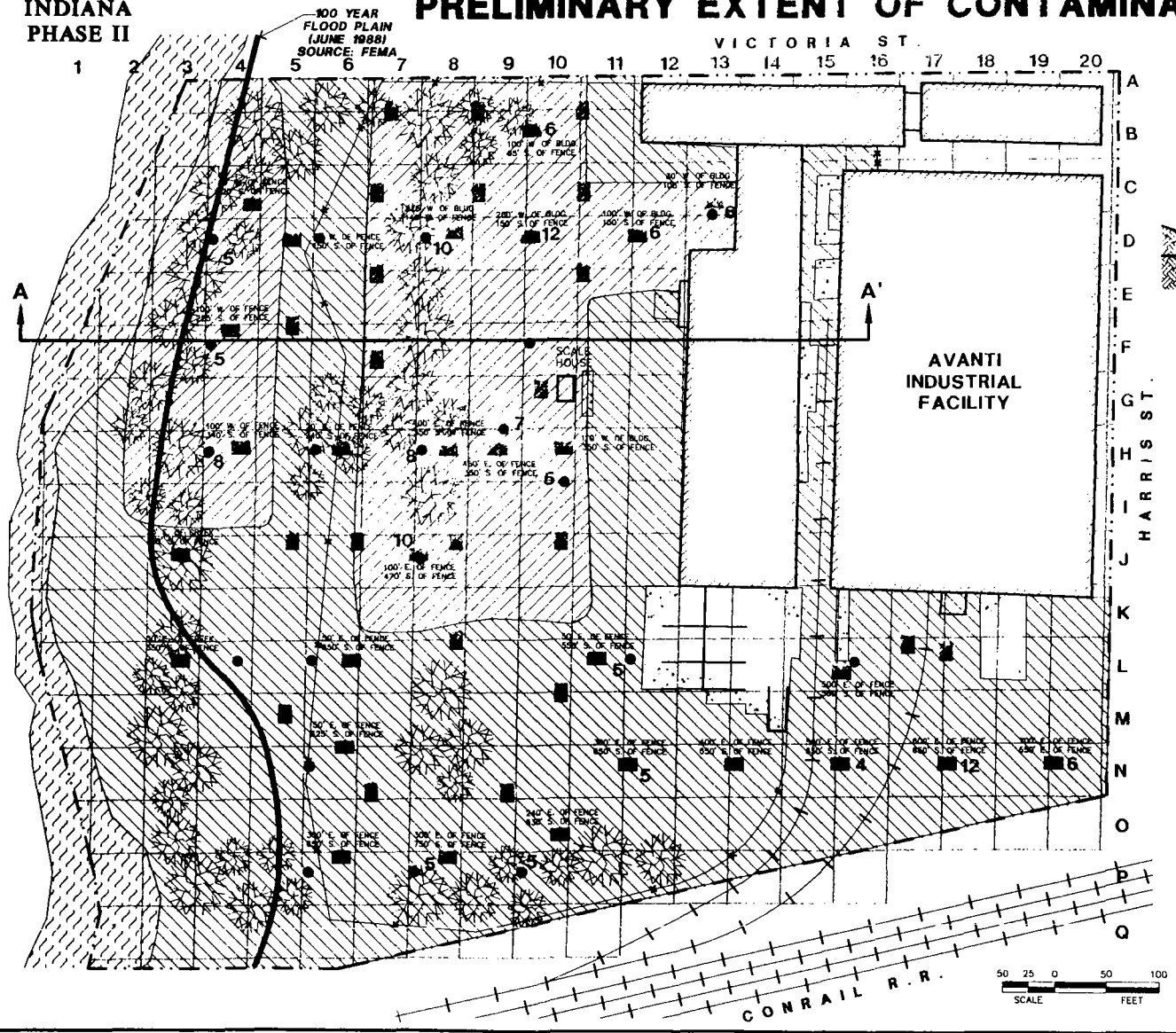
Section four

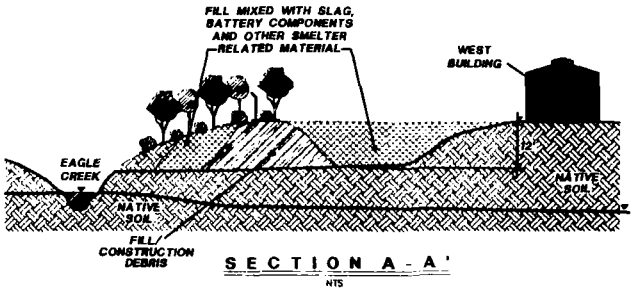
Section 4

AVANTI SITE
INDIANA
PHASE II

PRELIMINARY EXTENT OF CONTAMINATION

ENTACT





SECTION A - A'
NTS

NOTES

- THIS PRELIMINARY EOC (PEOC) WAS PERFORMED IN JULY 1995 TO ASSESS THE AREAS OF THE SITE THAT POTENTIALLY CONTAIN SMELTER RELATED MATERIAL.
- THIS PEOC WAS PERFORMED BY DIGGING INVESTIGATION PITS AT THE SHOWN LOCATIONS. THE PITS WERE LOGGED EVERY 2' FOR VISIBLE SLAG, BATTERY COMPONENTS AND OTHER HAZARDOUS SMELTER RELATED MATERIAL.
- RANDOM SAMPLES WERE SCREENED WITH THE XRF TO ESTIMATE THE TOTAL LEAD CONTAMINATION.
- THE AREAS OF THE SITE WERE PRIORITIZED BASED ON THE PRESENCE OF HAZARDOUS SMELTER RELATED MATERIAL AND THE POTENTIAL CONTAMINATION EXPOSURE TO WIND, SURFACE WATER, SURFACE WATER RUNOFF AND GROUNDWATER.
- FILL MATERIAL WAS FOUND ACROSS THE SITE. FILL WITH ELEVATED LEAD CONCENTRATIONS IS HIGHLIGHTED ON THE SITE MAP.
- WHERE LEAD IMPACTED FILL WAS ENCOUNTERED, THE NATIVE SOIL BENEATH THE FILL DISPLAYED XRF READINGS AT OR BELOW 1,000 mg/kg TOTAL LEAD.
- NO GROUNDWATER WAS ENCOUNTERED AT MAXIMUM TEST PIT DEPTHS OF 18 FEET.

LEGEND

PRIORITIZED SMELTER RELATED MATERIAL TO BE ADDRESSED IN PHASE II STAGE A ACTIVITIES

SMELTER RELATED MATERIAL ABOVE 1,000 mg/kg TOTAL LEAD NOT ADDRESSED IN STAGE A ACTIVITIES

6 — DEPTH IN FEET OF VISUAL SLAG, BATTERY COMPONENTS OR OTHER SMELTER RELATED MATERIAL

● — INVESTIGATION PIT LOCATIONS

700' E. OF FENCE
650' S. OF FENCE
TEST PIT LOCATIONS

FIGURE 4-1

1299-31A

4.0 REMOVAL ACTIVITIES

The following section describes the various tasks that will be performed as part of Phase II Stage A emergency removal activities on the Industrial portion of the Avanti Site.

The information in this section addresses removal action items contained in Paragraph V. 3 of the Order including the following:

- ***Extent of Contamination Survey within the Industrial Portion of the Site,***
- ***Field Investigation within the Industrial Portion of the Site,***
- ***Excavate 30,000 cubic yards of Impacted Soils and debris,***
- ***Excavation will continue until the clean-up criteria of 1,000 mg/kg total lead and TCLP lead of less than 5.0 mg/l is reached,***
- ***Stabilize lead impacted soil and debris displaying the hazardous characteristic for lead, and***
- ***Backfill excavated areas with topsoil removed from the residential portion of the site. The backfill soils will have a total lead concentration less than 1,000 mg/kg and less than 5.0 mg/l leachable lead.***

Each action item above is discussed in the following sections.

4.1 PRELIMINARY EXTENT OF CONTAMINATION SURVEY

As required in the Administrative Order, an Extent of Contamination (EOC) Survey will be preformed and completed in Stage A and B activities. In July 1995 a Preliminary EOC was performed on the Industrial Property to prioritize areas that pose the most potential endangerment to human health and the environment. This visual survey consisted of the exploratory digging and logging of approximately 50 test pits located throughout the industrial portion of the site. The test pit locations can be found on Figure 4-1.

The test pits were logged every 2 feet to determine the visible presence of slag, battery components, foundry sand and other smelter related materials. Periodically, the material was screened with an XRF instrument to provide preliminary estimates of total lead levels. Notes from the preliminary investigation are provided on Figure 4-1.

Prioritization of the excavation areas to be addressed in Phase II Stage A removal activities is based on the presence of smelter related materials. The areas shown in Figure 4-1 have been chosen based on this criteria.

4.2 TREATABILITY STUDY FOR STABILIZATION

A treatability Study will be conducted to determine the most efficient and effective blend of proprietary additive to effectively reduce lead leachability in the treated soil to non-hazardous levels. During the treatability study, each sample will also be analyzed for arsenic, barium, cadmium, chromium, and mercury.

Treatability samples will be collected from soils on the Industrial portion of the site known to contain high levels of lead contamination. Five, one quart sample jars will be used to collect five grab samples of surface and subsurface material with visible presences of slag, battery components and other smelter related materials.

XRF field screening will be used to verify that the samples contain high lead levels. Samples will be delivered to Southern Spectrographic Laboratory, Irving, Texas, individually homogenized, and analyzed for total lead and TCLP lead.

Portions of the individual samples will be mixed treated with varying ratios of additives that are proven effective for lead impacted materials. The stabilized samples will then be analyzed for TCLP lead. The results will be evaluated to determine the appropriate and economic add-mixture ratio which yields TCLP values below 5.0 mg/l leachable lead. Arsenic, barium, cadmium, chromium, and mercury will included in the analyses to ensure that they do not exceed allowable leachable concentrations.

4.3 Engineering Controls

In the prioritized excavation areas, all soil will be misted and wetted prior to any excavation. ***Also, wetting and dust suppression measures, such as the use of surfactant, will be implemented during activities that may generate dust emissions.*** If misting systems are ineffective on cold and windy days, an encapsulant will be applied to specific areas in order to control potential emissions. Wetting will be performed in a manner so as not to saturate the soils.

A designated person in each Exclusion Zone will be responsible for eliminating all visible emissions. This person has the authority to stop all excavation and transporting activities, as necessary, to enforce this requirement. Broad span water misting will be used to suppress possible dust emissions from open excavations. Air monitoring will also be performed as outlined in Section 2.

4.4 Clean-up Activities

Excavation will begin along the northwest portion of the site in the area identified on Figure 4-2 as having prioritized smelter related material.

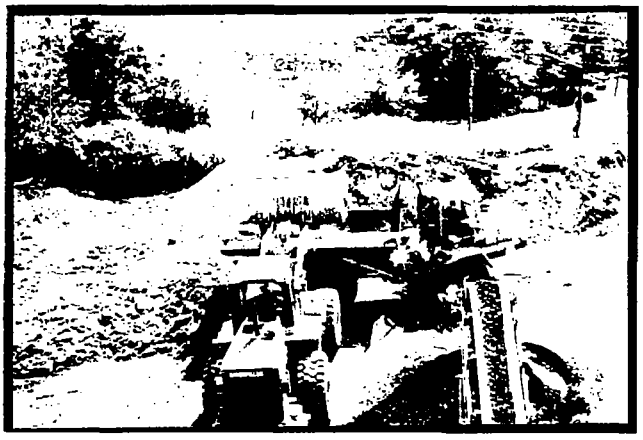
ENTACT will employ an XRF field screen instrument to guide excavation toward the cleanup goal real-time in the field, thereby eliminating laboratory turn around time.

Materials identified by XRF analysis as having a lead concentration in excess of the action level will be excavated and transported to the treatment area for segregation and treatment as shown in Figure 4-2. Based on XRF readings and visual observations, excavation will continue until the affected materials are removed.

Once all affected materials are removed from a grid final excavation verification samples will be collected as grab samples from each grid and submitted for laboratory analysis. Analyses will include total lead. The parameters TCLP lead and the additional total metals arsenic, barium, cadmium, chromium and mercury will be analyzed on a frequency of 10% of the total lead samples.

All material designated for off-site disposal will be analyzed for TCLP lead at a frequency of 1 sample for every 200 cubic yards.

The XRF sampling equipment will be properly calibrated with standardized on samples on a daily basis. QA/QC samples will be collected at the frequencies and by the procedures specified in the Quality Assurance Project Plan, Appendix F of this Work Plan.



Movement of treated soil

Following excavation, contaminated materials will be segregated and transferred to the treatment area inside of the on-site Industrial Buildings, shown in Figure 4-2, for staging, treatment and sampling. ENTACT will employ an XRF to segregate excavated material for treatment purposes. Excavated materials will be segregated based on the need for treatment (i.e. whether they leach TCLP lead concentrations less than or greater than 5.0 mg/l).

Segregation of excavated materials will be accomplished by using the correlation between XRF total lead and TCLP lead developed during the first part of the Stage A removal activities as discussed in Section 3.5.3. Materials that are not conducive to treatment such as metal debris, large concrete debris, tires, and wood timbers will be segregated, sampled, decontaminated and properly disposed.

4.5 STABILIZATION OPERATIONS

The material requiring treatment will be treated through a chemical fixation/stabilization process. Treated / Untreated non-hazardous materials will remain stockpiled in the on-site East Warehouse pending Phase II Stage B removal activities. Following final volume determinations during Stage B, the non-hazardous materials will be disposed of in accordance with IDEM's Special Waste regulations and RCRA subtitle D, as necessary.

The treatment approach presented herein has been used successfully at other sites with lead-contaminated soil, debris and residual material from the operation of secondary lead smelters.

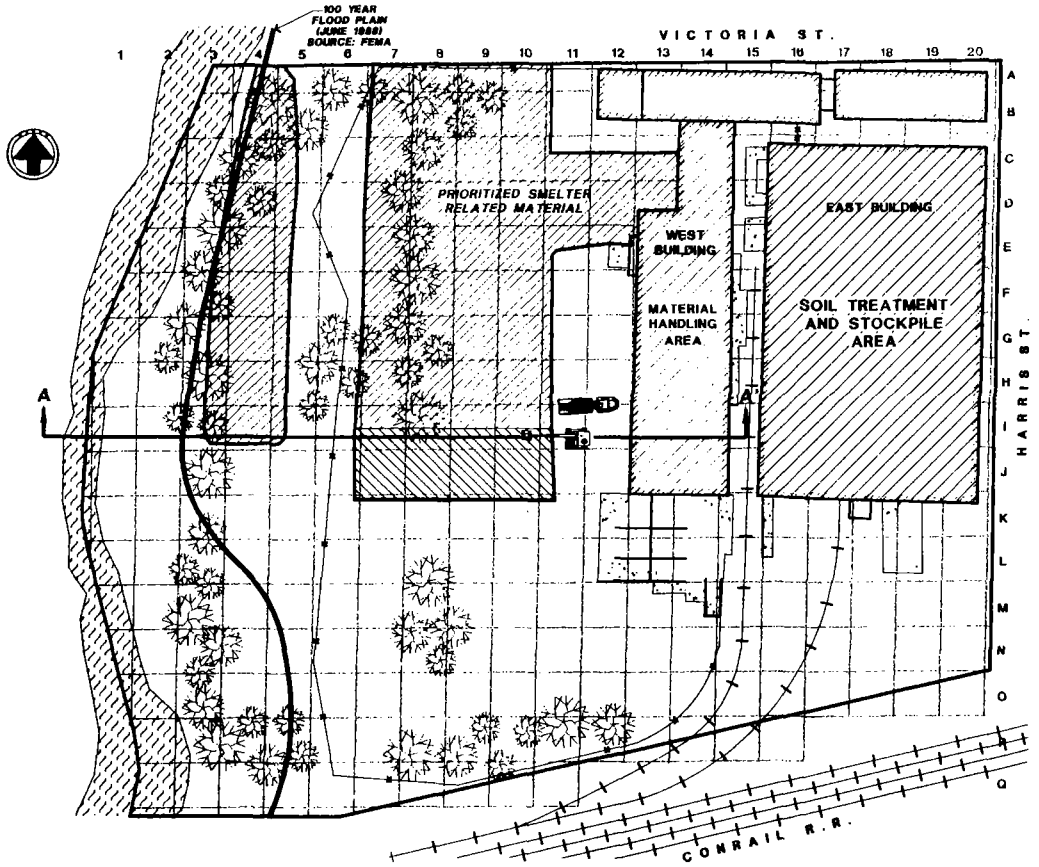
The ENTACT patented treatment process combines heavy metal contaminated soil and debris with a chemical additive to reduce leachable metal concentrations to non-hazardous levels. The process maximizes particle surface area and thoroughly mixes waste with additive to create a more thoroughly treated product than conventional soil treatment units. The chemical additive is also an ENTACT patent pending product.

The waste preparation portion of the treatment unit consists of a series of specially designed crushing units and screens to reduce particle diameters to approximately one inch. As a result, the particle surface area available to react with the treatment additive is maximized. The unit has the ability to recycle the waste material through the sizing units to consistently deliver the desired particle size. This type of quality control on the particle size is unique to the ENTACT system.

AVANTI SITE
INDIANA
PHASE II

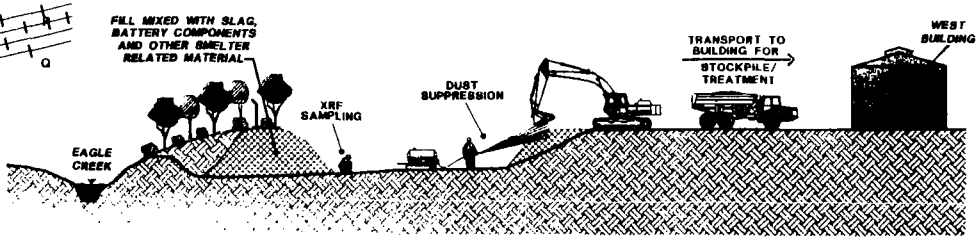
EXCAVATION OF SMELTER RELATED MATERIAL

ENTACT



NOTES

- STORMWATER MANAGEMENT PRACTICES WILL BE IMPLEMENTED AS REQUIRED.
- EXCAVATE 30,000 c.y. OF SMELTER RELATED MATERIAL FROM THE PRIORITIZED AREAS.
- VERIFICATION SAMPLES WILL BE COLLECTED BASED ON THE COORDINATE GRID SYSTEM AND SUBMITTED FOR TOTAL LEAD AND TCLP LEAD ANALYSIS.
- 10% OF THE EOC SAMPLES AND TREATMENT VERIFICATION SAMPLES WILL BE ANALYZED FOR ARSENIC, BARIUM, CADMIUM, CHROMIUM, LEAD AND MERCURY.
- SEGREGATE AND STOCKPILE MATERIALS BASED ON FIELD-SCREENING. VERIFY NON-HAZARDOUS STOCKPILES WITH TCLP LEAD ANALYSIS.
- GRAB SAMPLES WILL BE COLLECTED ON A 50'x50' GRID FROM PRIORITIZED AREAS FOR LABORATORY ANALYSIS
- DUST CONTROL MEASURES (MISTING & POSSIBLY ENCAPSULANTS) WILL BE IMPLEMENTED DURING EXCAVATION ACTIVITIES.
- AIR MONITORING WILL BE CONDUCTED IN THE WORK ZONE AS WELL AS THE INDUSTRIAL SITE PERIMETER TO SATISFY OSHA REQUIREMENTS, AND TO EVALUATE THE EFFECTIVENESS OF DUST CONTROL MEASURES. NO VISIBLE EMISSIONS WILL BE ALLOWED TO MIGRATE OFF-SITE. ACTION LIMIT FOR LEAD IN THE AIR WILL BE 50 mg/m^3.

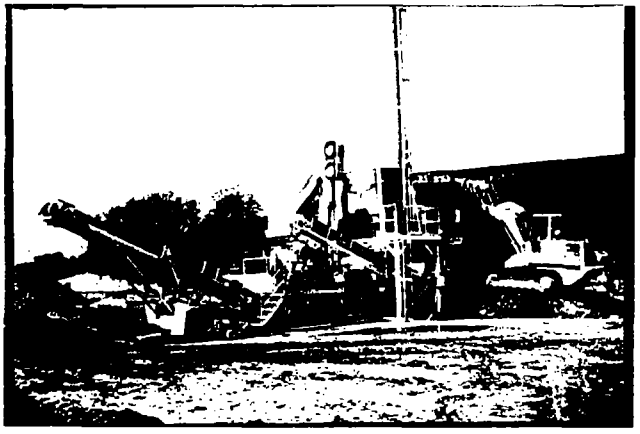


EXCAVATION OPERATION
CROSS SECTION A-A'

FIGURE 4-2

1299-12A

Once particle sizing has been achieved, the stabilization additive (a dry material) is metered into the waste stream based on the weight of waste material flowing through the treatment system. The add-mixture ratio is optimized during the treatability study. The waste and



Stabilization equipment

stabilization treatment additive is then mixed in the mixing chamber to form a granular homogeneous product suitable for handling and disposal.

The chemistry of stabilization relies on soil moisture to create the stabilization reaction (i.e. solution chemistry). If the soil is frozen, the additive can still be mixed with the smelter related material; the particle size control on the ENTACT treatment system will ensure thorough mixing to a particle size of one inch or less.

The treatment additive reacts with the heavy metal to create compounds with the metal ions which are stable and insoluble, and thus are prevented from dissolving, leaching and migrating. ENTACT's patented treatment additive uses a combination of the following chemicals to facilitate this stabilization:

phosphoric acid,
monocalcium phosphate,
monoammonium phosphate and
diammonium phosphate.

The above additives provide the two necessary components necessary to stabilize the metal ions, the phosphate ion and the phosphoric acid buffer system. For the Avanti site, lead is the contaminant of concern. The chemistry of lead stabilization is described below.

Lead is anticipated to be present at the site in a variety of forms, including metallic lead (Pb), lead oxide (PbO), lead sulfate ($PbSO_4$), and possibly lead sulfide (PbS). Metallic lead often has a thin coating of lead oxide due to exposure to the oxygen in the air. While this is an extremely minor fraction of the lead content, it is important. Under certain pH conditions, lead oxide is readily dissolved, allowing the lead to migrate. Lead oxide is amphoteric and, consequently, it is soluble under both acidic and alkaline conditions.

In order for chemical fixation/stabilization to be successful, the various forms of lead salts, especially lead oxide, need to be converted to compounds that are particularly insoluble under the normal pH range. Lead is capable of forming the following three low solubility orthophosphate salts:

$Pb_3(PO_4)_2$,
Pb_2HPO_4 , and
$Pb(H_2PO_4)_2$.

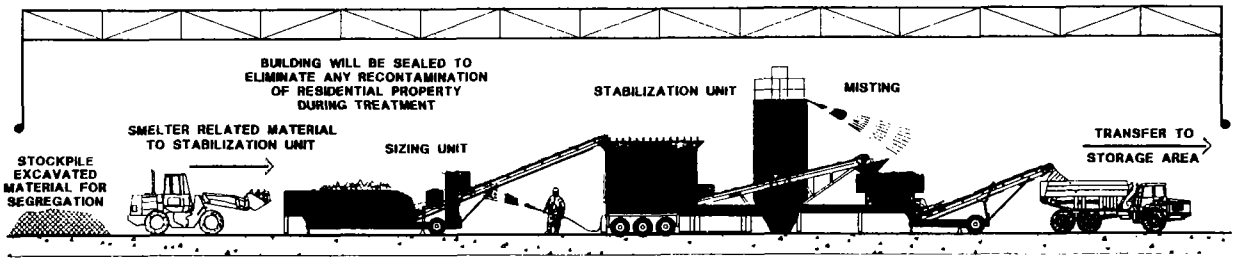
ENTACT's patented treatment system and additive are proven technology. Treatment through the ENTACT patented process typically reduces post-treatment volume by 10-25% compared to volume prior to treatment. Large heterogeneous material is substantially reduced

in size during treatment to one inch minus. This results in less void space in the treated material and, consequently, less volume. The process and additives provide the necessary environment including particle size, phosphate ion, buffering system, and thorough mixing needed to successfully treat lead contaminated soil and debris. The treatment system shown on Figure 4-3 is capable of treating up to 1,000 cubic yards of waste per day.

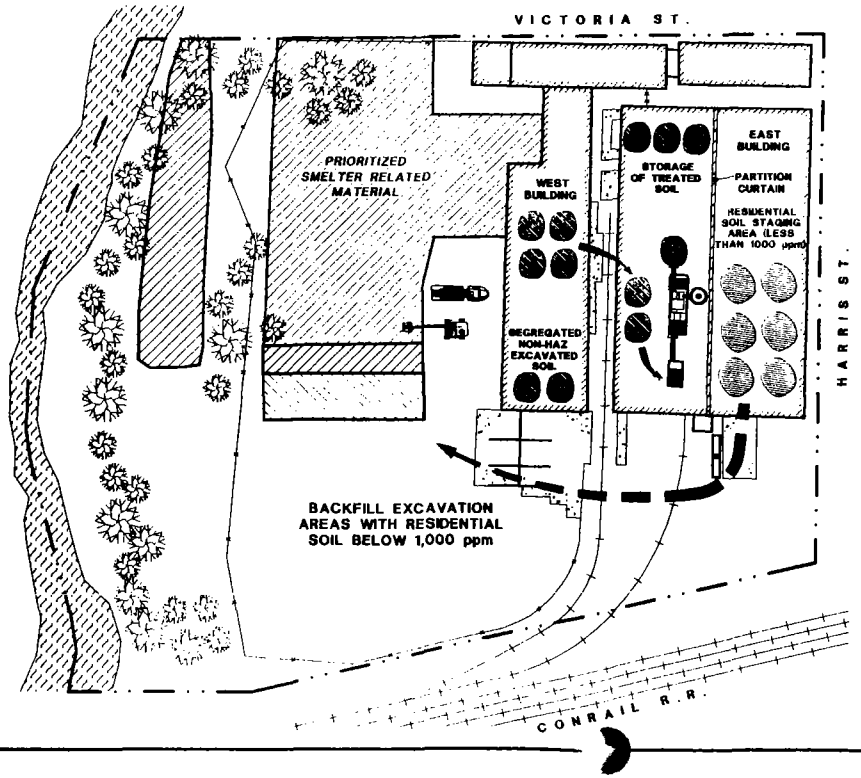
AVANTI SITE
INDIANA
PHASE II

TREATMENT OF SMELTER RELATED MATERIAL

ENTACT



TREATMENT OPERATIONS



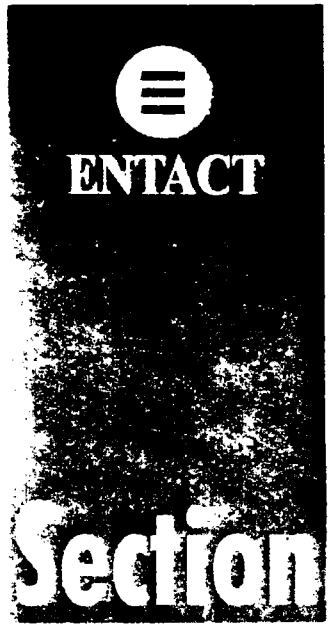
NOTES

- *30,000 c.y. OF REMAINING SMELTER RELATED MATERIAL WILL BE EXCAVATED FROM THE AREAS PRIORITIZED FROM THE PRELIMINARY EXTENT OF CONTAMINATION AND TREATED.*
- *DUST SUPPRESSION WILL BE MAINTAINED AT THE EXCAVATION AREA BY MOBILE MISTING SYSTEM. PERIMETER MISTING SYSTEMS WILL ELIMINATE THE POSSIBILITY OF AIR BORNE EMISSIONS LEAVING THE INDUSTRIAL AREA.*
- *THE WEST BUILDING WILL BE PREPARED FOR SOIL HANDLING OPERATIONS. ALL CRITICAL BARRIERS WILL BE SEALED, FLOOR DRAINS & VENT SYSTEMS WILL BE PLUGGED. ROOF HOLES WILL BE REPAIRED AND SEALED.*
- *EXCAVATED MATERIAL WILL BE TRANSFERRED TO THE WEST BUILDING FOR SEGREGATION.*
- *STOCKPILES OF EXCAVATED MATERIAL WILL BE SCREENED USING AN XRF UNIT & CORRELATED TO TCLP LEAD. MATERIAL DEEMED NOT REQUIRING TREATMENT WILL BE VERIFIED BY TCLP LEAD ANALYSIS.*
- *MATERIALS REQUIRING TREATMENT WILL BE TRANSFERRED TO THE EAST BUILDING AND WILL BE SIZED USING A MOBILE CRUSHING UNIT. THE SIZED MATERIAL WILL BE CONVEYED TO THE STABILIZATION UNIT FOR TREATMENT. TREATED SOIL WILL BE VERIFIED NON-HAZARDOUS BY TCLP ANALYSIS AND WILL BE STORED IN THE EAST BUILDING UNTIL FINAL DISPOSAL IS APPROVED.*

  A SYNTHETIC PARTITION CURTAIN WILL SEPARATE THE TREATMENT AREA FROM THE RESIDENTIAL SOILS.
- *EXCAVATED AREAS WILL BE BACKFILLED WITH STOCKPILED RESIDENTIAL SOIL BELOW 1,000 ppm LEAD AND LESS THAN 5.0 mg/l TCLP LEAD.*

FIGURE 4-3

1299 13A

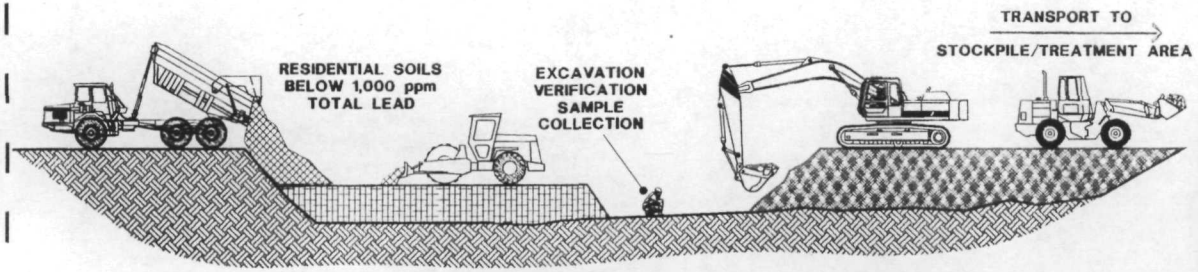


five

AVANTI SITE
INDIANA
PHASE II

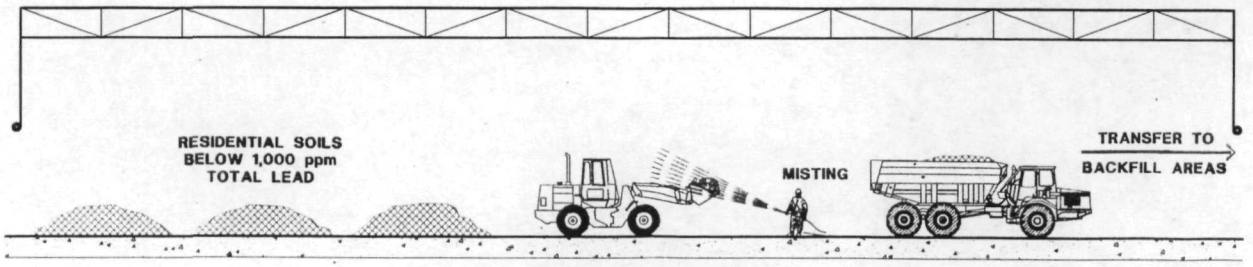
SITE RESTORATION

ENTACT



REMOVAL & PLACEMENT ACTIVITIES

- EXCAVATED MATERIAL MOVED TO TREATMENT AREA FOR SEGREGATION TREATMENT AND STORAGE.
- MATERIAL REQUIRING TREATMENT WILL BE TREATED TO NON-HAZARDOUS LEVELS.
- RESIDENTIAL SOILS (BELOW 1,000 ppm TOTAL LEAD) WILL BE COMPACTED (85% STANDARD PROCTOR) AND THE SITE GRADED TO PROVIDE PROPER DRAINAGE.



RESIDENTIAL SOILS LOAD OUT

FIGURE 5-1

1299-18A

5.0 SITE RESTORATION

Site restoration at the culmination of Stage A activities will include the following:

- segregation of the residential soils;
- backfill of the excavated areas; and
- compaction and grading.

Final building decontamination activities will occur in Stage B removal activities.

5.1 BACKFILL AND SITE GRADING

Following excavation, segregation, treatment and storage of approximately 30,000 cubic yards of impacted materials from the prioritized areas described in Section 1 of this Work Plan, and after verification sampling has indicated that the clean-up goal of 1,000 ppm total lead has been reached, the open excavations will be backfilled with an appropriate and acceptable fill material. This material will include Residential soils that do not exceed the action level established for the Industrial portion of the Site, 1,000 ppm total lead. Figure 5-1 is an overview of excavation, treatment and backfilling operations.

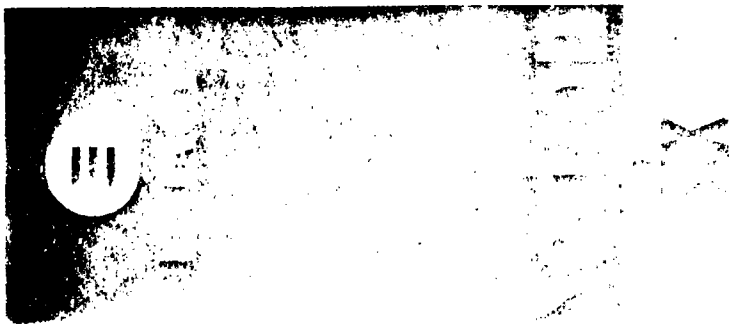
...after verification sampling has indicated that the clean-up goal has been reached, the open excavations will be backfilled...

Compaction of the backfill material will be performed based on a standard proctor density. A standard proctor will be obtained for the Residential soils. Backfill will be placed and compacted in 12 inch lifts to 85% of standard proctor density.

...grading will be performed in order to develop adequate drainage patterns....

5.2 FINAL SITE GRADING AND REVEGETATION

Once the Industrial portion of the site has been returned to original elevations, final grading will be performed in order to develop adequate drainage patterns such that ponding does not occur. Once final grading has been completed, the restored areas will be hydro-seeded. Additionally, to facilitate erosion control, the silt fences established during site preparation procedures will remain until an acceptable stand of grass is established.



6.0 PROJECT ORGANIZATION AND RESPONSIBILITY

ENTACT, Inc., Irving, Texas (ENTACT) has overall responsibility for the Phase II removal action at Avanti. ENTACT will perform the work described in the Phase II Workplan and prepare the final report. The various quality assurance, field, laboratory, and management responsibilities of key personnel are defined below.

6.1 PROJECT ORGANIZATION CHART

The lines of authority for this specific project are depicted on Figure 6-1. This chart includes the individuals discussed below.

6.2 MANAGEMENT RESPONSIBILITIES

U.S. EPA On-Scene Coordinator

The U.S. EPA On-Scene Coordinator (OSC), Mr. Paul R. Steadman, has overall responsibility for all phases of the removal action. Mr. Steadman can be contacted as follows:

Mr. Paul R. Steadman
On-Scene Coordinator
U.S. EPA - EERB
77 West Jackson Boulevard (HSE-5J)
Chicago, IL 60604-3590
(312) 353-7615

Avanti Project Management Team

Tom Sweeney and Doug Davenport will be the project management team in charge of the work and final completion of the project. They are responsible for ensuring that all project procedures and workmanship conform to regulatory guidelines and accepted engineering practices. All work under this management must be scheduled to allow QA and QC testing personnel to perform their duties. The project management team will delegate and oversee site safety protocol and coordinate emergency responsibilities. Additionally the project management team will be responsible for maintaining the project schedule or amending as required. All site construction personnel report to the project management. ENTACT reserves the right to change the designated project management team. The Project Managers can be contacted as follows:

Tom Sweeney
Doug Davenport

Project Management Team
ENTACT, Inc.
566 South Harris Street
Indianapolis, IN 46222
(317) 756-9721

Avanti Quality Assurance Officer

Eric Ward or Kevin Russom will be the QA officer and will manage a planned system of inspections and testing procedures to directly monitor and control the quality of the project All tests and inspections will be completed by him, or someone appointed by him, or outside testing services or analytical laboratories. The QA Officer is responsible for ensuring that all sampling and analysis performed pursuant to this project conforms to the EPA direction, approval, and guidance regarding sampling, quality assurance/ quality control, data

AVANTI SITE
INDIANA
PHASE II

PROJECT ORGANIZATIONAL CHART

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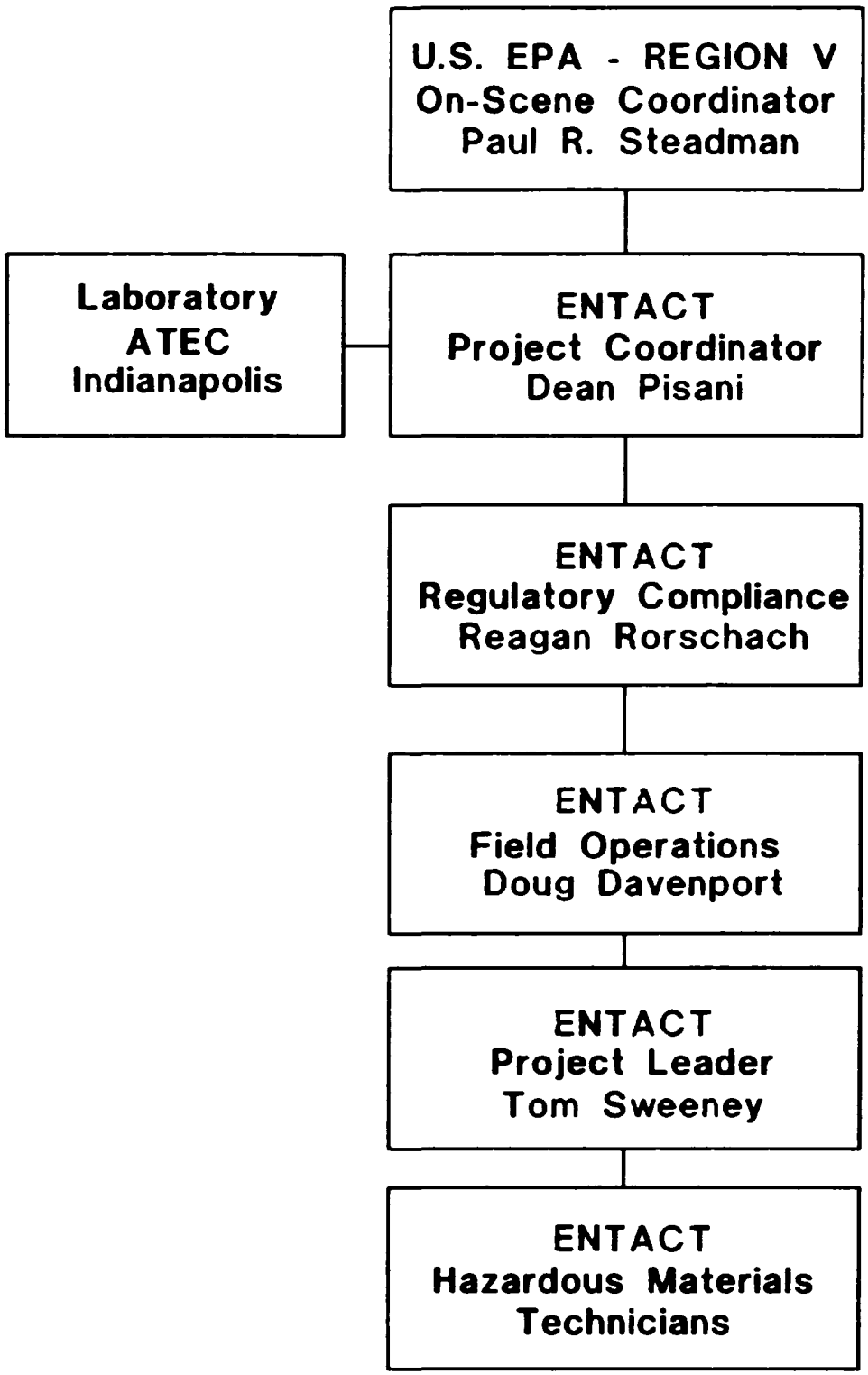


FIGURE 6-1

1299-025

validation, and chain of custody procedures. He will also ensure that the laboratory used to perform the analysis participates in a QA/QC program that complies with EPA guidance. All daily activities reports, periodic summaries, measurements and other pertinent activities will be scheduled and managed by him and all information will be reported to the Project Manager.

6.3 LABORATORY RESPONSIBILITIES

Analytical Laboratory Project Manager

The laboratory to be used for all sample analyses is American Testing and Engineering Corporation Associates, Inc. (ATEC), Indianapolis, Indiana. The project manager for overseeing all sample results at the laboratory is Mr. Richard A. Gehlbach. All laboratory analysis will be performed by qualified laboratory technicians under the supervision of Mr. Gehlbach.

ENTACT

Section seven

Section

7.0 STATUS REPORTING AND FINAL REPORT

7.1 REPORTING REQUIREMENTS

Information generated during the course of this project will be reported to EPA in the form of monthly Status Reports and a Final Report at the end of the project. The frequency and content of these reports is detailed below.

Information generated during the course of this project will be reported to EPA in the form of monthly Status Reports and a Final Report at the end of the project.

7.2 STATUS REPORTS

During the course of Phase II activities, status reports will be submitted to EPA on a monthly basis. This reporting frequency was established during Phase I activities and was agreed to by EPA. ***The Status Reports will include the following information:***

- ***Project status,***
- ***Significant developments for the reporting,***
- ***Work performed during the reporting period,***
- ***Problems encountered,***
- ***Resolution of problems,***
- ***Data collected, and***
- ***Anticipated progress and developments for upcoming period.***

7.3 FINAL REPORT

Within 60 calendar days after completion of all removal actions defined within this Work Plan, a final report summarizing the actions taken comply with the Administrative Order will be submitted to EPA for review. The report will include but not necessarily be limited to the following items:

- Summary of actions taken to comply with the Administrative Order,
- Excavation verification analytical results,
- Treatment and waste classification analytical results,
- Disposal documentation,
- Backfill analytical results,
- Air monitoring analytical results,
- Compaction testing results,
- Photographic documentation of project activities, and
- Trueness, accuracy, and completeness certification.

ENTACT

Appendix A

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION V

IN THE MATTER OF:	Docket No. V-W-'94-C-231
AVANTI SITE	ADMINISTRATIVE ORDER PURSUANT TO SECTION 106(a) OF THE COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT OF 1980, AS AMENDED, 42 U.S.C. SECTION 9606(a)
Respondents:	
Oxide Services Corp. d/b/a O & C Corp., Indiana Oxide Corp., RSR Corp., RSR-Quemetco, Inc., Avanti Development, Inc.	

I. JURISDICTION AND GENERAL PROVISIONS

This Order is issued pursuant to the authority vested in the President of the United States by section 106(a) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended ("CERCLA"), 42 U.S.C. § 9606(a), and delegated to the Administrator of the United States Environmental Protection Agency ("EPA") by Executive Order No. 12580, January 23, 1987, 52 Federal Register 2923, and further delegated to the Regional Administrators by EPA Delegation Nos. 14-14-A and 14-14-B, and to the Director, Waste Management Division, Region V, by Regional Delegation Nos. 14-14-A and 14-14-B.

This Order pertains to property located at the Avanti Site (the "Site"), which includes industrial property located at 502-566 South Harris Street, Indianapolis, Indiana (the "Industrial Property"), surrounding residential properties, and areas where hazardous substances from the Industrial Property have come to be located, including areas where lead has come to be located as a result of air pollution or wind dispersal from the Industrial Property. This Order requires the Respondents to conduct removal activities described herein to abate an imminent and substantial endangerment to the public health, welfare or the environment that may be presented by the actual or threatened release of hazardous substances at or from the Site.

EPA has notified the State of Indiana of this action pursuant to section 106(a) of CERCLA, 42 U.S.C. § 9606(a).

II. PARTIES BOUND

This Order applies to and is binding upon Respondents and Respondents' receivers, trustees, successors and assigns. Any change in ownership or corporate status of Respondents including, but not limited to, any transfer of assets or real or personal property shall not alter such Respondents' responsibilities under

this Order. Respondents are jointly and severally liable for carrying out all activities required by this Order. Compliance or noncompliance by one or more Respondents with any provision of this Order shall not excuse or justify noncompliance by any other Respondent.

Respondents shall ensure that their contractors, subcontractors, and representatives comply with this Order. Respondents shall be responsible for any noncompliance.

III. FINDINGS OF FACT

Based on available information, including the Administrative Record in this matter, U.S. EPA hereby finds that:

1. The Industrial Property which is part of the Avanti Site is located at or along 502-566 South Harris Street, Indianapolis, Indiana 46222. The Industrial Property is located on an Indianapolis 7.5' topographic quadrangle map at 40^0 17' 30" latitude and 86^0 13' 40" longitude. The Industrial Property occupies an approximate area of 7.3 acres. It is bounded on the north by West Victoria Street, on the east by Harris Street, on the south by the Conrail railroad tracks, and on the west by Eagle Creek.

2. Operations at the Industrial Property previously included a battery recycling operation, a lead smelter, and a lead oxide facility. Neighbors of the property have complained about air emissions during these operations. Other businesses have also leased the property. The current owner of the Industrial Property is Avanti Development, Inc. Former owners or operators on the Industrial Property include Western Lead Products Co., Quemetco, Inc., RSR-Quemetco, Inc., and Oxide and Chemical Corp.

There are two main buildings on the Industrial Property, which are known as the East building and the West building. The buildings are separated by an alley. The West building, which is in the form of a "T", housed a company called "Federal Bevel, Inc." in the northeast section of that building. There are holes in a fence which surrounds the Industrial Property. Access to the Industrial Property is controlled by two gates. The first gate is on Harris Street, while the second gate, which is west of the first gate, is at a dirt road leading to the west building.

3. In April 1993, the Indiana Department of Environmental Management (IDEM) and the Marion County Health Department (MCHD) conducted surface soil sampling for heavy metals at the Avanti Site. Concentrations as high as 180,000 parts per million (ppm) total lead was detected in one of the samples.

4. On May 18, 1993, MCHD conducted a blood-lead screening test for area homeowners and their children, and for employees of

businesses leasing parcels of this property. Preliminary results showed that 39% of the children ages 8 years and younger and 24% of the population aged 9 years and older had elevated blood-lead levels of concern. On May 18, 1993, IDEM collected surface soil samples for heavy metals on the residential properties within a two block radius of the Industrial Property. Preliminary results showed total lead levels as high as 1,000 ppm. On May 21 and May 25, 1993, IDEM staff gave verbal notice to the property owners to secure the Industrial Property and implement dust suppression measures at the Industrial Property.

5. U.S. EPA and its contract Technical Assistance Team (TAT) members conducted the Site Assessment (SA) of the Avanti Site on August 4 and August 5, 1993. A supplemental SA was conducted for residential soils on December 1 and December 2, 1993. IDEM and MCHD representatives were present during the conduct of the initial SA and the supplemental SA. A final Site Assessment Report was issued January 12, 1994. In the initial SA, a Spectrace 9000 X-ray fluorescence (XRF) device was utilized for purposes of screening soil on the Industrial Property for heavy metal contamination. Sixteen (16) soil samples and two sediment samples were collected during the initial SA. Six (6) of these samples were collected from the sidewalks adjacent to the Industrial Property and from the residences across from the Industrial Property. Analysis of the sample from the sidewalks showed lead concentrations as high as 59,000 ppm total lead and 1000 ppm TCLP lead. All nine (9) soil samples from the Industrial Property collected during the initial SA had high concentrations of lead contamination, and showed as much as 230,000 ppm total lead and 1,500 ppm TCLP lead.

6. During the initial SA it was observed that the East building contains several pieces of machinery, drums, and pails, along with eight (8) 55-gallon "Standout Paints by Bradley" drums, and seven (7) 5-gallon pails which are labeled "Residual insect spray", "Cleaners", and "Strippers". One of the open drums gave a reading of 5% in the lower explosive limit (LEL) register of the oxygen/explosimeter equipment during the initial SA. The East building floor is concrete and appears to be about 5 feet above the railroad spur that is situated in the middle of the building. The floor appears gray from some kind of powdery material. During the initial SA, people were observed working in the front portion of the building. The northeast portion of this building contains approximately 13 overpacked metal drums, some of them labelled with the words "Grit, perma steel." During the initial SA, several people, including children, were observed in Eagle Creek. Eagle Creek is located along the westside of the Industrial Property and is used for recreational purposes. The sidewalks of Harris Street along the east side of the Industrial Property are documented to be contaminated with lead. Children were also observed playing along the sidewalk directly adjacent to the Industrial Property and live in homes on the Site.

7. Analytical results of the samples collected by U.S. EPA indicate the presence of total lead as high as 23% (230,000 parts per million (ppm)) on the Industrial Property and as high as 59,000 ppm on portions of the Site outside the Industrial Property. Toxicity Characteristic Leachate Procedure (TCLP) analysis of lead indicates results as high as 1500 ppm on the Industrial Property and 1000 ppm on portions of the Site outside of the Industrial Property.

IV. CONCLUSIONS OF LAW AND DETERMINATIONS

Based on the Findings of Fact set forth above, and the Administrative Record supporting these removal actions, EPA determines that:

1. The Avanti Site is a "facility" as defined by Section 101(9) of CERCLA, 42 U.S.C. § 9601(9).

2. Lead and PCBs are "hazardous substances" as defined by Section 101(14) of CERCLA, 42 U.S.C. § 9601(14).

3. Each Respondent is a "person" as defined by Section 101(21) of CERCLA, 42 U.S.C. § 9601(21).

4. Respondent Avanti Development, Inc. is the present owner of the industrial portion of the Avanti Site, as defined by Section 101(20) of CERCLA, 42 U.S.C. § 9601(20). Respondent Avanti Development, Inc. is therefore liable as an owner under Section 107(a) of CERCLA, 42 U.S.C. § 9607(a).

5. Respondent Indiana Oxide Corp. is a successor to Oxide & Chemical Corp., which, prior to the re-location of its lead oxide facility to Brazil, Indiana, was an owner and operator of a lead oxide facility on the Industrial Property at the time of disposal of hazardous substances. Respondent Indiana Oxide Corp. operates at the same location in Brazil, Indiana where Oxide & Chemical Corp. operated, is also a lead oxide producer, and possesses an identity of officers and/or directors with the former Oxide & Chemical Corp. Respondent Indiana Oxide Corp. is therefore liable as an owner and operator under Section 107(a) of CERCLA, 42 U.S.C. § 9607(a).

6. Respondent Oxide Services Corp. d/b/a O & C Corp. is a parent corporation of Indiana Oxide Corp., is a 100% shareholder of Indiana Oxide Corp., possesses an identity of officers and/or directors with Indiana Oxide Corp., and provides legal representation on behalf of Indiana Oxide Corp. Respondent Oxide Services Corp. d/b/a O & C Corp. is therefore liable as an owner and/or operator under Section 107(a) of CERCLA, 42 U.S.C. § 9607(a).

7. Respondent RSR-Quemetco, Inc. was an owner of part of the Industrial Property at the time of disposal of hazardous substances. Additionally, Respondent RSR-Quemetco, Inc. is a successor to Quemetco, Inc., which was an owner and operator of a lead smelter on the Industrial Property at the time of disposal of hazardous substances. Prior to the re-location of lead smelting operations to 7870 West Morris Street, Indianapolis, Indiana, Respondent RSR-Quemetco, Inc. was purchased in a stock sale by RSR Corp. Respondent RSR-Quemetco, Inc. was and is engaged in the business of lead smelting, as was Quemetco, Inc. Respondent RSR-Quemetco, Inc. is therefore liable as an owner and operator under Section 107(a) of CERCLA, 42 U.S.C. § 9607(a).

8. Respondent RSR Corp. is a parent corporation of RSR-Quemetco, Inc., is 100% shareholder of RSR-Quemetco, Inc., and provides legal representation on behalf of RSR-Quemetco, Inc. Respondent RSR Corp. is therefore liable as an owner and/or operator under Section 107(a) of CERCLA, 42 U.S.C. § 9607(a).

9. The conditions described in the Findings of Fact above constitute an actual or threatened "release" into the "environment" as defined by Sections 101(8) and (22) of CERCLA, 42 U.S.C. §§ 9601(8) and (22).

10. The conditions present at the Site constitute a threat to public health, welfare, or the environment based upon the factors set forth in section 300.415(b)(2) of the National Oil and Hazardous Substances Pollution Contingency Plan, as amended ("NCP"), 40 CFR Part 300. These factors include, but are not limited to, the following:

a. Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances, pollutants or contaminants; this factor is present at the Site due to the existence of a TCLP lead concentration of 1,000 ppm in the soil along the sidewalk bordering the Industrial Property. Residences are located directly east of the Industrial Property across Harris Street and thus are considered to be primary receptors and directly impacted by the conditions at the Industrial Property. Surface soil samples of residences near the Site contain elevated levels of lead. Also, during the conduct of the initial Site Assessment, children were observed playing basketball approximately 100 feet south of this sampling location.

A TCLP lead concentration of 850 ppm was detected in the sample Number SS-18 collected on the outside of the western fence. This area, which is along Eagle Creek, is commonly used for recreational purposes. A TCLP lead concentration of 1,500 ppm was detected in the floor sweeping of the East building. During the SA, people were observed working in the front portion of the building.

Acts such as vandalism and forcible entry through the fence pose a potential threat to human population, especially children, by contact with the potentially hazardous lead contaminated soil found at the Industrial Property.

b. **Actual or potential contamination of drinking water supplies**; the potential for contamination of drinking water supplies as a result of lead processing operations on the Industrial Property is present at the Site, as evidenced by the presence of lead, documented to be above Removal Action Levels of 30 parts per billion, in at least one aquifer from which residences directly south of the Industrial Property receive private drinking water supplies.

c. **Hazardous substances or pollutants or contaminants in drums, barrels, tanks, or other bulk storage containers, that may pose a threat of release**; there are presently unconfirmed reports of possibly scores of buried drums and at least two underground storage tanks of unknown capacities, undetermined condition, and unknown contents, located within the industrial portion of the Site. Several open drums with lower explosive limit (LEL) detection readings were observed and documented on the Industrial Property during the Site Assessment, as well as at least 15 additional 55-gallon capacity drums of unknown but potentially hazardous contents.

d. **High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface, that may migrate**; this factor is present at the Site due to the existence of both industrial property and residential property soil which has been documented to be contaminated with high concentrations of lead. Lead contaminated soil along the sidewalk of the Industrial Property can potentially be carried off the Industrial Property as a result of children playing in this area who come in contact with and inadvertently carry contamination away with them. This migration path poses a very high potential for the contaminated soil being taken into the nearby residences. Contaminated soil along the outside of the western fence is approximately 200 feet from Eagle Creek. A potential migration path here may be due to people who frequent Eagle Creek. Wind blown dust is another route by which lead contamination may migrate.

e. **Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released**; this factor is present at the Site due to the existence of soil along the outside of the western fence of the Industrial Property that is contaminated with lead. The Site topography slopes towards Eagle Creek. A strong migration potential exists for surface run-off water from rain or snow to carry the contaminants into Eagle Creek, thereby posing a threat of release to the environment or area residences. Wind

dispersion of lead contaminated soil and dust from the facility may also pose a threat to area residences and the environment.

f. Threat of fire or explosion; this factor is present at the Site due to the existence of drums of unknown content and other drums displaying a reading of 5% in the LEL register on instrumentation used during the conduct of the Site Assessment, indicating a serious potential fire or explosion threat. Explosive gases from these containers could propagate a flame from these substances at ambient air temperatures of 77° F or less. In addition, based on the apparent poor housekeeping of the Industrial Property and reports of USTs and other buried drums within the industrial portion of the Site, the threat of a fire or explosion is severe. A fire would carry the lead and various other contaminants as particulates to adjacent residential locations, adding to the threats to the health and welfare of this community.

g. Other factors and situations that may pose threats to the environment; these include the already high documented number of persons who exceed a blood-lead level of concern as defined by the exceedence of 10 ug/dl (micrograms of lead per decilitor of blood) blood lead level, and the recommendations for abatement of the lead threat and removal of the lead exposure hazard made by the Marion County Health Department (MCHD), the Indiana Department of Public Health (IDPH), the Indiana Department of Environmental Management (IDEM) as well as the Agency for Toxic Substance Disease Registry (ATSDR).

11. The actual or threatened release of hazardous substances from the Site may present an imminent and substantial endangerment to the public health, welfare, or the environment within the meaning of section 106(a) of CERCLA, 42 U.S.C. § 9606(a).

12. The removal actions required by this Order are necessary to protect the public health, welfare, or the environment, and are not inconsistent with the NCP and CERCLA.

V. ORDER

Based upon the foregoing Findings of Fact, Conclusions of Law, Determinations, and the Administrative Record for this Site, EPA hereby orders that Respondents perform the following actions:

1. Notice of Intent to Comply

Respondents shall notify EPA in writing within 3 business days after the effective date of this Order of Respondents' irrevocable intent to comply with this Order. Failure of each Respondent to provide such notification within this time period shall be a violation of this Order.

2. Designation of Contractor, Project Coordinator, and On-Scene Coordinator

Respondents shall perform the removal actions themselves or retain a contractor to implement the removal actions. Respondents shall notify EPA of Respondents' qualifications or the name and qualifications of such contractor, whichever is applicable, within 5 business days of the effective date of this Order. Respondents shall also notify EPA of the name and qualifications of any other contractors or subcontractors retained to perform work under this Order at least 5 business days prior to commencement of such work. EPA retains the right to disapprove of the Respondents or any of the contractors and/or subcontractors retained by the Respondents. If EPA disapproves a selected contractor, Respondents shall retain a different contractor within 2 business days following EPA's disapproval and shall notify EPA of that contractor's name and qualifications within 3 business days of EPA's disapproval.

Within 5 business days after the effective date of this Order, the Respondents shall designate a Project Coordinator who shall be responsible for administration of all the Respondents' actions required by the Order and submit the designated coordinator's name, address, telephone number, and qualifications to EPA. To the greatest extent possible, the Project Coordinator shall be present on site or readily available during site work. EPA retains the right to disapprove of any Project Coordinator named by the Respondents. If EPA disapproves a selected Project Coordinator, Respondents shall retain a different Project Coordinator within 3 business days following EPA's disapproval and shall notify EPA of that person's name and qualifications within 4 business days of EPA's disapproval. Receipt by Respondents' Project Coordinator of any notice or communication from EPA relating to this Order shall constitute receipt by all Respondents.

The EPA has designated Paul Steadman of the Emergency and Enforcement Response Branch, Region V, as its On-Scene Coordinator (OSC). Respondents shall direct all submissions required by this Order to the OSC at 77 West Jackson Boulevard, HSR-5J, Chicago, Illinois, 60604-3590, by certified or express mail. Respondents shall also send a copy of all submissions to Kevin C. Chow, Office of Regional Counsel, 77 West Jackson Boulevard, Chicago, Illinois, 60604-3590. All Respondents are encouraged to make their submissions to U.S. EPA on recycled paper (which includes significant postconsumer waste paper content where possible) and using two-sided copies.

3. Work to Be Performed

Respondents shall perform, at a minimum, the following response activities:

a) Prepare a work plan, which is to include a site safety and health plan addressing continuous monitoring of airborne contaminants and dust control measures.

b) Secure the industrial portion of the Site by establishing 24-hour security during removal activity and repairing or replacing damaged fencing.

c) Sample, remove, and dispose of drums from the East building and the contents of the drums at an approved, permitted TSD facility.

d) Decontaminate metal and other debris, and dispose or recycle as appropriate.

e) Consolidate, remove and/or decontaminate all solid wastes within the industrial portion of the Site that have been contaminated by lead-laden soils.

f) Conduct an extent of contamination (EOC) survey which includes a determination whether lead batteries have been disposed within the industrial portion of the Site. The EOC will also address the residential portion of the Site to determine well systems where lead contamination exceeds the removal action levels (RALs).

g) Excavate and stabilize all lead contaminated soil including: lead contaminated soils within the Industrial Property which exceed 1000 ppm total lead; soils along the sidewalks; and soils from the yards of the nearby residences where lead levels exceed 400 ppm total lead. 1000 ppm for the Industrial Property and 400 ppm for residences are the clean-up levels for total lead to be achieved in this removal action.

h) Dispose of stabilized soils off-Site in compliance with RCRA.

i) Backfill the excavated areas upon the residential properties with clean top soil, vegetate, and restore such areas.

j) Provide municipal water hookups to residential units where lead contamination in private water supply systems have been shown to be above U.S. EPA's lead Removal Action Levels (RALs) for residential water supplies (30 parts per billion), and also provide hookups for those residences where the area hydrogeology would indicate that their water supply system would likely be impacted above RALs in the future.

k) Sample the interior of nearby residents' homes and advise occupants on lead abatement procedures as necessary.

l) Conduct field investigative procedures for determination of buried drums, USTs, containers, and other contaminants on the Industrial Property. Where such containers and contaminants are found, sample their contents and the surrounding soils, excavate the soils and containers where appropriate, and dispose of such materials.

3.1 Work Plan and Implementation

Within 10 business days after the effective date of this Order, the Respondents shall submit to EPA for approval a draft Work Plan for performing the removal activities set forth above. The draft Work Plan shall provide a description of, and an expeditious schedule for, the activities required by this Order.

EPA may approve, disapprove, require revisions to, or modify the draft Work Plan. If EPA requires revisions, Respondents shall submit a revised draft Work Plan within 7 business days of notification. Respondents shall implement the Work Plan as finally approved in writing by EPA in accordance with the schedule approved by EPA. Once approved, or approved with modifications, the Work Plan, the schedule, and any subsequent modifications shall be fully enforceable under this Order. Respondents shall notify EPA at least 48 hours prior to performing any on-Site work pursuant to the EPA approved work plan.

Respondents shall not commence or undertake any removal actions at the Site without prior EPA approval.

3.2 Health and Safety Plan

Within 10 business days after the effective date of this Order, the Respondents shall submit a plan for EPA review and comment that ensures the protection of the public health and safety during performance of on-Site work under this Order. This plan shall comply with applicable Occupational Safety and Health Administration (OSHA) regulations found at 29 CFR Part 1910. If EPA determines it is appropriate, the plan shall also include contingency planning. Respondents shall incorporate all changes to the plan recommended by EPA, and implement the plan during the pendency of the removal action.

3.3 Quality Assurance and Sampling

All sampling and analyses performed pursuant to this Order shall conform to EPA direction, approval, and guidance regarding sampling, quality assurance/quality control (QA/QC), data validation, and chain of custody procedures. Respondents shall ensure that the laboratory used to perform the analyses participates in a QA/QC program that complies with EPA guidance. Upon request by EPA, Respondents shall have such a laboratory analyze samples submitted by EPA for quality assurance monitoring.

Respondents shall provide to EPA the quality assurance/quality control procedures followed by all sampling teams and laboratories performing data collection and/or analysis. Respondents shall also ensure provision of analytical tracking information consistent with OSWER Directive No. 9240.0-2B, "Extending the Tracking of Anaytical Services to PRP-Lead Superfund Sites."

Respondents shall made adequate office and electrical hook-up facilities available to EPA or its authorized representatives during and throughout the conduct of the removal.

Upon request by EPA, Respondents shall allow EPA or its authorized representatives to take split and/or duplicate samples of any samples collected by Respondents or their contractors or agents while performing work under this Order. Respondents shall notify EPA not less than 3 business days in advance of any sample collection activity. EPA shall have the right to take any additional samples that it deems necessary.

3.4 Post-Removal Site Control

The On-Scene Coordinator has begun planning for provision of post-removal site control, consistent with the requirements of Section 300.415(k) of the NCP. Post-removal site controls or actions such as installing monitoring wells along Eagle Creek and regularly monitoring them may be deemed necessary at this location after the removal of the lead contaminated soil.

3.5 Reporting

Respondents shall submit a weekly written progress report to EPA concerning activities undertaken pursuant to this Order, beginning 7 calendar days after the date of EPA's approval of the Work Plan, until termination of this Order, unless otherwise directed by the OSC. These reports shall describe all significant developments during the preceding period, including the work performed and any problems encountered, analytical data received during the reporting period, and developments anticipated during the next reporting period, including a schedule of work to be performed, anticipated problems, and planned resolutions of past or anticipated problems.

Any Respondent that owns any portion of the Site, and any successor in title shall, at least 30 days prior to the conveyance of any interest in real property at the Site, give written notice of this Order to the transferee and written notice of the proposed conveyance to EPA and the Indiana Department of Environmental Management (IDEM). The notice to EPA and IDEM shall include the name and address of the transferee. The party conveying such an interest shall require that the transferee will provide access as described in Section V.4 (Access to Property and Information).

3.5 Final Report

Within 60 calendar days after completion of all removal actions required under this Order, the Respondents shall submit for EPA review a final report summarizing the actions taken to comply with this Order. The final report shall conform to the requirements set forth in section 300.165 of the NCP. The final report shall also include a good faith estimate of total costs incurred in complying with the Order, a listing of quantities and types of materials removed, a discussion of removal and disposal options considered for those materials, a listing of the ultimate destinations of those materials, a presentation of the analytical results of all sampling and analyses performed, and accompanying appendices containing all relevant documentation generated during the removal action (e.g., manifests, invoices, bills, contracts, and permits).

The final report shall also include the following certification signed by a person who supervised or directed the preparation of that report:

> Under penalty of law, I certify that, to the best of my knowledge, after appropriate inquiries of all relevant persons involved in the preparation of this report, the information submitted is true, accurate, and complete.

4. Access to Property and Information

Respondents shall provide or obtain access as necessary to the Site and all appropriate off-site areas, and shall provide access to all records and documentation related to the conditions at the Site and the activities conducted pursuant to this Order. Such access shall be provided to EPA employees, contractors, agents, consultants, designees, representatives, and IDEM representatives. These individuals shall be permitted to move freely at the Site and appropriate off-site areas in order to conduct activities which EPA determines to be necessary. Respondents shall submit to EPA, upon request, the results of all sampling or tests and all other data generated by Respondents or their contractor(s), or on the Respondents' behalf during implementation of this Order.

Where work under this Order is to be performed in areas owned by or in possession of someone other than Respondents, Respondents shall obtain all necessary access agreements within 14 calendar days after the effective date of this Order, or as otherwise specified in writing by the OSC. Respondents shall immediately notify EPA if, after using their best efforts, they are unable to obtain such agreements. Respondents shall describe in writing their efforts to obtain access. EPA may then assist Respondent(s in gaining access, to the extent necessary to effectuate the response activities described herein, using such means as EPA deems appropriate.

5. Record Retention, Documentation, Availability of Information

Respondents shall preserve all documents and information relating to work performed under this Order, or relating to the hazardous substances found on or released from the Site, for six years following completion of the removal actions required by this Order. At the end of this six year period and at least 60 days before any document or information is destroyed, Respondents shall notify EPA that such documents and information are available to EPA for inspection, and upon request, shall provide the originals or copies of such documents and information to EPA. In addition, Respondents shall provide documents and information retained under this Section at any time before expiration of the six year period at the written request of EPA.

6. Off-Site Shipments

All hazardous substances, pollutants or contaminants removed off-site pursuant to this Order for treatment, storage or disposal shall be treated, stored, or disposed of at a facility in compliance, as determined by EPA, with the Procedures for Planning and Implementing Off-Site Response Actions (Off-Site Rule), published in the Federal Register on September 22, 1993 (58 Federal Register 49200), to be codified in the National Oil and Hazardous Subtances Pollution Contingency Plan (NCP) at 40 CFR 300.440. See also CERCLA Section 121(d)(3), as amended, 42 U.S.C. § 9621(d)(3).

7. Compliance With Other Laws

All actions required pursuant to this Order shall be performed in accordance with all applicable local, state, and federal laws and regulations except as provided in CERCLA section 121(e) and 40 CFR section 300.415(i). In accordance with 40 CFR section 300.415(i), all on-site actions required pursuant to this Order shall, to the extent practicable, as determined by EPA, considering the exigencies of the situation, attain applicable or relevant and appropriate requirements under federal environmental or state environmental or facility siting laws.

8. Emergency Response and Notification of Releases

If any incident, or change in Site conditions, during the activities conducted pursuant to this Order causes or threatens to cause an additional release of hazardous substances from the Site or an endangerment to the public health, welfare, or the environment, the Respondents shall immediately take all appropriate action to prevent, abate or minimize such release, or endangerment caused or threatened by the release. Respondents shall also immediately notify the OSC or, in the event of his/her unavailability, shall notify the Regional Duty Officer, Emergency and Enforcement Response Branch, Region V at (312) 353-2318, of the incident or Site conditions.

Respondents shall submit a written report to EPA within 7 business days after each release, setting forth the events that occurred and the measures taken or to be taken to mitigate any release or endangerment caused or threatened by the release and to prevent the reoccurrence of such a release. Respondents shall also comply with any other notification requirements, including those in CERCLA section 103, 42 U.S.C. § 9603, and section 304 of the Emergency Planning and Community Right-To-Know Act, 42 U.S.C. § 11004.

VI. AUTHORITY OF THE EPA ON-SCENE COORDINATOR

The OSC shall be responsible for overseeing the implementation of this Order. The OSC shall have the authority vested in an OSC by the NCP, including the authority to halt, conduct, or direct any work required by this Order, or to direct any other response action undertaken by EPA or Respondents at the Site. Absence of the OSC from the Site shall not be cause for stoppage of work unless specifically directed by the OSC.

EPA and Respondents shall have the right to change their designated OSC or Project Coordinator. EPA shall notify the Respondents, and Respondents shall notify EPA, as early as possible before such a change is made, but in no case less than 24 hours before such a change. Notification may initially be made orally, but shall be followed promptly by written notice.

VII. PENALTIES FOR NONCOMPLIANCE

Violation of any provision of this Order may subject Respondents to civil penalties of up to $25,000 per violation per day, as provided in section 106(b)(1) of CERCLA, 42 U.S.C. § 9606(b)(1). Respondents may also be subject to punitive damages in an amount up to three times the amount of any cost incurred by the United States as a result of such violation, as provided in section 107(c)(3) of CERCLA, 42 U.S.C. § 9607(c)(3). Should Respondents violate this Order or any portion hereof, EPA may carry out the required actions unilaterally, pursuant to section 104 of CERCLA, 42 U.S.C. § 9604, and/or may seek judicial enforcement of this Order pursuant to section 106 of CERCLA, 42 U.S.C. § 9606.

VIII. REIMBURSEMENT OF COSTS

Respondents shall reimburse EPA, upon written demand, for all response costs incurred by the United States in overseeing Respondents' implementation of the requirements of this Order. EPA may submit to Respondents on a periodic basis a bill for all response costs incurred by the United States with respect to this Order. EPA's Itemized Cost Summary, or such other summary as certified by EPA, shall serve as the basis for payment.

Respondents shall, within 30 days of receipt of the bill, remit a cashier's or certified check for the amount of those costs made

payable to the "Hazardous Substance Superfund," to the following address:

U.S. Environmental Protection Agency
Superfund Accounting
P.O. Box 70753
Chicago, Illinois 60673

Respondents shall simultaneously transmit a copy of the check to the Director, Waste Management Division, U.S. EPA Region V, 77 West Jackson Blvd., Chicago, Illinois, 60604-3590. Payments shall be designated as "Response Costs - (Site Name) Site" and shall reference the payor(')s(') name and address, the EPA Site Identification Number (Number), and the docket number of this Order.

Interest at a rate established by the Department of the Treasury pursuant to 31 U.S.C. § 3717 and 4 CFR § 102.13 shall begin to accrue on the unpaid balance from the day after the expiration of the 30 day period notwithstanding any dispute or an objection to any portion of the costs.

IX. RESERVATION OF RIGHTS

Nothing herein shall limit the power and authority of EPA or the United States to take, direct, or order all actions necessary to protect public health, welfare, or the environment or to prevent, abate, or minimize an actual or threatened release of hazardous substances, pollutants or contaminants, or hazardous or solid waste on, at, or from the Site. Further, nothing herein shall prevent EPA from seeking legal or equitable relief to enforce the terms of this Order. EPA also reserves the right to take any other legal or equitable action as it deems appropriate and necessary, or to require the Respondents in the future to perform additional activities pursuant to CERCLA or any other applicable law.

X. OTHER CLAIMS

By issuance of this Order, the United States and EPA assume no liability for injuries or damages to persons or property resulting from any acts or omissions of Respondents. The United States or EPA shall not be a party or be held out as a party to any contract entered into by the Respondents or their directors, officers, employees, agents, successors, representatives, assigns, contractors, or consultants in carrying out activities pursuant to this Order.

This Order does not constitute a pre-authorization of funds under section 111(a)(2) of CERCLA, 42 U.S.C. § 9611(a)(2).

Nothing in this Order constitutes a satisfaction of or release from any claim or cause of action against the Respondents or any person

not a party to this Order, for any liability such person may have under CERCLA, other statutes, or the common law, including but not limited to any claims of the United States for costs, damages and interest under sections 106(a) or 107(a) of CERCLA, 42 U.S.C. §§ 9606(a), 9607(a).

XI. MODIFICATIONS

Modifications to any plan or schedule may be made in writing by the OSC or at the OSC's oral direction. If the OSC makes an oral modification, it will be memorialized in writing within 7 business days; however, the effective date of the modification shall be the date of the OSC's oral direction. The rest of the Order, or any other portion of the Order, may only be modified in writing by signature of the Director, Waste Management Division, Region V.

If Respondents seek permission to deviate from any approved plan or schedule, Respondents' Project Coordinator shall submit a written request to EPA for approval outlining the proposed modification and its basis.

No informal advice, guidance, suggestion, or comment by EPA regarding reports, plans, specifications, schedules, or any other writing submitted by the Respondents shall relieve Respondents of their obligations to obtain such formal approval as may be required by this Order, and to comply with all requirements of this Order unless it is formally modified.

XII. NOTICE OF COMPLETION

After submission of the Final Report, Respondents may request that EPA provide a Notice of Completion of the work required by this Order. If EPA determines, after EPA's review of the Final Report, that all work has been fully performed in accordance with this Order, except for certain continuing obligations required by this Order (e.g., record retention), EPA will provide notice to the Respondents. If EPA determines that any removal activities have not been completed in accordance with this Order, EPA will notify the Respondents, provide a list of the deficiencies, and require that Respondents modify the Work Plan to correct such deficiencies. The Respondents shall implement the modified and approved Work Plan and shall submit a modified Final Report in accordance with the EPA notice. Failure to implement the approved modified Work Plan shall be a violation of this Order.

XIII. ACCESS TO ADMINISTRATIVE RECORD

The Administrative Record supporting these removal actions is available for review during normal business hours in the EPA Record Center, Region V, 77 W. Jackson Blvd., Seventh Floor, Chicago, Illinois. Respondents may contact Kevin C. Chow, Office of Regional Counsel, at (312) 353-6181 to arrange to review the

Administrative Record. An index of the Administrative Record is attached to this Order.

XIV. OPPORTUNITY TO CONFER

Within 3 business days after issuance of this Order, Respondents may request a conference with EPA. Any such conference shall be held within 5 business days from the date of the request, unless extended by agreement of the parties. At any conference held pursuant to the request, Respondents may appear in person or be represented by an attorney or other representative.

If a conference is held, Respondents may present any information, arguments or comments regarding this Order. Regardless of whether a conference is held, Respondents may submit any information, arguments or comments in writing to EPA within 2 business days following the conference, or within 7 business days of issuance of the Order if no conference is requested. This conference is not an evidentiary hearing, does not constitute a proceeding to challenge this Order, and does not give Respondents a right to seek review of this Order. Requests for a conference shall be directed to Kevin C. Chow of the Office of Regional Counsel, at (312) 353-6181. Written submittals shall be directed as specified in Section V.2 of this Order.

XV. SEVERABILITY

If a court issues an order that invalidates any provision of this Order or finds that Respondents have sufficient cause not to comply with one or more provisions of this Order, Respondents shall remain bound to comply with all provisions of this Order not invalidated by the court's order.

XVI. EFFECTIVE DATE

This Order shall be effective 10 business days following issuance unless a conference is requested as provided herein. If a conference is requested, this Order shall be effective 5 business days after the day of the conference.

IT IS SO ORDERED

BY: Wm E. Muno DATE: 3/29/94

William E. Muno, Director
Waste Management Division
United States
Environmental Protection Agency
Region V

ENTACT

Appendix B

Historical prevailing wind data for the Indianapolis, Indiana area for the period beginning January 1950 and ending December 1990 was secured through the Midwestern Climate Center at the University of Illinois. The frequency and wind speed data for the 40 year period is presented in Table 1. To calculate the coordinates for the Indianapolis Wind Rose, the product of frequency and mean wind speed is plotted as a function of direction. The result is a radial plot showing the larger magnitudes of wind speed and frequency distributed away from the plot origin. The data in Table 1 is plotted in Figure 1.

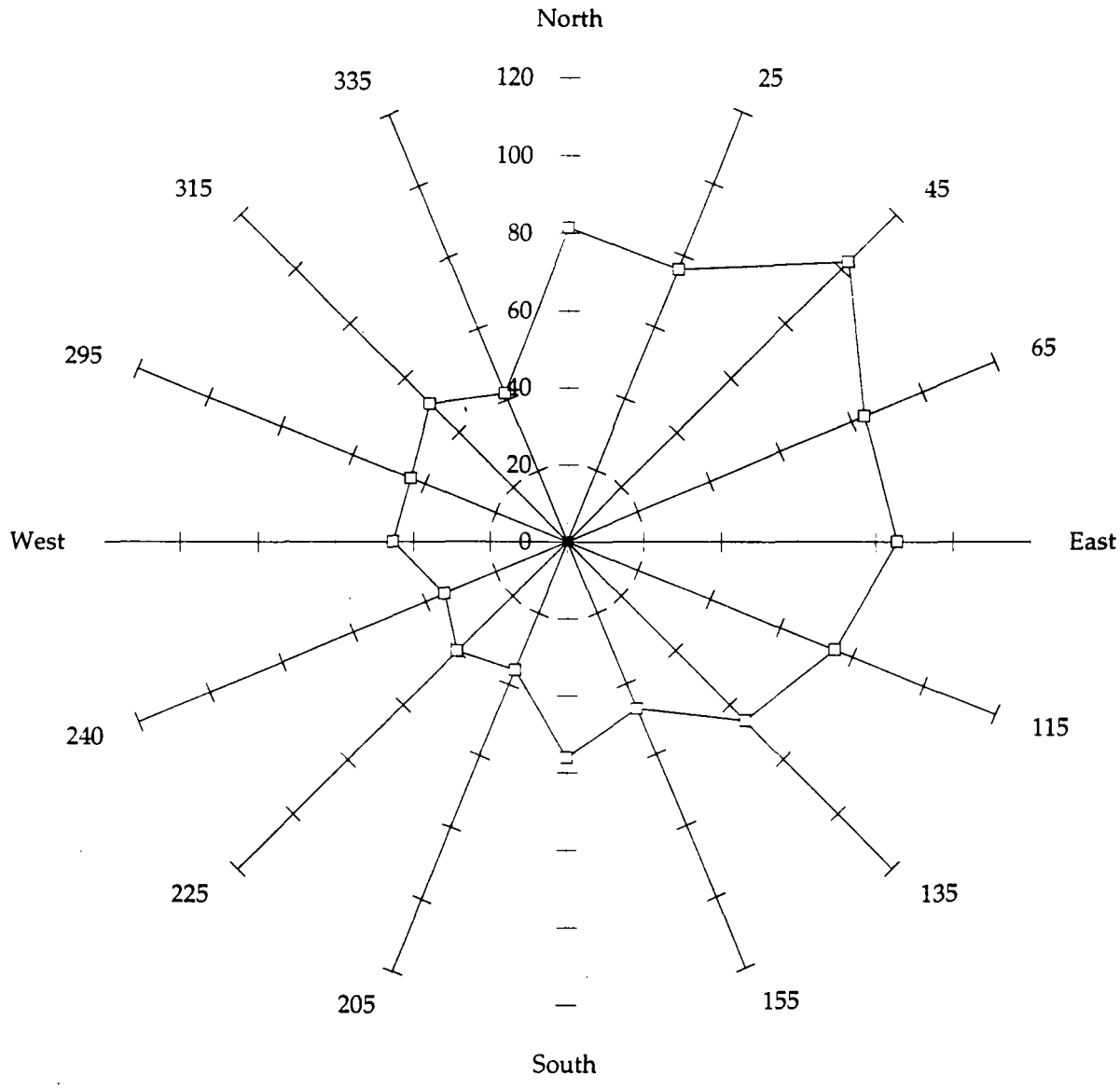
Table 1

Historical Wind Data for Indianapolis, Indiana

Direction		%	Mean Speed	Product
0	Calm	3.16	0.0	0.0
350 360 10	N	6.14	9.15	56.18
20 30	NNE	3.92	9.16	35.91
40 50	NE	4.31	9.32	40.17
60 70	ENE	3.57	9.70	34.63
80 90 100	E	4.82	9.38	45.21
110 120	ESE	5.11	8.61	44.0
130 140	SE	5.96	8.49	50.60
150 160	SSE	4.87	8.62	41.98
170 180 190	S	8.68	9.39	81.51
200 210	SSW	7.18	10.63	76.32
220 230	SW	9.84	10.45	102.83
240 250	WSW	7.87	10.63	83.66
260 270 280	W	7.66	11.18	85.64
290 300	WNW	6.28	11.96	75.11
310 320	NW	5.98	11.00	65.78
330 340	NNW	4.65	10.14	47.15

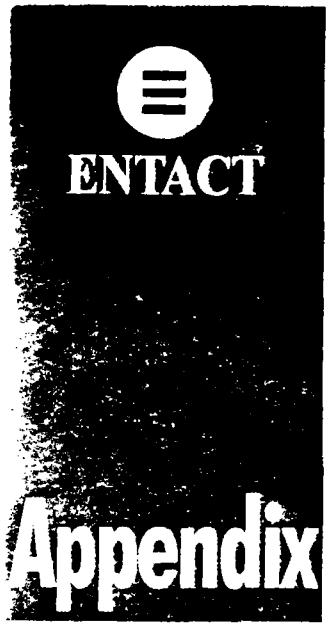
Source: Midwestern Climate Center, University of Illinois

Historical Wind Data for the Indianapolis, IN



Data taken from 1950 through 1990.

The graph represents the product of wind speed and frequency plotted as a function of direction.


ENTACT
Appendix
C

INSTRUCTION AND OPERATION MANUAL

HIGH VOLUME PM10 SAMPLER

GENERAL METAL WORKS, INC.
145 SOUTH MIAMI
VILLAGE OF CLEVES, OH 45002
(513) 941-2229
(800) 543-7412

Revised
July, 1988

An entire copy of the instruction and operation manual for the high volume PM10 sampler is available upon request. A copy of the manual was included in the Phase I Work Plan.

ENTACT

Appendix D

Appendix D

SOILS ANALYSIS FOR METALS

BY

X-RAY FLUORESCENCE

WITH

THE FIELD PORTABLE

SPECTRACE 9000

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1.0 SCOPE AND APPLICATION

1.1 This Soils Analysis method is proposed for use in determining the concentrations of various elements in soil, sediment, and solid samples.

1.2 This method offers qualitative identification of elements with atomic numbers 16 through 92 (any element above Sulfur in the periodic table) and currently quantitates the analytes listed in Table 1. Approximate quantitation limits are also listed in Table 1. A potential exists for other elements to be quantitated besides those listed in Table 1.

1.3 This method should be used only by trained analysts under the guidance of an experienced chemist.

1.4 This method analyzes total elemental concentrations and cannot distinguish between valence or oxidation states (i.e., total chromium versus hexavalent chromium). Liquids or oily wastes will not be analyzed by this method due to the potential damage to the instrument.

1.5 The primary objective for utilizing the FPXRF is to provide analytical data in a timely manner for guidance of ongoing work in the field. Field Portable XRF analyses is not equivalent to or a replacement for actual laboratory analyses. Verification of data through an approved laboratory, encompassing the range of sample concentrations, is recommended.

2.0 SUMMARY OF METHOD

2.1 This method utilizes the X-Ray fluorescence (XRF) technique to determine concentrations of elements in soil or solid samples. It is written specifically for the Spectrace 9000 energy dispersive X-Ray fluorescence analyzer but can generally be used with a variety of FPXRF instruments. Only qualified analysts trained in the proper use, theory, and safety of XRF analysis should operate this system.

2.2 The principle of XRF analysis is based on electron excitation. Elemental atoms in a soil sample are irradiated with a beam of X-Rays. Electrons in the atoms' lower lying energy levels are excited to higher energy levels. The vacancies left in the inner electron orbitals make the atom unstable. Relaxation to the ground state occurs, resulting in the emission of X-Rays characteristic of the excited elements. Thus, by examining the energies of the X-Rays emitted by the irradiated soil sample, identification of elements present in the sample is possible. Comparing the intensities of the X-Rays emitted from a given sample to those emitted from reference standards with known analyte concentrations allows quantitation of the elements present in the samples.

2.3 The Spectrace 9000 utilizes three radioisotope sources. Each source emits a different energy (wavelength) of radiation which provides efficient analysis of specific ranges of elements.

Table 1

SPECTRACE 9000 FPXRF TARGET COMPOUND LIST
AND QUANTITATION LIMITS*

Element	CAS Number	Quantitation Limit Soil/Sediment/Solid ** (ppm)
Antimony	7440-36-0	50
Arsenic	7440-38-2	50
Barium	5426-21-0	50
Cadmium	7440-43-9	50
Calcium	7440-70-2	50
Chromium	7440-47-3	50
Cobalt	7789-43-7	50
Copper	7440-50-8	50
Iron	7439-89-6	50
Lead	7439-92-1	50
Manganese	7439-96-5	50
Mercury	7439-97-6	50
Nickel	7440-02-0	50
Potassium	7440-09-7	50
Selenium	7782-49-2	50
Silver	7440-22-4	50
Strontium	7789-06-2	50
Thorium	7440-29-1	50
Tin	7440-31-5	50
Uranium	7440-61-1	50
Zinc	7440-66-6	50
Zirconium	1374-69-99	50

* Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may be biased high or may not always be achievable.

** Quantitation limits listed for soil/sediment are based on an "as-received" basis.

3.0 INTERFERENCES

3.1 Some complex matrix effects will produce synergistic (enhancing) or antagonistic (masking) effects that may artificially increase or decrease the resulting concentrations of various elements in the sample. The Spectrace 9000 corrects for these effects by applying a mathematical computer program called "Fundamental Parameters." Initially, spectra and corresponding elemental concentrations of certified standards are acquired. These standards are used to construct a calibration curve by plotting measured X-ray intensities against known elemental concentrations. The program calculates values termed alpha coefficient using the hypothetical standards established by the Fundamental Parameters' program, which mathematically describe the complex matrix effects.

3.2 Analysis of unknowns (samples) proceeds by an iterative computation. An estimate of the composition of the unknown is made by comparison of the measured intensities to the pure element count-rate values and standard calibration curve. The alpha coefficients are then applied to the estimated concentrations to make a new estimate of the composition. The process is repeated with the program using the last calculated composition value and the alpha coefficients to calculate a new composition. If the difference between the last calculated concentration and the concentration determined from the new iteration is less than one percent relative, the program assumes convergence, and the analysis procedure ends.

4.0 APPARATUS AND MATERIALS

4.1 Analytical System: Elemental identification and quantitation is obtained using the Spectrace 9000 energy dispersive XRF spectrometer which incorporates the "Fundamental Parameter" software program. The Spectrace 9000 utilizes a high resolution Mercuric-Iodide detector and three radioisotope x-ray excitation sources. The spectrometer is able to achieve detection limits of approximately 50ppm (parts per million) consistently and confidently without liquid nitrogen cooling of the XRF detector. The detection limits are more than adequate for most elements in soil contamination investigations.

4.2 Other Equipment

4.2.1 Glass Petri dishes: 150mm or 25mm.

4.2.2 Plastic X-ray sample containers: 31mm.

4.2.3 Polypropylene (Mylar) window film: 0.2mL.

4.2.4 Tweezers: Stainless steel or plastic.

4.2.5 Drying oven.

4.2.6 Hand Trowel: To prepare in-situ samples.

5.0 REAGENTS

5.1 Certified Calibration Standards: Certified soil, sediment, ores, or solid samples may be obtained through the National Institute of Standards and Technology (NIST), the Environmental Protection Agency (EPA), or the Canadian Centre for Mineral and Energy Technology (CANMET).

5.2 Pure Elemental Standards: These solid samples may be the oxides, chlorides, etc., of the element of interest. Known concentration is not required, but the sample should be free of interfering constituents.

5.3 Reagent Water: Reagent water is defined as water in which an interferent is not observed at the quantitation limit (QL) of the analyte of interest. Reagent water may be purchased from commercial laboratory supply houses.

6.0 SAMPLE COLLECTION, PRESERVATION, AND HANDLING

6.1 Samples should be handled, preserved, and shipped maintaining a chain-of-custody following current EPA regulations and recommendations in force at the time of sample collection. The sole exception to this rule is the sample volumes required by the laboratory. Collection of the most homogeneous sample possible is recommended, avoiding large rocks and non-soil derived materials such as twigs or trash. The soil or sediment sample is collected in a 4 to 8 ounce glass jar.

6.2 The use of chain-of-custody records as described in the U.S. EPA "CLP Users Guide" (9240.0-1), December 1988, is required for sample tracking. The maximum holding time for solid samples is 6 months, but it is recommended that all samples be analyzed as soon as possible.

6.3 Use of metal sampling tools should be avoided as much as possible. The sample is collected to fill a 4 to 8 ounce glass jar. If laboratory confirmation is required additional samples must be collected to fulfill the laboratory requirements.

7.0 PROCEDURE

7.1 In-Situ Analysis Whenever it is easier to take the analyzer to the sample than it is to bring the sample to the analyzer.

7.1.1 Probe face must be kept in contact with the sample throughout the analysis. Whenever possible, arrange the sample so that the probe can be set down on top of it.

7.1.2 Flatten and compact the area to be measured with an appropriate tool.

7.1.3 Best results occur when area to be sampled is as fine-grained as possible, as opposed to course-grained.

7.1.4 If moisture content is greater than 25%, sample should be collected, prepared, and placed into sample cup for analysis.

7.2 Sample Preparation for bench top analysis

7.2.1 Place the sample in a clean, labelled Petri dish or compatible apparatus for drying. Dry the sample in an oven or air dry until moisture is removed.

7.2.2 Grind and homogenize the sample with a properly decontaminated agate mortar and pestle for at least 2 minutes, or until desired homogeneity has been obtained.

7.2.3 Place an aliquot of sample in an XRF sample cup and cover with polypropylene (Mylar) film. The sample is now ready for analysis by XRF.

7.2.4 Place probe in lab stand. Affix shield cup to probe to stop any radiation transmitted through or around samples.

7.3 Daily Calibration Check

7.3.1 Element X-Ray Response Check

7.3.1.1 Begin calibration of instrument by running a 50 second measurement (from each isotope) of the pure element Fe. Label as Fe for future reference.

7.3.1.2 From the results screen, choose options and select "see raw data." Scroll down to get the Mn, Fe, Co data onto the screen. Check to see that the Fe value is greater than 0.96 and that both the Mn and Co values are less than 0.003. If the values are in this range, they are said to be satisfactory.

7.3.2 Energy Calibration Checks

7.3.2.1 If the above values are not satisfactory, select options from the Measurement "Ready" Screen and select the Energy Calibration option. You will be prompted to place the safety cover (this is the flat cover, not to be confused with the safety cap). A 600 second analysis will automatically update the x-ray energy calibration.

7.3.3 Spectrum Resolution Check

7.3.3.1 From the Measurement "Ready" Screen, analyze the Teflon plug for a 200 second (per isotope) measurement. Label as Teflon for future reference.

7.3.3.2 From the Results screen, check that each assay (or element) value lies within a range of the absolute value of 3 times the standard deviation value. If all are in range, values are said to be satisfactory.

7.3.4 Analytical Background Check

7.3.4.1 If the above values are not satisfactory, select options from the Measurement "Ready" Screen and select the Acquire Background Data option. You will be prompted to place the quartz and teflon plugs onto the probe for a 10 minute analysis of each alternately. This will update the background coefficients.

7.3.4.2 This concludes the daily calibration check.

8.0 QUALITY CONTROL

8.1 Quality control criteria must be met for all analyses.

8.2 Energy Calibration: Most applications automatically perform an energy calibration with each analysis. A warning screen will inform you when it is required. This calibration corrects the instrument for electronic drift.

8.3 Initial and Continuing Calibration: Certified standards are analyzed at the beginning of each shift and at a 10 percent frequency rate to determine initial and continuing calibration of the instrument. Percent differences (%D) are calculated by comparing the certified values to instrumental results. All elements for associated samples for which %D is less than 80 percent or greater than 120 percent will be qualified as estimated (J). If %D is less than 50 percent or greater than 250 percent for any element, the instrument is re-energy calibrated and the standard and any associated samples are reanalyzed. If %D is still out of the control limits of 50 percent to 150 percent, the results for that element in associated samples are rejected and qualified "R". An exception to this requirement exists for values below 100ppm (2 times the QL).

$$\%D = \frac{X - true}{true} \times 100\%$$

8.4 Duplicate Analysis: Sample duplicates are analyzed at a 20 percent frequency rate or for each sample group, whichever is more frequent. The samples are spilt for duplicate analysis during sample preparation. This indicates the precision of the analysis as well as the homogeneity of the sample matrix. Relative percent differences (%RPD) are calculated by comparing duplicate sample results. All elements for associated samples for which the %RPD is greater than 35 percent will be estimated and qualified "J". An exception to this requirement exists for values below 100ppm (2 times the QL).

$$\%\ RPD = \frac{X - Y}{(X + Y) / 2} \times 100\%$$

8.5 Confirmational Analysis: Sample splits shall be sent to other approved laboratories for confirmation of analytical results at a recommended frequency of 20 percent. It is recommended that duplicate confirmation analyses be as similar as possible (i.e. XRF vs. XRF rather than XRF vs. AA/ICP. If AA/ICAP analysis is performed as a confirmation, a correlation between analytical results may be performed instead of a direct comparison.

ENTACT

Appendix E

CHAIN OF CUSTODY

ENTACT
environmental tactics in waste management

6025 Commerce #500
Las Colinas
Irving, Texas 75063
214/580-1323
1-800-788-8897
FAX: 214/550-7464

ENTACT P.O. No.: _____ Job No.: _____

Sampler: _____ Date: _____

ENTACT Contact: _____

Sample No.	Type of Sample	Description/Remarks	Preservative	Analysis

Samples Received By: _____ Date

Samples Relinquished By: _____ Date

Samples Received By: _____ Date

Samples Relinquished By: _____ Date

Samples Received By: _____ Date

Samples Relinquished By: _____ Date

ANALYSIS

A = _____ F = _____

B = _____ G = _____

C = _____ H = _____

D = _____ I = _____

E = _____ J = _____

DISTRIBUTION:

Original — To Customer w/Final Report
2nd Copy — To Job File
3rd Copy — To Lab

ENTACT

Appendix F

Appendix F

QUALITY ASSURANCE PROJECT PLAN
TO THE
PHASE II REMOVAL ACTION WORKPLAN

at the:

AVANTI SITE

Indianapolis, Indiana

Prepared by:

ENTACT, Inc.

November 17, 1995

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1.0 PROJECT DESCRIPTION

1.1 Introduction

This Phase II Quality Assurance Project Plan (QAPP), has been developed for the Avanti Site for use in conjunction with the Phase II Removal Action Workplan and Health and Safety Plan. These documents form the project operation plans intended to guide field personnel, contractors, and other involved parties in all aspects of field operations during Phase II. This QAPP will provide quality assurance (QA) and quality control (QC) procedures for activities to be performed in accordance with the Administrative Order for the Avanti Site issued on March 29, 1994.

This QAPP will serve as a controlling mechanism during the performance of the sampling and analysis activities to ensure that technical data gathered are accurate, precise, complete, and representative of actual field conditions and meet minimum requirements of the project.

1.1.1 Overall Phase II Project Objectives

Overall project objectives for Phase II, divided into stages, are fully described in Section 1.1 of the Workplan and summarized below:

Stage A

- Prioritizing excavation areas based on current site knowledge,
- Excavate and segregate 30,000 cubic yards of smelter related materials,
- Verification sampling of excavated areas,
- Treatment of the smelter-related materials
- Store the treated material in the on-site buildings,
- Segregate residential soils with total lead concentration less than 1,000 ppm, and
- Backfill and restore excavated areas using residential soils (<1,000 ppm total lead and < 5.0 mg/l TCLP lead).

Stage B

- Finish excavation and segregation of smelter related materials (>1,000 ppm total lead),
- Verification sampling of excavated areas,
- Finalize the Extent of Contamination Survey,
- Treatment of segregated smelter-related materials,
- Segregate residential soils with total lead concentration less than 1,000 ppm,
- Disposal of smelter related materials and residential soils (>1,000 ppm total lead),
- Backfill and restore excavated areas using residential soils (<1,000 ppm total lead and < 5.0 mg/l TCLP lead),
- Investigate and remediate, if necessary, the on-site USTs and
- Decontaminate buildings.

Stage C

- Review residential water well data,
- Perform a hydrogeologic investigation, and
- Address residential water supply connections.

1.1.2 QAPP Preparation and Guidelines

All QA and QC procedures described in this QAPP are structured in accordance with applicable technical standards, EPA requirements, regulations, and guidance. The guidance manual entitled, "Region 5 Model RCRA Quality Assurance Project Plan", May, 1993 was specifically used during QAPP document preparation. Quality assurance (QA) is a management system for ensuring that all information, data, and decisions resulting from the removal action are technically sound and properly documented. Quality control (QC) is the functional mechanism through which quality assurance achieves its goals. In the event there is a conflict in specifications presented herein with those presented in the parent document referencing this QAPP, then the specifications in the parent document will be followed to the extent they are different.

1.2 Site and Industrial Property Description

1.2.1 Site Location and Description

The Avanti Site (Site), as defined by the Administrative Order, includes the Industrial Property (defined below), surrounding identified residential properties, and areas where hazardous materials from the Industrial Property have come to be located, including areas where lead has come to be located as a result of wind dispersion from the Industrial Property. Figures depicting the Site and Industrial Property location are presented in the Phase II Workplan.

1.2.2 Industrial Property Location and Description

The Industrial Property (which is part of the Avanti Site) is located along 502-566 South Harris Street, Indianapolis, Indiana 46222. The Industrial Property is located on the United States Geological Survey (USGS) Indianapolis West Quadrangle 7.5 Minute map at 40° 17' 30" latitude and 86° 13' 40" longitude. This Industrial Property occupies an approximate area of 7.3 acres and is bounded on the north by West Victoria Street, on the east by Harris Street, on the south by the Vadalia railroad tracks, and on the west by Eagle Creek.

1.2.3 Natural/Manmade Features

There are two main, large buildings on the Industrial Property, which are known as the East building and the West building. The buildings are close together, being separated by an access drive. A security fence surrounds the Industrial Property with access controlled by two locked gates, one located on Harris Street and the other located on a side road leading to the West building. An additional security feature was added during Phase I which consists of a perimeter electronic beam monitoring system. Residential areas are located to the north and east of the Industrial Property.

1.2.4 Topography

Based upon topographic information from the USGS Indianapolis West quadrangle map and project reconnaissance information, the Site is almost flat, with area ground surface elevations of approximately 700 feet above mean sea level (AMSL). Eagle Creek, located on the west side of the Industrial Property, is situated at a lower elevation of approximately 690 feet AMSL.

1.3 Site/Facility History

1.3.1 General History

Operations at the Industrial Property ceased in 1979. Operations at the Industrial Property previously included a foundry operation, a battery recycling operation, a lead smelter, and a lead oxide facility. Other businesses have also leased the property. The current owner of the Industrial Property is Avanti Development, Inc.

1.3.2 Past and Current Data Collection Activities

1.3.2.1 Regulatory Agency Data Collection

In 1993 the Indiana Department of Environmental Management (IDEM), Marion County Health Department (MCHD), and EPA conducted various, separate, media sampling events. These events were described in the Phase I Workplan.

More recently, the EPA is obtaining media samples on a regular basis as part of the Phase I oversight activities. These samples are being obtained by EPA's on-scene coordinator as well as the oversite contractor, Ecology and Environment, Inc. This oversight sampling will continue during the Phase I and Phase II activities.

1.3.2.2 Phase I Data Collection

A large number of various media samples are being collected as part of the ongoing Phase I removal activities. These samples, obtained to verify that wastes are handled properly and that target clean-up levels are being achieved in the residential areas, include waste container samples, waste water samples, soil samples, backfill samples, and air monitoring samples. This sampling effort will continue throughout the Phase I schedule.

1.3.2.3 Preliminary Extent of Contamination Survey

A preliminary Extent of Contamination (EOC) survey was performed at the site in July 1995. The EOC was used to prioritize the areas of the site that posed the most potential endangerment to human health and the environment. Details of the findings are presented in Section 4.0 of the Phase II Work Plan. In summary, the EOC consisted of a visual survey by exploratory digging and logging of 50 test pits throughout the industrial portion of the site. Based on the results, two areas of prioritization were determined and are shown on Figure 4-1 in the Work Plan.

1.4 Specific Project Objectives

1.4.1 Objectives and DQOs

The overall project objectives for the Phase II removal action are summarized in Section 1.1.1. Data Quality Objectives (DQOs) are qualitative and quantitative statements which specify the quality of the data required to support decisions made during project activities and are based on the end uses of the data to be collected. As such, different data uses require different levels of data quality. For this project it will be necessary to gather sufficient information to verify that target cleanup levels are achieved in the Industrial Property and that remediation achieves the desired levels. These and other tasks are described below:

Extent of Contamination and Excavation Verification

The purpose of the EOC is to determine the vertical and horizontal extent of soils and other solid media within the Industrial Property which contain total lead concentrations greater than the clean-up criteria of 1,000 mg/kg. This will be accomplished by using a combination of visual indications, X-Ray Fluorescence Analyzer (XRF) measurements, and laboratory analyses. Using a grid coordinate system of 50 feet by 50 feet cells, described in Section 3 of the Phase II Workplan, XRF measurements will be made from each grid cell to perform the initial EOC for that grid cell.

EOC samples for laboratory analysis will be collected and analyzed for total lead and TCLP lead during the early stages of excavation from representative grid excavations. where XRF analysis showed total lead concentrations greater than the clean-up criteria. The EOC laboratory analysis will be used to further calibrate the XRF for site-specific conditions. ENTACT will also analyze 10% of the EOC laboratory samples for arsenic barium, cadmium, chromium, and mercury. Confirmed levels greater than 1,000 mg/kg total lead would require excavation from the grid cell to remove impacted soils and soil media.

The XRF will be used constantly during the excavation process to determine the extent of excavation. Upon indications that all soils and solid media greater that 1,000 mg/kg were excavated then at least one grab soil sample will be collected from each grid cell and submitted for laboratory analysis of total lead to verify (Verification Sample) the clean-up criteria was achieved in that grid cell.

Documentation of the laboratory quality control and conformance with the SW-846 analytical methods will be required. Field duplicates of the laboratory samples will be required at a rate of one (1) out of every ten (10) samples submitted for laboratory analysis.

TCLP Soil Classification and Treatment Confirmation

During excavated from the Industrial Property the soils will be segregated into two groups, those expected to exhibit a lead Toxicity Characteristic Leachate Procedure test result (TCLP) of less than 5 mg/l and those expected to exhibit a lead TCLP of 5 mg/l or greater. Segregation will be accomplished by using an XRF total lead vs. TCLP lead correlation. The correlation will be developed through sample results from the initial stages of the project. Based on data from other battery recycling and lead smelter facilities, a total lead vs. TCLP lead correlation of 1500 ppm:5 mg/l will be used unless and until the site specific data generates a different correlation factor. Any shift in this correlation factor should be noticeable after approximately 10 samples are analyzed.

The soil which indicates total lead concentrations of less than 1500 ppm (or other developed correlation factor) will be segregated and stockpiled for classification sampling. The frequency of sampling will be one (1) grab sample from every 200 cubic yards of treated material for at least the first 2,000 cubic yards. If little variability is observed in these sample results, the frequency will be reduced to one (1) grab sample every 500 cubic yards for the next 2,000 cubic yards of treated material. The frequency will then be reduced to one grab sample for every 1,000 cubic yards for the remainder of the treatment activities if no significant variability is seen in the analytical results. If results from a sample indicate TCLP lead at or above 5 mg/l, the entire batch will be moved to the treatment staging area for stabilization

As previously discussed, an XRF total lead vs. TCLP lead correlation factor will be used to segregate excavated soil. Excavated soils which exhibit a total lead concentration of 1500 ppm (or other developed correlation factor) or greater based on XRF analysis will be taken directly to the treatment staging area. Following treatment the material will be sampled and analyzed for TCLP lead (Treatment Confirmation Sample). If a sample indicates that treatment to less than 5 mg/l TCLP was not accomplished, the entire batch will be retreated.

Full documentation of SW-846 protocol and laboratory quality control samples will be required of the laboratory. In addition, field duplicates will be taken and data validation procedures will be performed for 10 percent of the samples submitted to the laboratory.

Air Monitoring

During removal activities, air monitoring will be performed for articulates and total lead to ensure worker safety and that the National Ambient Air Quality Standards are not exceeded. Samples will be analyzed as appropriate to the collection apparatus. Full documentation of EPA and NIOSH protocol and laboratory quality control samples will be required of the laboratory.

Decontamination Waste Water

During the removal activities decontamination waste water will be generated that may require characterization for appropriate handling and disposal. The waste water will be stored in a portable tank. At least one sample of waste water will be obtained per tank and analyzed for an appropriate list of parameters. Full documentation of SW-846 protocol and laboratory quality control samples will be required of the laboratory. In addition, field duplicates will be taken and data validation procedures will be performed for 10 percent of the samples submitted to the laboratory.

Underground Storage Tanks

Underground storage tanks will be investigated in the Phase II Stage B Workplan. Per current state guidelines, samples of affected media will be obtained a frequency of seven soil samples per tank. The samples will be analyzed for total petroleum hydrocarbons. Full documentation of SW-846 protocol and laboratory quality control samples will be required of the laboratory. In addition, field duplicates will be taken and data validation procedures will be performed for 10 percent of the samples submitted to the laboratory.

Backfill Material

There will be two (2) types of backfill soil samples. The Work Plan first calls for excavated grid areas to be backfilled with residential soil from the East Building. Backfill may also be brought in from off-site sources.

Residential soil used as backfill will be sampled and analyzed every 200 cubic yards for TCLP lead and total lead.

Off-site backfill material characterization samples will be obtained at each backfill source area. At least 12 soil samples will be obtained from the source area and analyzed for a broad list of parameters.

Full documentation of SW-846 protocol and laboratory quality control samples will be required of the laboratory. In addition, field duplicates will be taken and data validation procedures will be performed for 10 percent of the samples submitted to the laboratory.

Containerized Waste Material

Waste materials may be generated during the investigation. These materials may require sampling to determine the appropriate disposal methods. The number of samples for the containerized waste material is variable, depending upon the waste type. For waste container samples full documentation of SW-846 protocol and laboratory quality control samples will be required of the laboratory. In addition, field duplicates will be taken and data validation procedures will be performed for 10 percent of the samples submitted to the laboratory.

1.4.2 Target Parameters and Intended Data Usages

The target parameters and test methods for Phase II are presented on Table 1-1. Intended data usages include evaluating impacts to soil and air, determination of excavation

boundaries, verification of cleanup criteria levels, determination of soils to be treated, treatment confirmation, and determination of air quality.

1.4.2.1 Field Parameters

The intended field parameters include soil and solid media sampling for total lead as analyzed by a field portable X-ray Fluorescence Analyzer (XRF). A portable organic vapor analyzer will be used when necessary to determine the presence of organic vapors.

1.4.2.2 Laboratory Parameters

The intended laboratory parameters for Phase II are presented on Table 1-1. The parameters include the metals total lead for the extent of contamination and field investigation survey, total lead for excavation verification, total lead for air quality monitoring, total lead and lead by the Toxicity Characteristic Leaching Procedure (TCLP) for soil segregation and treatment verification. Total petroleum hydrocarbon (TPH) will be used to assess media impacts during the field investigations for the USTs. Additional parameters are listed on Table 1-1 for characterizing backfill material, decontamination wash water, and containerized waste materials resulting from the removal action.

1.4.2.3 Data Quality Objectives

The intended data quality objectives (DQOs) for this Phase II removal action are summarized on Table 3-1.

1.5 Sampling Design and Rational

The sampling rational, fully explained in Section 3.0 of the Phase II Workplan is summarized below.

1.5.1 Sampling by Task and Matrix

Sample matrices, analytical parameters and frequencies of sample collection are presented on Table 1-1.

1.5.2 Site Maps of Sampling Locations

A map showing the intended soil sampling locations is presented in the Phase II Workplan as Figure 3-1, which is fully incorporated into this QAPP through reference. It is possible, however, that depending on the nature of encountered field conditions some of these locations will be changed. The person who shall be responsible for making such decisions will be the Project Manager or the Quality Assurance Officer, whose responsibilities are described in Section 2.0 of this QAPP.

1.5.3 Rational of Selected Sample Locations

The rational for selected sampling locations is fully described in Section 3.0 of the Phase II Workplan.

1.6 Project Schedule

The project schedule is discussed in Section 1.2 of the Phase II Workplan. The project schedule is an approximation of time required to complete Phase II activities.

TABLE 1-1: LIST OF PHASE II PARAMETERS AND TEST METHODS BY INVESTIGATION TASK QUALITY ASSURANCE PROJECT PLAN TO THE REMOVAL ACTION WORKPLAN AVANTI SITE, INDIANAPOLIS, INDIANA

Test Description	Test Method	Extraction Method	Matrix	Frequency	Container	Preservation	Sample Size	Maximum Holding Time
Extent of Contamination								
Total Arsenic	SW-6010[1]	SW-3050	Soil	1 per grid cell (10% of samples)	P/G	None	25 g	6 months
Total Barium	SW-6010	SW-3050	Soil	1 per grid cell (10% of samples)	P/G	None	25 g	6 months
Total Cadmium	SW-6010	SW-3050	Soil	1 per grid cell (10% of samples)	P/G	None	25 g	6 months
Total Chromium	SW-6010	SW-3050	Soil	1 per grid cell (10% of samples)	P/G	None	25 g	6 months
Total Lead	SW-6010	SW-3050	Soil	1 per grid cell	P/G	None	25 g	6 months
Total Mercury	SW-7471	SW-3050	Soil	1 per grid cell (10% of samples)	P/G	None	25 g	28 days
Total Lead	XRF[3]	na	Soil	Lateral extent determinations	Field Test	na[4]	na	na
Excavation Verification								
Total Arsenic	SW-6010	SW-3050	Soil	1 per grid cell (10% of samples)	P/G	None	25 g	6 months
Total Barium	SW-6010	SW-3050	Soil	1 per grid cell (10% of samples)	P/G	None	25 g	6 months
Total Cadmium	SW-6010	SW-3050	Soil	1 per grid cell (10% of samples)	P/G	None	25 g	6 months
Total Chromium	SW-6010	SW-3050	Soil	1 per grid cell (10% of samples)	P/G	None	25 g	6 months
Total Lead	SW-6010	SW-3050	Soil	1 per grid cell	P/G	None	25 g	6 months
Total Mercury	SW-7471	SW-3050	Soil	1 per grid cell (10% of samples)	P/G	None	25 g	28 days
Soil Classification and Treatment Confirmation								
TCLP Lead[5]	SW-6010	SW-1311	Soil	Initially 1 per 200 c.y., then incremental to 1 per 1000 c.y.	P/G	None	250 g	6 months
Total Lead	SW-6010	SW-3050	Soil	Initially 1 per 200 c.y., then incremental to 1 per 1000 c.y.	P/G	None	25 g	6 months

Notes:
[1] Sample Test Method designated as SW-xxxx is from EPA SW-846.
[2] P/G - Plastic or Glass
[3] XRF - X-Ray Fluorescence Analyzer
[4] na - not applicable
[5] TCLP - Toxicity Characteristic Leaching Procedure.

TABLE 1-1 (Continued): LIST OF PHASE II PARAMETERS AND TEST METHODS BY INVESTIGATION TASK QUALITY ASSURANCE PROJECT PLAN TO THE REMOVAL ACTION WORKPLAN AVANTI SITE, INDIANAPOLIS, INDIANA

Test Description	Test Method	Extraction Method	Matrix	Frequency	Container	Preservation	Sample Size	Maximum Holding Time
Air Monitoring								
Total Suspended Particulate	40 CFR Part 50, App. B	40 CFR Part 50, App. B	Air	daily [1] (4 per Industrial Perimeter)	Filter	na	na	na
Respirable Dust by PM-10	40 CFR Part 50, App. J	40 CFR Part 50, App. J	Air	daily [1] (4 per Industrial Perimeter)	Filter	na	na	na
Total Lead by PM-10	40 CFR Part 50, App. G	40 CFR Part 50, App. G	Air	daily [1] (4 per Industrial Perimeter)	Filter	na	na	na
Total Lead by low-vol Sampler	NIOSH 7300	NIOSH 7300	Air	daily [1] (5 per Industrial Perimeter and Work Areas)	Filter Cassette	na	na	na

Notes:
[1] Analyze 1 every 5 days and, additionally, if Random Air Monitor indicates an elevated daily level.

TABLE 1-1 (Continued): LIST OF PHASE II PARAMETERS AND TEST METHODS BY INVESTIGATION TASK QUALITY ASSURANCE PROJECT PLAN TO THE REMOVAL ACTION WORKPLAN AVANTI SITE, INDIANAPOLIS, INDIANA

Test Description	Test Method	Extraction Method	Matrix	Frequency	Container	Preservation	Sample Size	Maximum Holding Time
Decontamination Wastewater								
Total Arsenic	E-200.7[1]	E-4.1.3[1]	Water	1 per Tank	P/G[3]	HNO_3 pH <2	1000 ml	6 months
Total Cadmium	E-200.7	E-4.1.3	Water	1 per Tank	P/G	HNO_3 pH <2	1000 ml	6 months
Total Lead	E-200.7	E-4.1.3	Water	1 per Tank	P/G	HNO_3 pH <2	1000 ml	6 months
Total Mercury	E-245.1	E-4.1.3	Water	1 per Tank	P/G	HNO_3 pH <2	1000 ml	28 days
Underground Storage Tanks								
Total Petroleum Hydrocarbons	SW-8015[2] Modified	SW-3500	Soil	7 per Tank	P/G	ice to 4°C	250 g	14 days

Notes:

[1] Sample Test Method designated as E-xxx.x is from EPA 600/4-79-020 Water Methods.

[2] Sample Test Method designated as SW-xxxx is from EPA SW-846.

[3] P/G - Plastic or Glass.

TABLE 1-1 (Continued): LIST OF PHASE II PARAMETERS AND TEST METHODS BY INVESTIGATION TASK
QUALITY ASSURANCE PROJECT PLAN TO THE REMOVAL ACTION WORKPLAN
AVANTI SITE, INDIANAPOLIS, INDIANA

Test Description	Test Method	Extraction Method	Matrix	Frequency	Container	Preservation	Sample Size	Maximum Holding Time
Residential Backfill Material								
TCLP Lead[4]	SW-6010	SW-1311	Soil	1 per 200 c.y.	P/G	None	250 g	6 months
Total Lead	SW-6010	SW-3050	Soil	1 per 200 c.y.	P/G	None	25 g	6 months
Off Site Backfill Material								
Total Arsenic	SW-6010[1]	SW-3050	Soil	12 per source	P/G[2]	None	25 g	6 months
Total Barium	SW-6010	SW-3050	Soil	12 per source	P/G	None	25 g	6 months
Total Cadmium	SW-6010	SW-3050	Soil	12 per source	P/G	None	25 g	6 months
Total Chromium	SW-6010	SW-3050	Soil	12 per source	P/G	None	25 g	6 months
Total Lead	SW-6010	SW-3050	Soil	12 per source	P/G	None	25 g	6 months
Total Mercury	SW-7471	SW-3050	Soil	12 per source	P/G	None	25 g	28 days
Total Selenium	SW-6010	SW-3050	Soil	12 per source	P/G	None	25 g	6 months
Total Silver	SW-6010	SW-3050	Soil	12 per source	P/G	None	25 g	6 months
pH	SW-9045	SW-9045	Soil	12 per source	P/G	None	25 g	ASAP[3]
Total Petroleum Hydrocarbons	SW-8015 Modified	SW-3500	Soil	12 per source	P/G	ice to 4°C	250 g	14 days
Pesticides	SW-8080	SW-3540/50	Soil	12 per source	P/G	ice to 4°C	250 g	14 days

Notes:
[1] Sample Test Method designated as SW-xxxx is from EPA SW-846.
[2] P/G - Plastic or Glass.
[3] ASAP - These samples should be analyzed as soon as possible.
[4] TCLP - Toxicity Characteristic Leaching Procedure.

TABLE 1-1 (Continued): LIST OF PHASE II PARAMETERS AND TEST METHODS BY INVESTIGATION TASK
QUALITY ASSURANCE PROJECT PLAN TO THE REMOVAL ACTION WORKPLAN
AVANTI SITE, INDIANAPOLIS, INDIANA

Test Description	Test Method	Extraction Method	Matrix	Frequency	Container	Preservation	Sample Size	Maximum Holding Time
Containerized Waste Material								
TCLP[1] Arsenic	SW-6010[2]	SW-1311	Waste	Waste specific	P/G[3]	None	250 g	6 months
TCLP Barium	SW-6010	SW-1311	Waste	Waste specific	P/G	None	250 g	6 months
TCLP Cadmium	SW-6010	SW-1311	Waste	Waste specific	P/G	None	250 g	6 months
TCLP Chromium	SW-6010	SW-1311	Waste	Waste specific	P/G	None	250 g	6 months
TCLP Lead	SW-6010	SW-1311	Waste	Waste specific	P/G	None	250 g	6 months
TCLP Mercury	SW-7471	SW-1311	Waste	Waste specific	P/G	None	250 g	28 days
TCLP Selenium	SW-6010	SW-1311	Waste	Waste specific	P/G	None	250 g	6 months
TCLP Silver	SW-6010	SW-1311	Waste	Waste specific	P/G	None	250 g	6 months
TCLP Volatiles	SW-8240	SW-1311	Waste	Waste specific	P/G	ice to 4°C	250 g	14 days
TCLP Semivolatiles	SW-8270	SW-1311	Waste	Waste specific	P/G	ice to 4°C	250 g	14 days
TCLP Pesticides	SW-8080	SW-1311	Waste	Waste specific	P/G	ice to 4°C	250 g	14 days
TCLP Herbicides	SW-8150	SW-1311	Waste	Waste specific	P/G	ice to 4°C	250 g	14 days
pH	SW-9040/41	SW-9040/41	Waste	Waste specific	P/G	None	25 g	ASAP[4]

Notes:
[1] TCLP - Toxicity Characteristic Leaching Procedure.
[2] Sample Test Method designated as SW-xxxx is from EPA SW-846.
[3] P/G - Plastic or Glass.
[4] ASAP - These samples should be analyzed as soon as possible.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITY

ENTACT, Inc., Irving, Texas (ENTACT) has overall responsibility for the Phase II removal action at Avanti. ENTACT will perform the work described in the Phase II Workplan and prepare the final report. The various quality assurance, field, laboratory, and management responsibilities of key personnel are defined below.

2.1 Project Organization

The lines of authority for this specific project and a project organization chart are described in Section 6.0 of the Phase II Workplan. The project organization individuals are discussed below:

2.2 Management Responsibilities

- U.S. EPA On-Scene Coordinator

The U.S. EPA On-Scene Coordinator (OSC), Mr. Paul R. Steadman, has overall responsibility for all phases of the removal action. Mr. Steadman can be contacted as follows:

Mr. Paul R. Steadman
On-Scene Coordinator
U.S. EPA - EERB
77 West Jackson Boulevard (HSE-5J)
Chicago, IL 60604-3590
(312) 353-7615

- Avanti Project Management Team

Tom Sweeny and Doug Davenport will be the project management team in charge of the work and final completion of the project. They are responsible for ensuring that all project procedures and workmanship conform to regulatory guidelines and accepted engineering practices. All work under this management must be scheduled to allow QA and QC testing

personnel to perform their duties. The project management team will delegate and oversee site safety protocol and coordinate emergency responsibilities. Additionally the project management team will be responsible for maintaining the project schedule or amending as required. All site construction personnel report to the project management. ENTACT reserves the right to change the designated project management team. The Project Managers can be contacted as follows:

Mr. Tom Sweeny
Mr. Doug Davenport

Project Management Team
ENTACT, inc.
566 South Harris Street
Indianapolis, IN 46222
(317) 756-9721

- Avanti Quality Assurance Officer

Eric Ward or Kevin Russom will be the QA officer and will manage a planned system of inspections and testing procedures to directly monitor and control the quality of the project. All tests and inspections will be completed by him, or someone appointed by him, or outside testing services or analytical laboratories. The QA Officer is responsible for ensuring that all sampling and analysis performed pursuant to this project conforms to the EPA direction, approval, and guidance regarding sampling, quality assurance/ quality control, data validation, and chain of custody procedures. He will also ensure that the laboratory used to perform the analysis participates in a QA/QC program that complies with EPA guidance. All daily activities reports, periodic summaries, measurements and other pertinent activities will be scheduled and managed by him and all information will be reported to the Project Manager.

2.3 Laboratory Responsibilities

- Analytical Laboratory Project Manager

The laboratory to be used for all Site sample analyses is American Testing and Engineering Corporation Associates, Inc. (ATEC), Indianapolis, Indiana. The project manager for overseeing all sample results at the laboratory is Mr. Richard A. Gehlbach. Mr. Gehlbach will report to the Avanti Project Manager or the Avanti QA Officer. All laboratory analysis will be performed by qualified laboratory technicians under the supervision of Mr. Gehlbach.

3.0 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA

The overall QA objective for this project is to develop and implement procedures for field sampling, chain-of-custody, laboratory analysis, and reporting that will provide results which are legally defensible in a court of law. The primary goal of the program is to ensure that the data generated meet the project requirements. To obtain this goal, data generated during implementation of the removal action will be evaluated for accuracy, precision, representativeness, completeness, and comparability for both the laboratory analytical program and field sample collection activities. Specific procedures for sampling, chain-of-custody, laboratory instrument calibration, laboratory analysis, reporting of data, internal quality control, audits, preventative maintenance of field equipment, and corrective action are described in other sections of this QAPP.

3.1 Precision

3.1.1 Definition

Precision is a measure of mutual agreement among individual measurements of the same matrix sample type. Precision is assessed through the calculation of relative percent differences (RPD) for duplicate samples. The equations to be used for precision in this Phase II removal action can be found in Section 12.0 of this QAPP.

3.1.2 Field Precision Objectives

Field precision is assessed through the collection and measurement of field duplicates at a rate of 1 duplicate per 10 analytical samples. The total number of duplicate samples is difficult to estimate since it is, in part, dependent upon the number of samples for laboratory analysis to determine treatment volumes, confirmation of treated material, amount of decontamination water generated, etc.

3.1.3 Laboratory Precision Objectives

Precision in the laboratory is assessed by analysis of matrix duplicates or matrix spike duplicates for each batch not to exceed 20 samples. Precision control limits are given in Table 3-1.

3.2 Accuracy

3.2.1 Definition

Accuracy is the degree of agreement between a measurement and an accepted reference or true value.

3.2.2 Field Accuracy Objectives

Accuracy in the field is assessed through the use of field blanks, reference standards, and adherence to all sample handling, preservation, and holding times.

3.2.3 Laboratory Accuracy Objectives

Laboratory accuracy is assessed through the analysis of matrix spikes (MS) or standard reference materials (SRM) and the determination of percent recoveries. The equation to be used for accuracy in this project can be found in Section 12.0 of this QAPP. Accuracy control limits are given on Table 3-1.

3.3 Completeness

3.3.1 Definition

Completeness is the amount of valid data obtained from a measurement system compared to the amount that was expected and needed to be obtained to meet the project data goals.

3.3.2 Field Accuracy Objectives

Field completeness is the measurement of the amount of valid measurements obtained from all the measurements taken in the project. The intent of this program is to attempt to achieve a goal of 100 percent completeness. Realizing that under normal conditions this goal may not be achievable, the completeness goal for this program is 90 percent. The equation for completeness is presented in Section 12.0 of this QAPP.

3.3.3 Laboratory Completeness Objectives

Laboratory completeness is a measure of the amount of valid measurements obtained from all the measurements taken in the project. The intent of this program is to attempt to achieve a goal of 100 percent completeness. Realizing that under normal conditions this goal may not be achievable, the completeness goal for this program is 95 percent. The laboratory equation for completeness is presented in Section 12 of this QAPP.

3.4 Representativeness

3.4.1 Definition

Representativeness expresses the degree to which sample data accurately and precisely represent environmental conditions and parameter variations at a sampling location. The Representativeness criterion is best satisfied by assuring that sampling locations are properly selected and a sufficient number of investigative samples are collected.

3.4.2 Measures to Ensure Representativeness of Field Data

Representativeness is dependent upon the proper design of the sampling program and will be satisfied by ensuring that the field sampling plan is followed and that proper sampling techniques are used.

3.4.3 Measures to Ensure Representativeness of Laboratory Data

Representativeness in the laboratory is ensured by using the proper analytical procedures, meeting sample holding times, and analyzing and assessing field duplicate samples. The sampling network was designed to provide data representative of facility conditions. During the development of this network, consideration was given to past operational practices, existing analytical data, physical setting and environmental conditions. The rationale of the sampling network is discussed in detail in Section 3.0 of the Phase II Workplan.

3.5 Comparability

3.5.1 Definition

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. Sample data should be comparable with other measurement data for similar samples and sample conditions.

3.5.2 Measures to Ensure Comparability of Field Data

The use of documented soil sampling and ground water sampling procedures will ensure the resulting data are comparable with other similar measurements on similar samples.

3.5.3 Measures to Ensure Comparability of Laboratory Data

The use of documented standard laboratory procedures will ensure comparability of results. Similar QA objectives will be used throughout the project to ensure comparability of laboratory generated data.

3.6 Level of Quality Control Effort

Field equipment blanks, duplicates, and standard reference materials will be utilized to assess the quality of data resulting from the field sampling and analytical programs.

3.6.1 Field Equipment Blanks

Field equipment blanks consisting of distilled water used to rinse decontaminated sampling equipment will be submitted to the analytical laboratory at a rate of 1 equipment blank per every twenty (20) environmental samples.

3.6.2 Filed Duplicates

Field duplicates will be collected and submitted to the laboratory at a rate of 1 duplicate per every 10 environmental samples.

3.6.3 Standard Reference Materials

Laboratory-prepared reference standards are used in the field to standardize XRF equipment on a daily basis. Other standards, such as the calibration gas for the organic vapor analyzer, will be procured from the instrument manufacturer or a manufacturer approved supplier.

3.6.4 Laboratory Quality Control

Method blanks, matrix spike duplicate samples, calibration blanks, continuing calibration verification, check standards and surrogates will be performed to assess the quality of laboratory data, where appropriate to the method and/or instrument, in accordance with the approved analytical method.

Method blank samples are generated within the laboratory and used to assess contamination resulting from laboratory procedures. All reagents are added to the blank in the same volumes or proportions as used in sample processing and is carried through the complete sample preparation and analytical procedure. Method blanks will be performed at a rate of 1 per sample batch not to exceed 20 samples.

Matrix spike samples provide information about the effect of the sample matrix on the digestion and measurement methodology. The sample is spiked with a known concentration of target analyte prior to preparation and analysis.

Further, matrix spike samples will be prepared in duplicate to check for analytical precision of a method within the matrix. One set of matrix spike duplicates will be analyzed for every batch of 20 or fewer investigative samples per sample matrix. Instrument calibration checks will be performed in accordance with the approved analytical method.

TABLE 3-1: LIST OF PHASE II DATA QUALITY ASSURANCE OBJECTIVES
QUALITY ASSURANCE PROJECT PLAN TO THE REMOVAL ACTION WORKPLAN
AVANTI SITE, INDIANAPOLIS, INDIANA

Test Description	Test Method	Extraction Method	Matrix	Reporting Limit[1]	Precision (%RPD)[2]	Accuracy (% Recovery)	Completeness
Total Arsenic	SW-6010[3]	SW-3050	Soil	10 mg/kg	0 - 20	80 - 120	95%
Total Barium	SW-6010	SW-3050	Soil	1 mg/kg	0 - 20	80 - 120	95%
Total Cadmium	SW-6010	SW-3050	Soil	0.25 mg/kg	0 - 20	80 - 120	95%
Total Chromium	SW-6010	SW-3050	Soil	0.5 mg/kg	0 - 20	80 - 120	95%
Total Lead	SW-6010	SW-3050	Soil	4.0 mg/kg	0 - 20	80 - 120	95%
Total Mercury	SW-7471	SW-3050	Soil	0.025 mg/kg	0 - 20	80 - 120	95%
Total Suspended Particulate	40 CFR Part 50, App. B	40 CFR Part 50, App. B	Air	[4]	0 - 8	[5]	95%
Respirable Dust by PM-10	40 CFR Part 50, App. J	40 CFR Part 50, App. J	Air	[4]	0 - 8	[5]	95%
Total Lead by PM-10	40 CFR Part 50, App. G	40 CFR Part 50, App. G	Air	0.07 ug/m^3	0 - 20	80 - 120	95%
Total Lead by low-vol Sampler	NIOSH 7300	NIOSH 7300	Air	2.5 ug/m^3	0 - 20	80 - 120	95%

Notes:

[1] Reporting limits listed are specific for instrument and analyst and are based on minimal matrix interference. Actual reporting limits may vary depending due to sample matrix, sample dilution, or changes in instrument and/or analyst.

[2] %RPD - Relative percent difference.

[3] Sample test method designated as SW-xxxx is from EPA SW-846.

[4] The lower limit of the mass concentration range is determined by the repeatability of filter tare weight. Previous analytical results have been in the low 20 ug/m^3 range.

[5] It is difficult to define the absolute accuracy of particulate samplers because of the variability of particulate matter.

TABLE 3-1 (Continued): LIST OF PHASE II DATA QUALITY ASSURANCE OBJECTIVES QUALITY ASSURANCE PROJECT PLAN TO THE REMOVAL ACTION WORKPLAN AVANTI SITE, INDIANAPOLIS, INDIANA

Test Description	Test Method	Extraction Method	Matrix	Reporting Limit[1]	Precision (%RPD)[2]	Accuracy (% Recovery)	Completeness
Total Arsenic[3]	E-200.7[4]	E-4.1.3	Decon Water	0.20 mg/l	0 - 20	80 - 120	95%
Total Cadmium	E-200.7	E-4.1.3	Decon Water	0.005 mg/l	0 - 20	80 - 120	95%
Total Lead	E-200.7	E-4.1.3	Decon Water	0.080 mg/l	0 - 20	80 - 120	95%
Total Mercury	E-245.1	E-4.1.3	Decon Water	0.0005 mg/l	0 - 20	80 - 120	95%
Total Petroleum Hydrocarbons	SW-8015[5] Modified	SW-3500	Soil	15 mg/kg	0 - 20	[6]	95%
Total Barium	SW-6010	SW-3050	Soil	1.0 mg/kg	0 - 20	80 - 120	95%
Total Chromium	SW-6010	SW-3050	Soil	0.50 mg/kg	0 - 20	80 - 120	95%
Total Selenium	SW-6010	SW-3050	Soil	25 mg/kg	0 - 20	80 - 120	95%
Total Silver	SW-6010	SW-3050	Soil	0.50 mg/kg	0 - 20	80 - 120	95%
Pesticides	SW-8080	SW-3540/50	Soil	[7]	0 - 20	[7]	95%
pH	SW-9045	SW-9045	Soil	NA	0-20	NA	95%

Notes:

[1] Reporting limits listed are specific for instrument and analyst and are based on minimal matrix interference. Actual reporting limits may vary depending due to sample matrix, sample dilution, or changes in instrument and/or analyst.

[2] %RPD - Relative percent difference.

[4] Sample test method designated as E-xxx.x is from EPA 600/4-79-020 Water Methods.

[5] Sample test method designated as SW-xxxx is from EPA SW-846.

[6] Statistically determined acceptance criteria is produced for each analysis from a population of data collected over a period of time. The mean +/- 3 standard deviations of the data population will be considered the control limits.

[7] Varies by compound - See SW-846.

[8] NA - Not applicable.

TABLE 3-1 (Continued): LIST OF PHASE II DATA QUALITY ASSURANCE OBJECTIVES
QUALITY ASSURANCE PROJECT PLAN TO THE REMOVAL ACTION WORKPLAN
AVANTI SITE, INDIANAPOLIS, INDIANA

Test Description	Test Method	Extraction Method	Matrix	Reporting Limit[1]	Precision (%RPD)[2]	Accuracy (% Recovery)	Completeness
TCLP[3] Arsenic	SW-7060[4]	SW-1311	Waste	0.25 mg/l	0 - 25	75 - 125	80%
TCLP Barium	SW-6010	SW-1311	Waste	25 mg/l	0 - 30	60 - 140	80%
TCLP Cadmium	SW-6010	SW-1311	Waste	0.5 mg/l	0 - 25	75 - 125	80%
TCLP Chromium	SW-7191	SW-1311	Waste	0.10 mg/l	0 - 25	75 - 125	80%
TCLP Lead	SW-7421	SW-1311	Waste	0.10 mg/l	0 - 25	75 - 125	80%
TCLP Mercury	SW-7471	SW-1311	Waste	0.5 mg/l	0 - 25	75 - 125	80%
TCLP Selenium	SW-7740	SW-1311	Waste	0.25 mg/l	0 - 25	75 - 125	80%
TCLP Silver	SW-6010	SW-1311	Waste	0.5 mg/l	0 - 30	60 - 140	80%
TCLP Volatiles	SW-8240	SW-1311	Waste	[5]	0 - 20	[5]	80%
TCLP Semivolatiles	SW-8270	SW-1311	Waste	[5]	0 - 20	[5]	80%
TCLP Pesticides	SW-8080	SW-1311	Waste	[5]	0 - 20	[5]	85%
TCLP Herbicides	SW-8150	SW-1311	Waste	[5]	0 - 20	[5]	85%
pH	SW-9040/41	SW-9040/41	Waste	NA	0 - 20	NA	95%

Notes:
[1] Reporting limits listed are specific for instrument and analyst and are based on minimal matrix interference. Actual reporting limits may vary depending due to sample matrix, sample dilution, or changes in instrument and/or analyst.
[2] %RPD - Relative percent difference.
[3] TCLP - Toxicity Characteristic Leaching Procedure.
[4] Sample test method designated as SW-xxxx is from EPA SW-846.
[5] Varies by compound - See SW-846.
[6] NA - Not Applicable.

4.0 SAMPLE PROCEDURES

Sampling procedures for each sample type are fully described in Section 3.0 of the Phase II Workplan, including sampling methodology, equipment lists, sample identification, decontamination and sample packaging procedures. Section 3.0 of the Phase II Workplan is the Sampling and Analysis Plan (SAP).

The sampling procedures to be used in this Phase II removal action will be consistent throughout the duration of this project. The SAP outlines all sampling procedure information. Refer to the following sections of the SAP for the following information:

- Sample Identification System - Section 3.3
- Establishment of Grid Coordinate System - Section 3.4
- Solid Media Sampling Procedures - Section 3.5
- TCLP Soil Characterization and Sampling Procedures - Section 3.6
- Treatment Confirmation Sampling Procedures - Section 3.7
- Backfill Material Sampling Procedures - Section 3.8
- Waste Water Sampling Procedures - Section 3.9
- Air Sampling Procedures - Section 3.10
- Data Quality Objectives and Field Quality Control Samples - Section 3.11
- Laboratory Quality Assurance and Quality Control - Section 3.11
- Sample Shipping - Section 3.12
- Field Instrument Procedures, Operation, and Calibration - 3.13

5.0 SAMPLE CUSTODY AND SHIPPING PROCEDURES

5.1 Custody Procedures

Custody is one of several factors which is necessary for the admissibility of environmental data as evidence in a court of law. Custody procedures help to satisfy the two major requirements for admissibility: relevance and authenticity. Sample custody is addressed in three parts: field sample collection, laboratory analysis, and final evidence files. Final evidence files, including all original laboratory reports, are maintained under document control in a secure area.

A sample or evidence file is under your custody if:

- the item is in actual possession of a person; or
- the item is in the view of the person after being in actual possession of the person; or
- the item was in actual physical possession but is locked up to prevent tampering; or
- the item is in a designated and identified secure area.

5.1.1 Field Custody Procedures

Sample identification documents will be carefully prepared to maintain identification and chain-of-custody records and to control sample disposition. Components of the field documentation procedures include the use of field logbooks, sample labels, and the chain-of-custody forms. Original data recorded in field logbooks, chain-of-custody records, and other forms will be written in waterproof ink. The field sampler is personally responsible for the care and custody of the samples until they are transferred or properly dispatched.

5.1.1.1 Field Logbook Records

A field log of daily activities will be used to record sampling activities on a daily basis. This book will be bound and have consecutively numbered pages. Entries in the field logbook will be made in ink and will include: the name of the author; date and time of entry; location

of activity; names and affiliations of personnel on site; sample collection or measurement methods; number of samples collected; daily weather report; sample identification numbers; field observation and comments; sampling depth increment for soils; field measurements; locations of photographs; and any deviations from the sampling plan. The field log book will be stored in the document control center when it is not in use.

5.1.1.2 Sample Labels

Sample labels are necessary to prevent misidentification of samples. Preprinted labels will be provided prior to the sampling activities. Each label will contain space for the following information: sample location/identification, project number, date and time of sample collection, name of sampler, preservatives, and types of analyses to be performed.

5.1.1.3 Chain-of-Custody Record

A Chain-of-Custody (COC) form will be completed to record the custody of every sample collected. A COC form will accompany every shipment of samples to the analytical laboratory in order to establish the documentation necessary to trace sample possession from the time of sample collection through sample analysis. The sample portion of the COC form will include the following:

- Project number, name and location;
- Sample identification;
- Name of Project Manager, Sampler, and Recorder;
- Sampling information (sampling area, depth, media type, type of sample. date and time of collection, etc.);
- Analysis to be performed;
- Preservatives used, if any; and
- Signatures of persons involved in the COC possession, including dates.

When a Chain-of-Custody form is filled out, one page of the three-part form is retained and placed in a file at the on-site office. The other two parts of the form accompany the sample to the laboratory. One of those pages is retained by the laboratory and the other is returned with the sample result report. When the sample report is received, it is cross-checked with the COC file record and both COC pages and the laboratory report are placed in a file in fireproof storage. The analytical result is also entered into a computer database consisting of a comprehensive list of all samples taken at the site and the analytical results.

5.1.2 Laboratory Custody

ATEC Associates, Inc. (ATEC) will be the primary laboratory for all sample analysis. The custody for each sample will be transferred by the signing of the COC record by the receiving laboratory sample custodian. ATEC maintains strict written protocol for internal sample custody.

Upon receipt of samples, information on the COC shipped with samples will be verified and recorded as to agreement or non-agreement. Labels will be checked for notation of proper preservation. If there is an apparent document non-agreement or incorrect preservation noted, the apparent problem will be recorded and the Project Manager notified. Samples will also be checked for leaking or broken containers. The samples will then be marked or labeled with laboratory sample numbers. Samples will be placed in appropriate storage and/or secure areas to await analysis.

5.1.3 Final Evidence Files

The final evidence file will be the central repository for all documents which constitute evidence relevant to sampling and analysis activities as described in this QAPP. ENTACT is the custodian of the evidence file and maintains the contents of the evidence files for the Avanti Site Phase II Remedial Action Workplan, including all relevant reports, records, logs, field notes, pictures, and data reviews in a secured, limited access area under the custody of the ENTACT project manager or central office file manager. At the completion of field

activities, all elements of the final evidence file will be transferred to the central ENTACT office in Irving, Texas.

5.2 Shipping Procedures

For shipping, all samples will be stored on ice and packaged in such a manner as to prevent damage or breakage during shipment or transport. Samples not delivered to the laboratory will be shipped through an overnight parcel service by sampling personnel. Samples will be placed into suitable containers, labeled and sealed in such a manner that tampering with the seal would be obvious. All sample holding times will be tracked and a copy of the Chain-of-Custody form will accompany the samples in a sealed plastic bag. Sample shipping is discussed in the Work Plan.

6.0 CALIBRATION PROCEDURES AND FREQUENCY

Proper calibration, maintenance, and use of instruments and equipment is imperative to ensure the quality of all data collected. a record of calibration and maintenance activities is important to provide legally defendable data.

Instruments and equipment used to gather, generate or measure environmental and physical testing data will be calibrated with sufficient frequency and in such a manner that accuracy and reproducibility are consistent with the manufacturer's specifications. Calibration procedures and frequency of laboratory instrumentation will be specified in the laboratory quality assurance manual.

6.1 Field Instrument Calibration

All instruments and equipment used for the Avanti Phase II removal action will be inspected to ensure that the item meets and performs to manufacturer specifications and project specifications. Instruments meeting these requirements are issued to a field technician trained in instrument operation and made available for site use. Field instrument operation and calibration are discussed for the specific equipment in Section 3.0 of the Phase II Workplan.

a record of the instrument calibration will be maintained in a bound field notebook and these records will be subject to a QA audit. Information recorded will include the following:

- Date of calibration;
- All data pertaining to the calibration procedures;
- Initials of analyst performing calibration;
- Adjustments made to equipment prior to and following calibration; and
- Record of equipment failure or inability to meet specifications.

6.2 Laboratory Instrument Calibration

The laboratory instruments used during analysis of samples will be calibrated according to and at the frequency indicated by the QA and QC procedures for each testing method used and any additional manufacturer's recommendations. Records of calibration, repair, or replacement will be filed and maintained by the designated laboratory personnel performing analyses and quality control activities. Calibration records of assigned laboratories will be filed and maintained at the laboratory location where the work is performed.

7.0 ANALYTICAL PROCEDURES

7.1 Field Analytical Procedures

Field analytical procedures consist of operation of a X-Ray Fluorescence analyzer (XRF), air monitoring instruments for particulates, and organic vapor analyzer. Operational procedures for these instruments are described in Section 3.0 of the Phase II Workplan.

7.2 Laboratory Analytical Procedures

The Phase II analytical parameters and their specified analytical method are listed in Table 1-1. ATEC will analyze all samples in accordance with the specified methods and perform all laboratory calibration checks and quality control checks specified by the methods. ATEC's Quality Assurance Plan is available upon request.

8.0 INTERNAL QUALITY CONTROL CHECKS

8.1 Field Quality Control Checks

This section describes all specific quality control checks to be addressed for both field and laboratory analysis in order to comply with the requirements of the Phase II removal. It will include, but not be limited to, the following information.

8.1.1 XRF Instrument

The XRF instrument is standardized daily using site specific reference standards. These reference standards consist of site specific soils and are prepared by an analytical laboratory. The XRF reading of each standard is noted. The difference in each reading is averaged and factored into every analysis performed with the instrument on that day.

8.1.2 PM10 and TSP Air Monitoring

PM10 samples for respirable dust will be collected from an Anderson General Metal Works PM10 Sampler, model 321-B/MFC HVPM10. Total suspended particulate matter (TSP) samples will be collected using the PM10 sampler model above, but with appropriate modifications for the desired aerodynamic particulate range. Each type of unit will be calibrated monthly in accordance with the manufactures recommendations.

8.1.3 Personal/Area Air Monitors

An air sampling pump kit utilizing a Sensodyne BDX 530 Heavy Duty Super Sampler Pump and preloaded filter cassettes will be used for personal and area air monitoring. These air monitoring devices are checked and calibrated by trained representatives from ATEC on a routine basis. ATEC provides a summary status report on each calibration event and any notations concerning repairs.

8.1.4 Random Air Monitoring

PCD-1 Respirable Dust Monitor manufactured by Measurement Systems, Inc. will be used for random air monitoring (RAM). This unit measures respirable dust concentrations from 0.001 to 100 mg/m^3. Concentration data is displayed on a LCD readout and stored in the instruments memory. All RAM units will be operated by technicians trained in the operation and calibration of RAM units.

8.1.5 Organic Vapor Meter

The organic vapor meter to be used at the Avanti site is a portable photionization analyzer (PID) unit. The advantages of this type of instrument are portability, wide range of operation, rapid response, and ease of operation. When used, the PID will be calibrated according to manufacturer instructions. The user will be trained in the maintenance and operation of the PID and any instrument limitations.

8.1.6 Field Quality Control of Analytical Samples

Field quality control will also be checked by field/equipment rinsate blanks and field duplicates. These samples were discussed in Section 3.6 of this QAPP.

8.2 Laboratory Quality Control Checks

Laboratory QC checks are accomplished through the use of system checks and QC samples that are introduced into the sample analysis stream. At a minimum, the following laboratory system checks and QC samples for inorganics will be performed.

- Method blank - All reagents are added to the blank in the same volumes or proportions as used in sample processing and is carried through the complete sample preparation and analytical procedure. Method blanks will be performed at a rate of 1 per sample batch not

to exceed 20 samples. A batch is a group of samples which are processed as a unit and prepared using the same reagent lot. If a batch exceeds 20 samples, then each group of 20 samples or less will be considered a separate batch.

- Matrix duplicate samples - Intralaboratory split samples which are analyzed to check for analytical precision of a method within the matrix. Matrix duplicates will be performed at a rate of 1 per batch not to exceed 20 samples.

- Matrix spike samples - A sample spiked with a known concentration of target analyte prior to preparation and analysis. One matrix spike will be analyzed for every batch of 20 or fewer investigative samples per sample matrix.

- Instrument calibration checks to be performed in accordance with the approved analytical method being employed.

9.0 DATA REDUCTION, VALIDATION AND REPORTING

All data collected will be reduced, managed, distributed, and preserved in a manner which substantiates and documents that data are of known quality. An outline of the QC data handling process for data collection, reduction, validation, transfer, reporting, and storage for both field and laboratory data is as follows:

9.1 Data Reduction

9.1.1 Field Data Reduction

Instruments to be used in the field during this project are the particulate air monitoring equipment (PM10 And TSP), random air monitors, the XRF analyzer, and organic vapor analyzer. The only instrument that requires field data reduction is the XRF analyzer.

The Spectrace 9000 field portable XRF is a direct read device. However, operational procedures require that the instrument be standardized daily. Site specific matrix reference standards are prepared by an analytical laboratory. Three reference standards for lead are used to standardize the instrument. The standards are stored in XRF compatible plastic analysis cups. Each cup is placed in the analysis chamber and a total lead analysis is performed. The direct read result is recorded in the calibration log book. The reading which is the lowest as compared to the reference standard analyzed is used for the calculation adjustment so that the screening will be conservative. The following calculation is performed and the calculated value is used to replace the cleanup criteria of 400 for XRF analyses performed on that day:

XRF Calculation

Adjusted criteria = (XRF reading/true standard concentration) x 400 mg/kg

9.1.2 Laboratory Data Reduction

Raw laboratory data will be recorded in a laboratory notebook along with other pertinent information, such as the sample identification number. Other information to be recorded includes: laboratory procedure used, name of analyst, date of analysis, matrix sampled, reagent concentrations and instrument settings. Copies of any strip chart printouts, such as gas chromatograms, will be maintained on file. The laboratory QA Manager makes periodic reviews of these notebooks prior to final data reporting. Equations to be employed in data reduction are those outlined in the approved method. Data from laboratory quality control samples will be compared to the method acceptance criteria. Unacceptable data shall be appropriately qualified on the results report. Case narratives will be prepared with information concerning data not within acceptance limits and any other anomalous conditions encountered during analysis. Once this procedure has been completed and the results have been released by the laboratory QA Manager, the data are ready for third party validation.

9.2 Data Validation

Technical data, including field data and results of laboratory sample analyses, will be validated to monitor the performance of the remedial action. Procedures for validating field and laboratory data are described below.

9.2.1 Procedures Used to Validate Field Data

Validation of data obtained from field measurements will be performed by the QA Officer. Field data requiring validation includes the daily standardization of the XRF analyzer. The QA Officer shall check the calculation and confirm that the adjusted criteria was used for the total lead field screening activities for that day. Other field validation procedures include a review of log books and proofing data entered into the computer database for transcription errors.

9.2.2 Procedures Used to Validate Lab Data

Under the direction of the laboratory QA Manager, the laboratory will review all analytical data to ensure that results for samples meet all method specified criteria. The requirements to be checked by the laboratory in data validation, as appropriate to the analysis, are:

- Sample Holding Times
- Tuning Calibration
- Calibration
- Blanks
- Surrogate Recovery
- Matrix Spike/Matrix Spike Duplicate
- Field Duplicate
- Internal Standards Performance
- Target Compound Identification
- Interference Check Sample Analysis
- Compound Quantitation and Reported Detection Limits
- Tentatively Identified Compounds
- System Performance
- Overall Assessment of Data
- Laboratory Control Sample Analysis

Data which do not meet the quality objectives will be noted. Case narratives will be prepared with information concerning data not within acceptance limits and any other anomalous conditions encountered during analysis. Once this procedure has been completed and the results have been released by the laboratory QA Manager, the data are ready for third party validation.

Third party validation will be conducted by the project QA Officer or other qualified person. Chain-of-custody records, holding times, blank contamination and detection limits will be

reviewed for all data reported. Third party validation will be conducted on 10% of the samples reported and will include a review of:

- Initial and continuing instrument calibration data
- Method blank, rinsate blank, duplicate and matrix spike data
- Documentation of quantitative results to include information and/or evidence on calculation procedures, calibration data, sample weight or volume, dilution factor, etc.

Precision and accuracy will then be calculated for replicate sample results. A data summary will be prepared and will include:

- Results;
- Sample media identification;
- Sample location and description;
- Appropriate concentration units;
- Appropriate significant figures;
- Data qualifiers; and
- Definitions.

9.3 Data Reporting

Data generated during the Phase II removal activities will be summarized in weekly progress reports, and included in the final report. The QA Manager will develop a data storage and information system to facilitate tracking, data calculations, and transfer of data to various forms and reports. Data reporting procedures are as follows.

9.3.1 Field Data Reporting

Data reporting will be performed by the QA Officer and/or Project Manager. All data collected in the field will go through data validation procedures and be put into a database

in an organized format so that intermittent and final summaries may be easily generated for data review.

9.3.2 Laboratory Data Reporting

After laboratory data validation, the laboratory will prepare reports which will include at a minimum the following components:

- Sample identification
- Laboratory cross-reference numbers
- Date of issuance
- Analysis method numbers performed
- Results from analyses
- Notation of any data qualifiers

The case narratives, to be prepared in the case of questionable or unacceptable results will include at a minimum:

- Date of issuance
- Project name and number
- Analytical tests performed
- Any deviations from the intended analytical strategy
- Laboratory batch number
- Number of samples and respective matrices
- Condition of samples
- Discussion of holding times
- Discussion of technical problems or observations
- Discussion of quality control checks which failed
- Sample description information
- Analytical results
- Quality control reports

- Description of analytical methodology
- Description of QC methodology
- Signature of Laboratory QC/Operations Manager

Data validation packages to be prepared for 10% of the sample results reported shall include:

- Summary page indicating dates of analyses for samples and laboratory quality control checks
- Cross referencing of laboratory sample to project sample identification numbers
- Data qualifiers to be used should be adequately described
- Sample preparation and analytical methods
- Sample results
- Raw data for sample results and laboratory quality control samples
- Results of (dated) initial and continuing calibration checks, and GC/MS tuning results, where applicable
- Matrix spike and matrix spike duplicate (if performed) recoveries, laboratory control samples, method blank results and calibration checks

10.0 PERFORMANCE AND SYSTEMS AUDITS

Performance audits and system audits of both field and laboratory activities will be conducted to verify that sampling and analysis are performed in accordance with the procedures established in the Phase II Workplan and this QAPP. The audits of field and laboratory activities include two independent parts: internal and external audits.

System audits consist of quantitative evaluation of field and laboratory quality control measurement systems to determine if they are used appropriately. These audits may be carried out before all systems are operational, during the program, or after the completion of the program. These audits involve a comparison of the activities presented in the QA plan with those actually scheduled or performed.

Performance audits are a quantitative evaluation of the measurement systems of the program. They require testing of the measurement systems with samples of known composition or behavior to evaluate precision and accuracy after systems are operational and generating data.

10.1 Field Performance and System Audits

10.1.1 Internal Field Audits

Internal audits of field activities, including sampling and field measurements, will be conducted by the QA Officer and/or the contractor's corporate office technical coordinator. An internal field audit will be conducted at least once during the first quarter following mobilization. At least one more internal audit will be conducted during the last half of the project.

The audit will include examination of field activity log books, field instrument calibration and standardizing, sample collection, handling, packaging and chain-of-custody procedures and

QA procedures. A summary report of the audit will be prepared. Any deficiencies noted during the audit will be rechecked within 30 days of the audit to verify that corrective action has been taken.

10.1.2 External Field Audits

External field audits may be conducted by U.S. EPA representatives at any time during the project and may or may not be announced.

10.2 Laboratory Performance and System Audits

Performance and system audits of both field and laboratory activities will be conducted to verify that sampling and analysis are performed in accordance with the procedures established in the Phase II Workplan and this QAPP. The audits of field and laboratory activities include two independent parts: internal and external audits.

10.2.1 Internal Laboratory Audits

Internal lab performance audits will be conducted on a quarterly basis and will consist of preparing and submitting blind QC samples along with other project samples. These samples will consist of either blind duplicates or field spiked samples. The QA Officer will evaluate the analytical results to ensure that the laboratory maintains acceptable QC performance.

The internal laboratory audit will be conducted by the QA Officer and/or the contractor's corporate office technical coordinator. An internal lab system audit will be performed at least once during project implementation. The system audit will include an examination of laboratory documentation procedures on sample receiving, sample log-in, sample storage, chain-of-custody procedures; sample preparation and analysis, instrument operating records, etc.

10.2.2 External Laboratory Audits

External laboratory audits may be conducted at any time by U.S. EPA representatives and may or may not be announced.

11.0 PREVENTATIVE MAINTENANCE

To minimize the occurrence of instrument failure and other system malfunctions, a preventative maintenance program for field and laboratory instruments will be implemented. Equipment, instruments, tools, gauges, and other items requiring preventative maintenance will be serviced in accordance with the manufacturer's specified recommendations and written procedures developed by the operators. Maintenance items that cannot be performed by the laboratory technician will be performed by a person certified to repair the instrument. The laboratory will be responsible for performing routine maintenance and will have available tools and spare parts to conduct routine maintenance. A backup XRF unit will be available for use in the case of a malfunction to avoid downtime.

Manufacturer's procedures identify the schedule for servicing critical items in order to minimize the downtime for the measurement system. It will be the responsibility of the field instrument operator and the laboratory to adhere to this maintenance schedule and arrange any necessary and prompt service. In the absence of any manufacturer recommended maintenance criteria, a maintenance procedure will be developed by the operator based upon experience and previous use of the equipment. Service to the equipment, instruments, tools, gauges, etc., shall be performed by qualified personnel.

Logs will be used to record maintenance and service procedures. All maintenance records will be documented and traceable to the specific equipment, instruments, tools, and gauges. Any items found to be inoperable will be taken out of use and a note stating the time and date of this action will be made in the calibration sheets and logs. The reason for equipment failure and the time and date of its return to service will also be noted in the logbook. Records produced shall be reviewed, maintained, and filed by the operators at the laboratories and by the data and sample control personnel when and if equipment, instruments, tools, and gauges are used at the site. The Project Manager will audit these procedures.

12.0 SPECIFIC ROUTINE PROCEDURES USED TO ASSESS DATA PRECISION, ACCURACY, AND COMPLETENESS

This section outlines the QA and QC procedures used in assessing the quality of the chemical data. The data evaluation procedures will be used by the QA Manager for assessing duplicate and/or spike/duplicate spike samples and checking any blank samples that are submitted blind to the analytical laboratories from the field or generated internally by the laboratory, in accordance with this QAPP. The purpose of implementing these procedures is to assess the chemical data generated for accuracy, precision, representativeness, and completeness for both the laboratory analytical program and field sample collection activities.

12.1 Precision Assessment

Precision is assessed by dividing a sample or a spiked sample into equal aliquots. The duplicate samples are then included in the analytical sample set. The splitting of the sample allows the analyst to determine the precision of the preparation and analytical techniques associated with the duplicate sample. The relative percent difference (RPD) between the duplicate samples are calculated and plotted. The RPD is calculated according to the following formula:

$$RPD = \frac{\text{Amount in Sample - Amount in Duplicate}}{0.5\ (\text{Amount in Sample + Amount in Duplicate})} \times 100$$

12.2 Accuracy Assessment

In order to assure the accuracy of the analytical procedures, an environmental sample is randomly selected from each sample shipment received at the laboratory, and spiked with a known amount of the analyte to be evaluated. A sample spike will be included in every set of 20 samples tested on each instrument. The spike sample is then analyzed. The increase in concentration of the analyte observed in the spiked sample, due to the addition of a known quantity of the analyte, compared to the reported value of the same analyte in the unspiked sample determines the percent recovery.

Daily control charts are plotted for each commonly analyzed compound and recorded. The percent recovery for a spiked sample is calculated according to the following formula:

$$\% \text{ Recovery} = \frac{\text{Amount in spiked sample - Amount in sample}}{\text{Known amount added}} \times 100$$

12.3 Completeness Assessment

Completeness is the ratio of the number of valid sample results to the total number of samples analyzed with a specific matrix and/or analysis. Following completion of the analytical testing, the percent completeness will be calculated by the following equation:

$$\text{Completeness} = \frac{\text{(Number of valid measurements)}}{\text{(Number of measurements planned)}} \times 100$$

13.0 CORRECTIVE ACTION

Corrective action is the process of identifying, recommending, approving and implementing measures to counter unacceptable procedures or out of quality performance which can affect data quality. Corrective action can occur during field activities, laboratory analyses, data validation and data assessment. All corrective action proposed and implemented should be documented in the regular quality assurance reports to management. Corrective action should only be implemented after approval by the QA Officer or Project Manager.

The following procedures have been established to assure that conditions adverse to quality, such as malfunctions, deficiencies, deviations, and errors, are promptly investigated, documented, evaluated, and corrected. When a significant condition adverse to quality is noted at the site, laboratory, or subcontractor locations, the cause of the condition will be determined and corrective action taken immediately. All project personnel have the responsibility to promptly identify, solicit approved correction, and report conditions adverse to quality. Conditions which warrant corrective action include:

- Predetermined acceptance standards are not attained;
- Procedures or data compiled are determined to be faulty;
- Equipment or instrumentation is found faulty;
- Samples and test results are questionably traceable;
- Quality assurance requirements have been violated;
- System and performance audits indicate problems.

13.1 Field Corrective Action

The need for corrective action will be identified as a result of the field audits previously described. If problems become apparent that are identified as originating in the field, immediate corrective action will take place. If immediate corrective action does not resolve the problem, appropriate

personnel will be assigned to investigate and evaluate the cause of the problem. When a corrective action is implemented, the effectiveness of the action will be verified such that the end result is elimination of the problem.

Corrective action in the field can be needed when the sample network is changed, sampling procedures, and field analytical procedures require modification due to unexpected conditions. In general, the Field Team, QA Officer, or the Project Manager may identify the need for corrective action. The field staff in consultation with the Field Coordinator will recommend the corrective action. It will be the responsibility of the QA Officer and the Project Manager to ensure that corrective action has been implemented.

Corrective action resulting from internal field audits will be implemented immediately if data may be adversely affected due to unapproved or improper use of approved methods. Corrective action will be implemented and documented in the field record book and in quality assurance reports to the entire project management.

13.2 Laboratory Corrective Action

The need for corrective action resulting from QA audits will be initiated by the laboratory QA and QC Manager in consultation with the Operations Manager. The corrective actions will be performed prior to the release of data from the laboratory. The corrective action will be documented in the logbook and submitted to the data validator. If the corrective action does not rectify the situation, the laboratory will contact the ENTACT Project Manager or QA Officer. If the nonconformance causes project objectives not to be achieved, it will be necessary to inform all levels of ENTACT management at the Avanti site and the US EPA OSC. Corrective action may include, but is not limited to:

- Reanalyzing the samples, if holding time criteria permit;
- Evaluating and amending sampling and analytical procedures;
- Accepting data with an acknowledged level of uncertainty; and

- Resampling and analysis, if the completeness of the data set or intended use of the data is recognized during a preliminary review to be insufficient to meet program objectives.

If the above corrective actions are deemed unacceptable, an alternate laboratory will be selected to perform necessary analyses.

13.3 Corrective Action During Data Validation and Data Assessment

The need for corrective action may be identified during either the data validation or data assessment. Potential types of corrective action may include resampling by the field team or reinjection/reanalysis of samples by the laboratory. These actions are dependent upon the ability to mobilize the field team, whether the data to be collected is necessary to meet the required quality assurance objectives (e.g. the holding time has not been exceeded, etc.). The QA Officer is responsible for identifying a corrective action situation, documenting the incident, determining the course of action, and implementing the corrective action.

14.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

14.1 Contents of a Project QA Report

Analytical results of samples analyzed during the remedial action will be submitted to the Project Manager following a QA and QC review. The results will include a tabulation of the analytical data and an explanation of any field conditions or laboratory QA and QC problems and their effects on data quality. Results of performance audits and system audits will also be included, as appropriate. Proposed corrective action will be recommended in the event that QA problems are identified during review of data quality or results of performance or system audits.

The final report will contain a discussion of QA and QC evaluations summarizing the quality of the data collected and/or used as appropriate to each activity of the project. The objective of the QA and QC summary will be to ensure that the data are representative of site conditions and sufficient in quality and quantity to support the field activities. The QA and QC summary will include:

- Tabulated results of all field and analytical data;
- A report from the laboratory QA Manager evaluating the validity of the analytical data with respect to accuracy, precision, completeness, and representativeness; and
- A report from the Project Manager evaluating the results of field and office audits.

A quality assurance report will be prepared by the QA Manager upon receipt of sufficient QA data from the laboratory. The report will be a summary of QA and QC results of the analytical work conducted and will be included as part of the final remedial action report.

14.2 QA Reporting and Routing Schedule

The QA Reports will be prepared on a monthly basis and will be delivered to all recipients by the end of the first full week of the month. The reports will continue without interruption, until the project has been completed. All individuals identified in the Project Organization Chart will receive copies of the monthly QA Report.

G

EPA'S COMMENTARY FOR THE PHASE II WORK PLAN (SEPTEMBER 8, 1995)

Work Plan General Comments

(ENTACT'S response is in blue print)

U.S. EPA's initial question for "Stage A" is which of the industrial buildings described in Section 1 on page 2 of the August 18, 1995 Removal Action Work Plan Phase II - Stage A, will be used for segregation and treatment of the estimated 20,000 yd^3 of smelter related materials to be excavated within the industrial portion of this Site, the East Building or the West Building?

The U.S. EPA also recommends that enhanced access controls be emplaced during the segregation and treatment operations in the designated "industrial building." The building should be designated as a "HOT ZONE" and no personnel may be admitted into the structure without a minimum of Level 'C' personal protective equipment worn.

The following excerpt from the Work Plan generated the EPA comment:

> *In the prioritized areas, 20,000 cubic yards of smelter related materials will be excavated. The excavated material will be transported into the industrial building for segregation and treatment. All critical barriers in the industrial building will be sealed to prevent any emissions release.*

Response:

The East Building will be used for segregation of the excavated materials. Once the residential backfill soils have been removed from the West Building, the excavated materials requiring treatment will be transferred from the East Building to the West Building for treatment. Access doors and a temporary haul road will be constructed to connect the two buildings at the north ends.

ENTACT has recently performed structural surveys of each building to ensure worker health and safety. Enhanced access controls including signs and Level C PPE requirements will be instituted for health and safety reasons on both the East and West Buildings.

Note also that the U.S. EPA has not officially, i.e., without reservation, approved the "treatment" process identified by ENTACT, Inc. to be used for stabilization of the lead contaminants upon this Site. Inasmuch as other heavy metal contaminants (viz. As, Ba, Cr, Hg, et al) have also been indicated to exist on the Site in excessive quantities and concentrations, the treatment process does not take these chemical elements and/or compounds into account. As such, U.S. EPA will approve the Stage A Plan for Phase II but will extend conditional approval only for the treatment/stabilization proposal. This conditional approval is extended pending submittal by ENTACT, Inc. of satisfactory evidence that the "treatment" is amenable to totally stabilize all the contaminants on the Site or a discussion of what is to be done concerning the other contaminants identified within this Site.

Response:

ENTACT will submit to EPA a treatability study which will include analyses to characterize both untreated and treated site samples for the metals indicated by EPA (arsenic, barium, cadmium, chromium, and mercury). The samples will be analyzed for both total and leachable metals.

Figure 1-1: Stage 'C' is not the period when residential indoor HEPA vacuum cleaners will be available; such availability shall start at the end of Phase I.

Response:

Figure 1-1 has been revised to show that HEPA vacuum cleaners will be available for residents upon completion of the Phase I Removal Activities.

Section 1.0, Pg 3: Second half of page, next to last paragraph..., if a release has occurred; the way this sentence is worded, it appears that an investigation will be done if it is known that a release has occurred. IDEM ARARs require USTs out of use for more than 12 months be removed whether there is contamination or not; contact IDEMs UST Branch for Ms. Betty McAtee at 317/233-6419 for resolution of this issue.

The following excerpt from the Work Plan generated the EPA comment:

The surrounding soils will be sampled and analyzed for the appropriate constituents to determine if a release occurred. If a release is identified, the impacted soils will be removed and properly managed.

Response:

The USTs will be addressed in the Phase II, Stage B work plan and in accordance with IDEM ARARs.

Section 2, Pg. 6: Copies of all air monitoring results....; a specific frequency for submittal of the data shall be stated; EPA suggests a monthly submittal of this data to Marion County Health Department and to the Administrative Record.

The following excerpt from the Work Plan generated the EPA comment:

Copies of all air monitoring results will be sent to Marion County Health Department.

Response:

Copies of all air monitoring results will be sent on a monthly basis to the Marion County Health Department and to the EPA and shall become part of the Administrative Record.

Section 3, Pg. 3: first half of page, last paragraph: In order to avoid unnecessary data collection and undue confusion and complexity, EPA suggests that 50 ft x 50 ft grids be established, not A, B, C, D. Each 100 ft x 100 ft grid cell is already to be numbered and lettered.

The following excerpt from the Work Plan generated the EPA comment:

As depicted on Figure 3-1, each grid has been further divided into four approximately equal 50 feet by 50 feet quarter sections (A, B, C, and D) to provide additional precision to be

used during sampling and excavation activity as described in the following sections.

Response:

ENTACT has established 50 ft x 50 ft grids across the site. Each grid has been numbered individually. A revised Figure 3-1 is provided.

3.5.1 Extent of Contamination Sampling: This step may be skipped for cells where test holes have already indicated contamination. "Native soils"?, who makes this determination, a geologist, a soils scientist?

The following excerpt from the Work Plan generated the EPA comment:

The purpose of the extent of contamination (EOC) sampling is to determine the vertical and horizontal extent of soils and other solid media within the Industrial Property boundary which contain total lead concentrations greater than the clean-up criteria of 1,000 mg/kg. This will be accomplished by using a combination of visual indications, XRF measurements, and laboratory analyses. Investigation will continue until native soils are encountered to eliminate the possibility of clean fill overlaying contaminated fill.

Response:

As previously mentioned by EPA, it is important to encounter native soils to eliminate the possibility of missing contaminated fill beneath clean fill. During the initial stages of excavation, an ENTACT geologist will identify native materials on-site. The ENTACT geologist will train project personnel to identify native soils from fill material (foundry sand, smelter related debris and waste, slag, battery components and construction debris). Following appropriate training, on-site personnel will identify native soils during excavation.

Section 3.8 Pg. 8, Backfill Material: No discussion is found in the text or work plan regarding TCLP sampling of residential soil to be used for backfill; this matter needs to be clarified in depth.

The following excerpt from the Work Plan generated the EPA comment:

Upon completion of contaminated soil removal and verification analysis of excavated grid areas, designated areas will be backfilled utilizing residential soils containing less than 1,000 mg/kg total lead.

In addition to residential soils, if an outside backfill source is required during site restoration activities on the industrial property the following steps will be performed....

Response:

Residential soils will be sampled and analyzed for TCLP lead on a frequency of every 200 cubic yards.

Figure 3-1, Site Coordinate Grid System: A careful review of the Avanti Site western property line should be made; MCHD indicates the property line has changed and that it follows the middle of the Eagle Creek.

Response:

The Figure 3-1 has been edited to reflect the revised property as defined on the attached MCHD map.

Table 3-1, Excavation Verification Section, Frequency Column: the composite samples indicated here should be grab samples.

Response:

The table has been revised to reflect grab sampling. One grab sample will be collected from the middle of each 50 ft by 50 ft grid.

Section 4.0, Pg. 1: All TCLP lead analysis will be reduced to 10%...; U.S. EPA has previously addressed this mater and continues its objection to the very small and conservative total lead to TCLP lead correlation factor. A basis must be explained.

The following excerpt from the Work Plan generated the EPA comment:

> *All TCLP lead analysis will be reduced to 10% once the site-specific total lead :TCLP lead correlation is established.*

Response:

ENTACT will employ an XRF field screening instrument for the following purposes. First, the XRF will be used to guide excavation and determine the extent of contamination (EOC) of the prioritized areas on a real-time basis. This use of the XRF, in conjunction with visual observations of smelter-related material, will achieve an efficient use of excavation effort while avoiding the delay of laboratory turnaround time. The XRF measurements will initially be supplemented with frequent samples for laboratory analysis of total lead and TCLP lead. This will enable the generation of three types of lead data from the excavated material: XRF total lead, laboratory total lead, and laboratory TCLP lead. This data will be correlated to determine relationships between the results and then used to segregate excavated soils (described below).

Also, 10% of the EOC samples sent to the laboratory will be analyzed for arsenic, barium, cadmium, chromium, and mercury. Verification that an excavated grid has achieved the cleanup criteria will be determined by laboratory analysis of total lead. Also, 10% of the verification samples sent to the laboratory will be analyzed for arsenic, barium, cadmium, chromium, and mercury. XRF measurements will not be used as verification samples.

Second, the XRF will be used to initially segregate excavated soils into two groups: material with XRF measurements indicating a hazardous material and XRF measurements indicating a non-hazardous material. This is the point at which the previously correlated XRF and TCLP results are used. Classification of the non-hazardous material will be confirmed by laboratory analysis of samples for total lead and TCLP lead.

By using the XRF as a field screening tool, field decisions can reliably be made,

with ultimate confirmation provided by laboratory analysis.

Section 4.0, Pg. 2, first paragraph: identify the laboratory specifically by name and specialty.

The following excerpt from the Work Plan generated the EPA comment:

> *Samples will be taken to the laboratory, individually homogenized and analyzed for total lead and TCLP lead. A small portion of each homogenized sample will be returned to the field for XRF analysis.*

Response:

All treatability samples for laboratory analysis will be taken to Southern Spectrographic Laboratory, Irving, Texas. Southern Spectrographic is a full-service environmental laboratory with particular expertise in the preparation and analysis of treatability study samples.

Also, 4.3 Pg. 2, Engineering Controls: consider the consequences if its a windy and dusty day but it's too cold for misting.

The following excerpt from the Work Plan generated the EPA comment:

> ### 4.3 ENGINEERING CONTROLS
>
> *In the prioritized excavation areas, all soil will be misted and wetted prior to any excavation.* ***Also, wetting and dust suppression measures, such as the use of surfactant, will be implemented during activities that may generate dust emissions.*** *Wetting will be performed in a manner so as not to saturate the soils. A designated person in each Exclusion Zone will be responsible for eliminating all visible emissions. This person has the authority to stop all excavation and transporting activities, as necessary, to enforce this requirement. Broad span water misting will be used to suppress possible dust emissions from open excavations. Air monitoring will also be performed as outlined in Section 2.*

Response:

If misting systems are ineffective on cold and windy days, an encapsulant will be applied to specific areas in order to control potential emissions.

Also 4.4, Pg. 2, Clean-up Activities: ....grid cell 3, 13, and 28. There are no such cells previously identified; each cell needs a number and a letter according to Figure 4-1.

The following excerpt from the Work Plan generated the EPA comment:

> ### 4.4 CLEAN-UP ACTIVITIES
>
> *As shown in the preliminary EOC survey, excavation will begin in grid cell 3, 13 and 28 along the northwest portion of the site. Materials identified by XRF analysis as having a lead concentration in excess of the action level will be excavated and transported to the treatment area for segregation and treatment as shown in Figure 4-2. Based on XRF readings and visual observations, excavation will continue until the affected materials are removed.*

Response:

The text in the Work Plan does not reflect the revised grid coordinate system. The current grid system reflects 50 foot spacing. The text should indicate that excavation will begin along the northwest portion of the site in the area identified on Figure 4-2 as having prioritized smelter related material.

Section 4.0, Pg. 3: It is not clear to EPA what happens to material excavated but which is less than 5 ppm TCLP, i.e., not requiring treatment.

The following excerpt from the Work Plan generated the EPA comment:

> *Following excavation, contaminated materials will be transferred to the treatment area inside of the on-site Industrial Buildings, shown in Figure 4-2, for staging, segregation, treatment and sampling. Excavated materials will be segregated based on the need for treatment (i.e. whether they leach TCLP lead concentrations less than or greater than 5.0 mg/l).* ***The material requiring treatment will be treated through a chemical fixation/stabilization process. Treated/Untreated non-hazardous materials will remain stockpiled in the on-site Industrial Buildings pending Phase II Stage B removal activities. Following final volume determinations during Stage B, the non-hazardous materials will be disposed of in accordance with IDEM's Special Waste regulations and RCRA subtitle D, as necessary.***

Response:

Industrial material not exceeding 5 mg/l TCLP will be initially segregated by using the XRF and stockpiled in the East Warehouse. This material will be further classified by sampling and analysis for total lead and TCLP lead. Any material exceeding 5 mg/l TCLP lead will be transferred to the West Warehouse, and considered under activities included in Phase II, Stages B and C.

Section 4.5, Pg. 4, Stabilization Operations: Will the process work in cold weather? The additive is a liquid. If this process works on metals other than lead, it must be so stated and empirical evidence should be provided.

The following excerpt from the Work Plan generated the EPA comment:

> *The treatment additive reacts with the heavy metal to create compounds with the metal ions which are stable and insoluble, and thus are prevented from dissolving, leaching and migrating. ENTACT's patented treatment additive uses a combination of the following chemicals to facilitate this stabilization:*
>
> *phosphoric acid,*
> *monocalcium phosphate,*
> *monoammonium phosphate and*
> *diammonium phosphate.*

The above additives provide the two necessary components necessary to stabilize the metal ions, the phosphate ion and the phosphoric acid buffer system. For the Avanti site, lead is the contaminant of concern. The chemistry of lead stabilization is described below.

Lead is anticipated to be present at the site in a variety of forms, including metallic lead (Pb), lead oxide (PbO), lead sulfate ($PbSO_4$), and possibly lead sulfide (PbS). Metallic lead often has a thin coating of lead oxide due to exposure to the oxygen in the air. While this is an extremely minor fraction of the lead content, it is important.

Under certain pH conditions, lead oxide is readily dissolved, allowing the lead to migrate. Lead oxide is amphoteric and, consequently, it is soluble under both acidic and alkaline conditions.

In order for chemical fixation/stabilization to be successful, the various forms of lead salts, especially lead oxide, need to be converted to compounds that are particularly insoluble under the normal pH range. Lead is capable of forming the following three low solubility orthophosphate salts:

$Pb_3(PO_4)_2$,
Pb_2HPO_4, *and*
$Pb(H_2PO_4)_2$.

ENTACT's patented treatment system and additive are proven technology. Treatment through the ENTACT patented process typically reduces post-treatment volume by 10-25% compared to volume prior to treatment.

Large heterogeneous material is substantially reduced in size during treatment to one inch minus. This results in less void space in the treated material and, consequently, less volume. The process and additives provide the necessary environment including particle size, phosphate ion, buffering system, and thorough mixing needed to successfully treat lead contaminated soil and debris.

Response:

The stabilization additive will be added as a dry material. The chemistry of stabilization relies on soil moisture to create the stabilization reaction (i.e. solution chemistry). If the soil moisture is frozen, the additive can still be mixed with the smelter related material; the particle size control on the ENTACT treatment system will ensure thorough mixing to a particle size of one inch and less.

Section 5.1, Pg. 1, Backfill and Site Grading: ....clean-up goal. What clean-up goal, 20,000 yd^3? This in unclear and confusing, and this concept should not be subject to random interpretation or speculation.

The following excerpt from the Work Plan generated the EPA comment:

5.1 BACKFILL AND SITE GRADING

Following excavation, segregation, treatment and storage of approximately 20,000 cubic yards of impacted materials from the prioritized areas identified in Section 1 of this Work Plan, and after verification sampling has indicated that the clean-up goal has been reached, the open excavations will be backfilled with an appropriate and acceptable fill material. This material will include Residential soils that do not exceed the action level established for the Industrial portion of the Site, 1,000 mg/kg total lead. Figure 5-1 is an overview of excavation, treatment and backfilling operations.

Compaction of the backfill material will be performed based on a standard proctor density . A standard proctor will be obtained for the Residential soils. Backfill will be placed and compacted in 12 inch lifts to 85% of standard proctor density.

Response:

The clean-up goal of 1,000 mg/kg total lead will be achieved in the areas from which the 30,000 cubic yards of smelter related material are excavated. 30,000 cubic yards is not a clean-up goal; it is an estimate of smelter related material to be excavated during Phase II, Stage A activities. Where smelter related material is excavated, the clean-up goal is 1,000 mg/kg total lead as specified by the Order.