US EPA RECORDS CENTER REGION 5
1000737

# MEMORANDUM

**DATE:** July 23, 1999

**TO:** Paul M. Purseglove - FOS Manager

**FROM:** Chris Cahnovsky - Collinsville FOS

**SUBJECT:** 1198010003 -- Madison County
Chemetco, Inc.
ILD488843809
FOS File

This memo is a request for sampling dollars to allow Region 6 to sample and analyze fish, sediment, soil and zinc oxide sludge from Long Lake and Chemetco. Inc. for the presences of dioxins and furans. I intend to collect three Long Lake sediment samples. Two sediment samples will collected from Long Lake on Chemetco's property and one sediment sample will come the section of Long Lake that runs through the Burton Subdivision in unincorporated Madison County. One zinc oxide sample from the East Canal will be collected and one background soil sample will be collected. A Sampling and Analysis Plan has been developed for this sampling event. The Illinois Department of Natural Resources has already collected two fish samples from the Northern portion of Long Lake. Necessary spike and duplicate samples will be needed.

I contacted Sue Doubet and she informed me that an analysis for SW-846 Method 8290A, high resolution analysis for dioxins and furans, is $1250.00 per sample. Also, two spike and duplicate samples will need to be run for QA/QC purposes. The lab charges a $150 processing fee for fish samples. The lab she contacted, ARDL in Mt. Vernon, Illinois, does not perform the analysis but subcontracts the work to another lab. The approximate cost of this sampling will be about $11,550. The sampling will be scheduled as soon as the money can be secured for this event.

Region 6 will take the sediment samples and the Illinois Department of Natural Resources have already collected the fish samples. When the results are received, the Illinois Department of Public Health will take the lead in interpreting the results for public health concerns. The IDPH will also relay the results of the analysis to the private citizens.

On April 12, 1987, the United States Environmental Protection Agency sampled the polish pits at Chemetco for the presence of dioxin. The USEPA found dioxin concentrations at a Toxicity Equivalence Factor of 3.4 ppb, 2,3,7,8-TCDD equivalents. The polish pits manage zinc oxide collected from Chemetco's Venturi scrubber system. On September 18, 1996, the IEPA discovered that Chemetco, Inc. was discharging a zinc oxide waste water slurry to Long Lake. The source of discharge was zinc oxide and water from the East Canal.

The discovery of the discharge has led to the criminal indictment of Chemetco and several of its former and present employees. These indictments were the source of many stories in the local newspapers. Since these stories were published, the Illinois Environmental Protection Agency has received numerous calls from local citizens who live around Long Lake. The citizens and the news media are concerned about the possible human health risks associated with the illegal discharge.

Due to the fact that in 1987 the USEPA found dioxin in the zinc oxide and from 1986 to 1996 zinc oxide was discharged to Long Lake, the Agency's Toxicological Assessment Unit raised concerns about dioxins and furans in Long Lake sediments and the fish population. Chemetco also smelts a large variety of low grade copper bearing scrap. Some of the scrap charged to the furnaces include coated wire, plastics and computer parts. The data obtained from this sampling will be used to evaluate any potential health risks to the general public from eating fish caught in Long Lake. The results may also be used for potential enforcement activities.

If you have any questions regarding this matter, please call me at 618/346-5120.

CNC
cc: BOL - Records Unit
cc: BOL - Collinsville Files
cc: Mike Nechvatal - BOL Manager
cc: Tom Hornshaw - OCS/TAU
cc: Chris Perzan - DLC
cc: Ken Mensing - Collinsville Region

# FINAL FIELD SAMPLING AND ANALYSIS REPORT
# ORGANIC SAMPLING
# LONG LAKE - MITCHELL, ILLINOIS

BY:
CHRIS CAHNOVSKY
ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
REGION 6 - FIELD OPERATIONS SECTION
BUREAU OF LAND
2009 MALL STREET
COLLINSVILLE, ILLINOIS 62234
OCTOBER 1999

FINAL FIELD SAMPLING AND ANALYSIS REPORT
LONG LAKE - MITCHELL ILLINOIS

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## 1.0 INTRODUCTION

The Illinois Environmental Protection Agency sampled zinc oxide sludge from the East Cooling Canal, sediment from Long Lake and a background soil sample at the Chemetco facility for the presents of dioxin and furan. This document is the Field Sampling and Analysis Report for sediment, soil and sludge from Chemetco and Long Lake.

The sampling event occurred on August 10, 1999 and was undertaken in accordance with the Site-Specific Sampling and Analysis Plan (SAP) For Dioxin and Furan in Sediment and Zinc Oxide, Chemetco, Inc. Hartford, Illinois and Long Lake - Mitchell, Illinois. The sampling team also followed the Bureau of Land Sampling Procedures Guidance Manual, September 1996. The sampling team from the Illinois Environmental Protection Agency's Collinsville Regional Office used ARDL in Mt. Vernon, Illinois as a contract laboratory. ARDL subcontracted the dioxin and furan sampling to Triangle Laboratory, Inc. in Durham, North Carolina.

The sampling event was undertaken by Collinsville Field Operation Section personnel Chris Cahnovsky, Tom Miller and John Senjan. Maps showing the sampling area layout and sample locations are provided in Appendix A. A Photograph Log of the sampling event is provided in Appendix B. Copies of the Chain of Custody forms and Unified Sampling Documents are provided in Appendix C and the laboratory reports are provided in Appendix D. A copy of the SAP is included as Appendix E.

On July 16, 1999, the Illinois Department of Natural Resources, Division of Fisheries obtained fish samples from Long Lake. The fish sampling was carried out in accordance with IDNR procedures and was not part of the SAP. The IDNR was contacted by the Illinois Environmental Protection Agency to obtain fish samples for dioxin and furan analysis.

## 2.0 SAMPLING PROCEDURES

### 2.1 Sediment

A total of three sediment samples were taken during this sampling event. The sediment samples were labeled X109 through X111. Samples X109 through X111 were obtained using separate and clean stainless steel bucket augers. The samples were removed from the augers using separate and clean stainless steel scoops. Each sample was placed into two 8-ounce glass jars.

Sample X109 was taken about 20 feet west of Containment Area #3. Sample X110 was taken on the east side of Containment Area #3. Sample X111 was taken about 15 feet north of Franko Lane. The sample depths of the sediment samples were 0-10 inches.

### 2.2 Soil

One background soil sample was taken in the front yard of Chemetco's "farmhouse". This background sample was labeled X112. Sample X112 was taken at a depth of 0 - 6 inches. This sample was taken using a stainless steel scoop and it as placed into two 8-ounce glass jars.

### 2.3 Zinc Oxide Sludge

One sample of zinc oxide sludge was taken from the bottom of the east side of the East Cooling Water Canal. This sample was taken using a stainless steel bucket auger at a depth of 0-10 inches. The sample was labeled X202 and placed in two 8-ounce glass jars.

### 2.4 Fish Samples

The IDNR used a shock boat to obtain the fish for sampling. The area samples was the section of the lake north of Franco Lane and south of the "slag road". In this section big buffalo, big carp and small buffalo were obtained. The IDNR filleted the fish in Grafton, Illinois.

The fish samples were in the possession of IDNR until August 9, 1999 when the Illinois Environmental Protection Agency took possession of the fish samples. The fish samples were taken to ARDL in Mt. Vernon by the Agency on August 10, 1999. The fish samples remained frozen at all times.

A sample of big buffalo and big carp from the north section of Long Lake were analyzed for dioxins and furans by ARDL, Inc. The big buffalo fillets were labeled 02420 and the carp fillets were labeled 02209.

## 2.5 Sample Preservation

All samples were sealed with evidence tape and placed in an iced cooler for shipment to ARDL, Inc. in Mt. Vernon, Illinois.

## 2.6 Sample Custody and Shipment

All sample containers were appropriately labeled in accordance with the SAP and the Bureau of Land Sampling Procedures Guidance Manual, September 1996. A Chain of Custody - DLPC/FOS Unified Sample Document accompanied the samples from the point of origin to ARDL. All samples collected by the Agency remained in the custody of Collinsville Regional Office personnel until shipment to ARDL. The samples were hand delivered to ARDL on August 10, 1999 and were received by ARDL with the evidence tape seals intact.

## 2.7 Equipment Decontamination

Since separate and clean sampling equipment was used to obtain each sample, no field documentation was needed.

# 3.0 RESULTS

The results are attached as Appendix D to this report. The sample results were forwarded to the Office of Chemical Safety's Toxicological Assessment Unit for interpretation. The following is a key to cross reference the Laboratory ID Numbers with the Field ID Numbers.

| Lab ID Number | Field ID Number | Site Location |
|---|---|---|
| 2448-1 | X109 | West of Containment #3 |
| 2448-2 | X110 | East of Containment #3 |
| 2448-3 | X111 | North of Franko Lane |
| 2448-4 | X112 | By Farmhouse (Background) |
| 2448-5 | X202 | ZnO East Cooling Water Canal |
| 2448-6 | 02209 | Carp Fillet |
| 2448-7 | 02420 | Bigmouth Buffalo Fillet |

| Lab ID Number | Field ID Number | Dioxin Equivalent (ppt) |
|---|---|---|
| 2448-1 | X109 | 123 ppt |
| 2448-2 | X110 | |
| 2448-3 | X111 | |
| 2448-4 | X112 | |

| | | |
|---|---|---|
| 2448-5 | X202 | 232 ppt |
| 2448-6 | 02209 | |
| 2448-7 | 02420 | |

# SITE-SPECIFIC SAMPLING AND ANALYSIS PLAN FOR DIOXIN AND FURAN IN SEDIMENTS AND ZINC OXIDE CHEMETCO, INC. HARTFORD, ILLINOIS LONG LAKE - MITCHELL, ILLINOIS

BY:

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
REGION 6 - FIELD OPERATIONS SECTION
BUREAU OF LAND
2009 MALL STREET
COLLINSVILLE, ILLINOIS 62234
JULY 1999

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# SITE-SPECIFIC SAMPLING AND ANALYSIS PLAN
# SEDIMENT AND SURFACE WATER
# LONG LAKE - MITCHELL, ILLINOIS

## 1.0 INTRODUCTION

The following constitutes a Site-Specific Field Sampling and Analysis Plan (SAP) for chlorinated dioxin and furan levels of zinc oxide produced by Chemetco, Inc. and in the sediments of the northern portion of Long Lake in unicorporated Mitchell, Illinois.

On April 12, 1987, the United States Environmental Protection Agency sampled the polish pits at Chemetco for the presence of dioxins and furans. The USEPA found dioxin concentrations at a Toxicity Equivalence Factor of 3.4 ppb, 2,3,7,8-TCDD equivalents in the polish pits. The polish pits manage zinc oxide collected from Chemetco's Venturi scrubber system. On September 18, 1996, the IEPA and the USEPA discovered that Chemetco, Inc. was discharging a zinc oxide and water slurry through a 10-inch pipe into a ditch tributary to Long Lake, Long Lake, and its adjacent wetlands. According to the April 21, 1999 United States District Court for the Southern District of Illinois Indictment of Chemetco and its former and present employees, the source of discharge was zinc oxide and water from the East Canal.

The discovery of the discharge has led to the criminal indictment of Chemetco and several of its former and present employees. These indictments were the source of many stories in the local newspapers. Since these stories were published, the Illinois Environmental Protection Agency has received numerous calls from local citizens who live around Long Lake. The citizens and news media are concerned about the possible human health risks associated with the illegal discharge.

Due to the fact that in 1987 the USEPA found dioxin in the zinc oxide and from 1986 to 1996 zinc oxide was discharged to Long Lake, the Agency's Toxicological Assessment Unit raised concerns about dioxins and furans in Long Lake sediments and the fish population. Chemetco also smelts a large variety of low grade copper bearing scrap. Some of the scrap charged to the furnaces include coated wire, plastics and computer parts.

Chemetco responded to this discharge by impounding an impacted section of Long Lake under an Army Corp of Engineers 404 Permit pursuant to the Clean Water Act. According to Chemetco, the approximate area of the release was 300 feet long by 450 feet wide. Chemetco constructed four Containment Areas. The impounded section of Long Lake, Containment Area 3, was pumped dry and zinc oxide, vegetation and contaminated soil were removed and place in Containment Area #1. According to Chemetco, Containment Area 1 contains about 1,500 cubic yards of zinc oxide. The water from the impounded portion Long Lake was pumped to Containment Area 2. Containment Area 2 contains about 575,000 gallons of water.

On November 17, 1997, Chemetco submitted a plan titled Zinc Oxide Spill Remediation Plan Phase I - Material Removal and Partial Closure. This plan was not approved by the Agency. Chemetco submitted a revised plan in April 1998. This plan was approved by the Agency with conditions. However, Chemetco appealed this approval to the Illinois Pollution Control Board. As of October 22, 1998, Chemecto has not removed any waste zinc oxide from the release area for proper disposal.

## 2.0 PURPOSE AND OBJECTIVE

This SAP has been prepared to allow for the collection and analysis of sediments in Long Lake and zinc oxide from the East Canal for dioxins and furans. Samples will be taken at the point of release to Long Lake and at Franko Lane in unincorporated Madison County. A zinc oxide sample will be obtained from the East Canal.

## 3.0 SITE DESCRIPTION

The section of Long Lake that is the subject of this SAP is a long narrow body of water that extends from the Mississippi River side of the levee in Hartford, Illinois to the Stanley Ditch just north of Interstate 270. The north section of Long Lake begins on the west side of the Mississippi River levee along Illinois Route 3. This portion of lake flows under Rt. 3 and extends past the Chemetco facility. The lake extends to just north of Interstate 270 where to flows into the Stanley Ditch. Stanley Ditch flows to the Melvin Price Port Authority where it is pumped to the Mississippi River. The lake in this area is intermittent and has depths of between six inches and three feet.

Portions of Long Lake are considered Lacustrine Systems. Lacustrine Systems are usually made up of wetlands and deepwater habitats with all of the following characteristics: (1) within topographic depression or a dammed river channel; (2) lacking trees, shrubs and persistent emergents and; (3) total area exceeds 20 acres. Lacustrine Systems include permanently flooded lakes and reservoirs. Portions of Long Lake are also considered Palustrine Systems. Palustrine Systems includes all non-tidal wetlands dominated by trees, shrubs and persistent emergents. Palustrine Systems also include wetlands lacking such vegetation, but all of the following characteristics: (1) less than 20 acres; (2) active wave-formed or bedrock shoreline features lacking; and (3) water depth in the deepest part of the basin less than 6.6 feet at low water[1].
The portions of Long Lake being sampled under this SAP are primarily Palustrine Systems with intermittent water with depths of seven feet or less.

## 4.0 SEDIMENT SAMPLING

A total of three sediment samples will be collected from Long Lake for dioxin and furan levels. One sample will be taken of the sediment east of Containment Area #3, one sample will be taken west of Containment #3 and the third sample will be taken north of Franko Lane. A background soil sample will be collected in an area which does not appear to have been impacted by potential releases from the Chemetco facility. The sample locations are shown on Figures 4-1, 4-2 and 4- 3. A summary of the analytical methods is presented in Table 9-1.

The sampling team will follow the sampling procedures outlined in the Bureau of Land Sampling Procedures Guidance Manual, September 1996. Specifically, Section VI: Soil and Section X: Sediment will be followed. The sediment samples and one soil sample will be given the field sample numbers X109, X110, X111 and X112, respectively.

The sediment samples will be obtained using a pre-cleaned stainless steel hand mud auger. The sample will be transferred directly into a sample container or into a stainless steel bowl prior to placement into a sample container. The soil sample will be collected using a pre-cleaned stainless steel hand trowel. The sample will be transferred directly into a sample container or into a stainless steel bowl prior to placement into a sample container.

## 5.0 ZINC OXIDE SLUDGE SAMPLING

One zinc oxide sample will be taken from the East Cooling Canal. This sample will be labeled X202. The location of this sample is shown in Figure 4-3. The zinc oxide sample will be collected using a pre-cleaned stainless steel hand trowel. The sample will be transferred directly into a sample container or into a stainless steel bowl prior to placement into a sample container.

## 6.0 QUALITY CONTROL SAMPLE

One matrix spike/,matrix spike duplicate (MS/MSD) sample will be collected for every 20 samples of each matrix collected. These MS/MSD samples will be analyzed for the same constituents as those in the sample matrix being analyzed.

Laboratory quality control requirements are outlined in the Illinois Environmental Protection Agency's Contract Laboratory Program.

## 7.0 DECONTAMINATION

Since separate sampling equipment will be used to collect each sample, it is not anticipated that any equipment will be decontaminated in the field.

## 8.0 SAMPLE COLLECTION, PREPARATION, CUSTODY AND SHIPMENT

The samples collected by the IEPA sampling team will remain in the custody of the IEPA sampling team leader until shipment to the laboratory. The sample containers supplied by the

contract laboratory will be labeled with the following information:

1. Field sample number
2. Date
3. Time
4. Sampler initials
5. Sample location
6. IEPA site number

Each sample container will be sealed on-site with evidence tape. The sealers initials, date and time of sealing will be marked on the evidence tape. A Unified Sampling Form (USF) will accompany the samples from the point of origin to the laboratory. All samples collected of Long Lake will be packaged at the Collinsville Regional Office and self transported to ARDL, Inc. P.O. Box 1566 Mt. Vernon Airport Road Mt. Vernon, Illinois.

## 9.0 ANALYTICAL REQUIREMENTS

The analytical methods, preservatives and holding time requirements are presented in TABLE 9-1.

**TABLE 9-1**
**ANALYTICAL METHODS, SAMPLE CONTAINERS, PRESERVATIVES, AND HOLDING TIMES**

| Parameters | Analytical Methods | Matrix | Preservative | Holding Time | Container |
|---|---|---|---|---|---|
| dioxin and furan | Sample Analysis: SW-846 Method 8290A | sediment, soil and sludge | cool at $4^0C$ | 7-14 days | two (2) 8 ounce glass jars w/Teflon lids |

## 10.0 PROJECT SCHEDULE AND PROJECT ORGANIZATION

The IEPA sampling team will be made up of the following personnel:

1. Chris Cahnovsky - Team Leader
2. Tom Miller
3. John Senjan

The sampling team's Site Safety Plan is included in Appendix 2.

## 11.0 REFERENCES


1. United State Department of Interior Fish and Wildlife Service, Classification of Wetlands

2. United State Department of Interior Fish and Wildlife Service, Wetlands Inventory for

Results

⇒ Less than part per trillion → fish fillet

⇒ Advisory 1 or 10 ppt other authorities guidelines

⇒ No results re whole fish

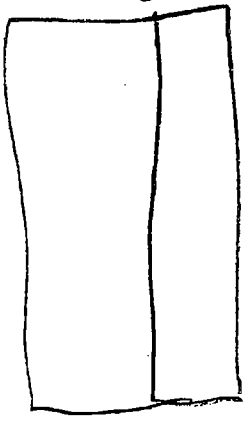
F.D.A. 25 PPT old

Canada 1 ppt

Minn 10 ppt

Wisc 1 ppt

⇒ sediment data –



raw X 109 X 110 X 111
123 ppt 36 ppt 8.5 ppt

extrapolate using model TEF

Background 2.9 ppt

Cooling water Canal 232 ppt

SAB said take another look ⇒ accepted

---

Standards lacking for sediments State

* Dioxin reassessment
* Toxicity information / value
* dose #

Need More samples to define extent

237-TCD > TEF

27 PPT – Region 9 industrial PRG

received 10/26/98
PK

**SPLITSTONE & ASSOCIATES**
**4530 William Penn Hwy. #110**
**Murrysville, Pennsylvania 15668**
**Telephone (724) 325-7421 FAX (724) 327-5958**
**E-mail: splide@trib.infi.net**

October 16, 1998

Mr. Patrick F. Kuefler
Enforcement and Compliance Assurance Branch
Waste, Pesticides and Toxics Division
USEPA, Region 5
77 West Jackson Blvd.
Chicago, IL 60604-3590

Dear Mr. Kuefler,

**Subject: Results of May 1998 Sampling - Chemetco, Inc. ILD 048 843 809**

I am a consulting statistician who has been retained by Armstrong, Teasdale, Schlafly & Davis, counsel for Chemetco, Inc. to assist with the review of the results of the sampling event conducted by the U. S. Environmental Protection Agency (USEPA) on May 28 and 29, 1998. The last 30 years of my consulting practice have focused on the making of environmental measurements and their relationship to the desired decision making process. This activity has been with both private industry and the public sector.

Of current principal concern is the characterization of the heterogeneous waste slag at the Chemetco site. The slag appears to exhibit a great deal of variation in size as observed during my visit to the site. This size variation may well have an affect on the extractable metals concentrations resulting from various leaching procedures. Based upon my personal observation of the split samples retained by Chemetco, the samples analyzed by the USEPA appear to be of the fine fraction of the on-site slag. This being the case, they can not be construed to represent the totality of on-site slag.

To date I have had the opportunity to review the USEPA draft "Site-Specific Sampling and Analysis Plan, Waste, Soil, Surface Water and Sediment Sampling" and the "Final Field Sampling and Analysis Report, Chemetco, Inc. Hartford, Illinois, EPA ID No. ILD048843809." The latter document is dated September 10, 1998 and prepared for the USEPA by TechLaw, Inc. I have also reviewed the analytical results from the sample splits collected by TechLaw for Chemetco.

Currently, the results of my review have raised several questions regarding the field sampling, laboratory sample preparation and chemical analyses. In order for me to provide a fair and complete review of the results of this sampling event, I hereby request the information listed below on behalf of Chemetco, Inc.

- A copy of the <u>final</u> "Site-Specific Sampling and Analysis Plan" and/or other description of the systematic planning for sample collection and analysis as required by EPA Order 5360.1.

- A copy of the approved Quality Assurance Project Plan (QAPP) applicable to this project.

- The results of any analyses performed upon all quality assurance/quality control samples. This includes, but is not limited to, any duplicate field samples, laboratory duplicates, spiked samples, matrix spiked samples, and any analytical results used for laboratory quality control. The latter is with reference to the laboratory sample processing batches which may include any samples from the subject sampling event.

The following Sample Identification Numbers are found on chain of custody forms and in the field notes, but analytical results are not reported: BD-101, SD-101, SD-306, SL-101, SL-111, SL-301, SL-311, SS-101, SS-111, SS-301, SS-311, SW-101, and ZO-101. Please, provide the analytical results for these samples, or an explanation as to why they are not available.

- The following information is requested in regard all samples taken for total metals analysis:
  - The total volume and weight of the sample received by the laboratory.
  - The volume and weight of the aliquot taken from the sample for digestion.
  - A description of how the aliquot selected for digestion and subsequent analysis was chosen and processed.
  - The concentration and nature of the reagent used for digestion.

- The following information is requested in regard all samples taken for analysis using the Toxicity Characteristic Leaching Procedure (TCLP):
  - The total volume and weight of the sample received by the laboratory.
  - The volume and weight of the aliquot taken from the as received sample.
  - A description of how this aliquot was selected and processed, including the particle size of the sample material and any mechanical process used to alter the material particle size.
  - The concentration and nature of the extraction fluid.

- Lastly, there has been some consideration in the literature of the Synthetic Precipitation Leaching Procedure (SPLP), Method 1312, as being more appropriate for waste evaluation than the TCLP. Did the USEPA consider the SPLP for evaluation of the samples of waste slag? If the SPLP was considered, why was it rejected?

Your prompt attention is supplying the requested information is appreciated and will expedite my review. Please send the information to me at

Splitstone & Associates
4530 William Penn Hwy. #110
Murrysville, Pennsylvania 15668.

Should you have any questions please feel free to contact me via telephone at (724) 325-7421. Thank you.

Very truly yours,

SPLITSTONE & ASSOCIATES

Douglas E. Splitstone
Principal

cc: Chris Cahnovsky, IEPA-Collinsville Region
Cindy Davis, CSD Environmental Services, Inc.
George von Stamwitz, Armstrong, Teasdale, Schlafly, & Davis
Heather Young, CSD Environmental Services, Inc.

Chemetco
FIRST IN PEOPLE – QUALITY – SERVICE
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May 26, 1998

Mr. Patrick Kuefler
US Environmental Protection Agency
Region V
77 W. Jackson Blvd
Chicago, IL 60604

**RE:** USEPA Site-Specific Sampling and Analysis Plan Waste, Soil, Surface Water, and Sediment Sampling (no date)

Dear Mr. Kuefler,

This letter will follow-up and document our phone call on Tuesday, May 19, 1998, regarding the draft USEPA sampling plan and Chemetco's comments. Below are comments and concerns which we discussed. We look forward to your visit.

1. Page 2 refers to information obtained from IEPA which identified four solid waste streams requiring characterization at Chemetco: waste slag; baghouse dust; zinc oxide; and, spent refractory brick. In fact, all four of these materials have been characterized. Air-cooled slag was characterized in 1988 and deemed non-hazardous already. Current slag fines have been characterized and, although they exhibit characteristically hazardous levels of lead more often than not, they are reused as a substitute and in addition to sand in the Dust Injection System (DIS). The water-cooled slag meets specifications is a product and, therefore, not a waste. Baghouse dust also, more often than not, exhibits characteristically hazardous levels of lead. The baghouse dust is reused in the DIS to help to absorb excess moisture. Chemetco has characterization data of zinc oxide from the bunker as well as current production. Although newly generated zinc oxide is characteristically hazardous for lead, it is a product and therefore, not a solid waste. In regards to current refractory brick, it is reclaimed, and, therefore, is not a spent material and not a solid waste.

2. *On page 2, "Waste slag is generated from both water-cooled and air-cooled processes in the Slag Drying and Screening Building. Slag is screened and subsequently stored into five separate slag piles identified as Units (Figure 2)."*

   The slag generated is not a waste, it is a by-product from the copper smelting process. Granulated slag is currently generated by quickly cooling molten slag with a thin, steady water spray. Molten slag which cools while the Kress pot is transported from the foundry to the cooling barge, or skulls, are placed to the east of the cooling barge. The approximate ratio of water cooled slag to skulls is 8:1.

   Chemetco is unsure of what is being referred to as the "Slag Drying and Screening Building". The Slag Granulation Plant is located adjacent to where the molten slag is water-cooled. The

five separate slag piles identified as Units (Figure 2) are not clear. Units identified as 1 through 4 are units currently addressed by the approved Interim Status Closure and Post Closure Plan dated June 1994. These include the old cooling canals (current stormwater canals), zinc oxide pits, old floor wash impoundment and zinc oxide bunker. Unit 5 on Figure 2 is where slag currently resides. Slag is no longer screened on the hill.

3. *A total of four baghouses are utilized at the facility to control air emissions, including one baghouse associated directly with the Slag Drying and Screening Operation, one baghouse associated with the Slag Grinding Operations, and a roof baghouse on the Slag Drying and Screening Operation Building. Information obtained from the IEPA indicates significant volumes of baghouse dust accumulates on concrete and/or asphalt surfaces outside the Slag Drying and Screening Operation Building . In addition, the IEPA has indicated that baghouse dust has been stored on-site at the Chemetco facility in the slag pile Units (Figure 2).*

   Chemetco is unclear as to what four baghouses USEPA/IEPA is referring to since the Slag Granulation Plant has only primary and secondary baghouses (2 baghouses). Chemetco has five (5) baghouses on-site which are referred to as the #2 baghouse (roof of foundry), #1 baghouse (in the American Air Filter (AAF) area), the primary baghouse for slag granulation, the secondary baghouse for slag granulation, and the DIS.

   Pursuant to IEPA's indication that significant volumes of baghouse dust accumulates outside the Slag Drying and Screening Operation Building, inspection procedures were developed in December 1997 and are completed daily. Also, collection hoppers are fitted with permanent lids and elasticized covers are used for transport of the dust collection hoppers to the Fines Building.

4. *Page 2, "This zinc oxide pile was later converted to a Zinc Oxide Bunker, and is still used for zinc oxide storage in current facility operations."*

   The zinc oxide bunker is not utilized in current facility operations. It is not used for storage of current generation zinc oxide. No zinc oxide has been added to the bunker since it was originally constructed and filled.

5. *Pages 2 and 3, "To process spent refractory brick, the facility currently operates an IEPA-air permitted rock crusher. This crusher generates residual brick "fines" and wastewater from air emission control."*

   The IEPA-air permitted rock crusher has not been utilized to crush spent refractory brick, therefore, there are no brick "fines" or wastewater from air emission control. Although the crusher has received an air permit, it is not currently utilized.

6. *"To characterize the waste slag generated at the facility, samples will be collected from the slag pile Units, the slag accumulation areas associated with the Slag Screening Operation, and the slag "fines" discharged from the Slag Drying and Screening Operation."*

   The old generation slag, or air-cooled slag, pursuant to testing conducted in 1988 is already non-hazardous. Sampling protocol and statistical methodology was agreed to by IEPA, USEPA, and Chemetco and a letter was issued to Chemetco agreeing that the air-cooled slag is non-hazardous. Although TCLP is the present testing methodology used to determine whether a material is characteristically hazardous, EPTOX was the testing methodology used and recoginized by the regulatory community in the late 1980's. Chemetco questions the need and motivation to revisit a decision that was made and agreed to 10 years ago by all parties.

7. USEPA mentions the use of heavy equipment to assist with vertical characterization.A Catpiller 215 with a bucket will be provided, if needed.

8. *Page 3, "It is anticipated that a minimum of five samples will be collected from each slag pile Unit and a minimum of three samples will be taken in each slag processing area."*

Again, please clarify slag pile Units and the slag processing areas.

9. *Page 3, "To characterize the dust generated from the four baghouses, a minimum of three samples will be taken from each baghouse.*

Again, what four baghouses is USEPA referring to? Chemetco has five (5) baghouse, two of which are at the Slag Granulation Plant.

10. *Page 3, "To characterize the zinc oxide filter press sludge, a minimum of three samples will be taken from the zinc oxide filter press and a minimum of five samples will be taken from the Zinc Oxide Bunker. In addition, a minimum of five samples will be taken from the zinc oxide product storage area where zinc oxide is accumulated for off-site transport."*

Chemetco already has data to characterize the current generation zinc oxide. No zinc oxide or other materials have been placed in the bunker since the cooling water canal was closed in September 1985. It is not clear why USEPA is characterizing materials which have already been characterized. Chemetco has never claimed that the zinc oxide is not characteristically hazardous if disposed of.

11. *Page 4, "Soil samples will be collected to determine if there have been releases of hazardous constituents to soil in the refractory brick waste pile area and waste handling areas."*

The refractory brick is stored on concrete. Also, please clarify "waste handling areas".

12. What general area does USEPA intend to sample for background?

13. *Page 7, "The report will include a discussion and statistical analysis of the results of the sampling effort."*

Exactly what statistical methodology is intended for use and involving what data? Again, the air-cooled slag has already been sampled and statistically shown to be non-hazardous. This was agreed upon by all parties in 1988. If USEPA intends on only taking a total of 50 samples of the air-cooled slag for use in a statistical analysis to determine whether the air-cooled slag is characteristically hazardous using TCLP, Chemetco objects for several reasons. The slag is not a homogeneous material but rather heterogeneous as exemplified in the 1988 sampling event. The amount of slag on-site along with the heterogenity of the material would require a much greater number of samples to be taken than only the fifty samples proposed. If USEPA's intent behind the resampling of the slag is to characterize the air-cooled slag, previously characterized as non-hazardous, a much more detailed work plan with statistical analysis will be necessary.

Again, Chemetco looks forward to your visit and if you have any questions or require additional information please call me at (618) 254-4381 ext. 268.

Sincerely,

Heather Young
Contractual Environmental Manager
CSD Environmental Services, Inc.

cc: Bruce Hendrickson
George von Stamwitz
Tom Martin

D27

May 6, 1999

TO: Greg Sukys, Esq.
Department of Justice
FROM: Brad Venner
National Enforcement Investigation Center
Environmental Protection Agency
RE: Slag Pile Sampling Issues
Chemetco, Inc.
Hartford, IL

At the request of the Office of Regulatory Enforcement, I have reviewed the sampling undertaken by EPA of the slag waste piles at Chemetco, Inc. for hazardous waste determination under the Resource Conservation and Recovery Act. As part of this review process, I have reviewed data collected in this investigation, spoken with personnel present at this sampling event, and spoken with personnel familiar with sampling issues at other secondary copper smelters. I have concluded that the samples of the slag pile collected by EPA are representative samples, and that the slag pile is a hazardous waste under RCRA.

Chemetco, Inc. produces copper and other non-ferrous metals and alloys from recyclable copper bearing scrap and manufacturing residues. Products of the facility include anode copper, cathode copper, and crude lead-tin solder. The production of copper from secondary sources requires several steps to purify the metal. A key step in this process is smelting, which involves melting various feedstocks in one of a variety of furnaces. In the molten phase, the copper metal will partially separate from other impurities. The molten copper is then physically separated from the impurities. The molten impurities, when cooled, form a slag. The amount of slag produced is mainly determined by the amount of impurities and/or gangue materials that have to be extracted into the slag. The molten slag, when removed from the furnace, is cooled to form a solid. Both air and water cooling have been used. The solid-phase slag is then aggregated into a large waste pile. This material is sorted into various size fractions and sold for a variety of uses, including as a substitute for sand in roofing shingles.

For a material to be a hazardous waste, it must first be determined if the material is a RCRA solid waste. A material is defined to be a solid waste if it is discarded and has not been granted an exemption in 261.4(a). A material is classified as discarded if it is abandoned, recycled or is inherently waste-like. A material may be given an exception if it is used or reused under certain conditions. One of these is that the material to be used or reused cannot be accumulated speculatively, which is defined as the accumulation of more than 25%, by weight or volume, of material from a single type of process in a calendar year. The large volume of material in the slag pile clearly exceeds 25% of annual production of slag production. Therefore, even if the slag material is to be reused, it must still be classified as a RCRA solid waste due to the speculative accumulation of the material. Slags generated by the secondary copper industry have

not been granted an exemption, although slags generated by many primary mineral operations are not considered to be solid wastes by virtue of the Bevil amendment to RCRA.

For a solid waste to be a hazardous waste, it must either demonstrate one or more hazardous properties (ignitable, corrosive, reactive, or toxic) or be listed. Since secondary copper smelter slag is not a listed waste, it must demonstrate a characteristic property to be considered a hazardous waste. The identification of the property of toxicity relies upon leachate tests. Two such tests have been used. The EP (Extraction Procedure) toxicity test was originally used. In 1990, EPA changed this to the TCLP (Toxicity Characteristic Leachate Procedure). Large quantity generators (>1000 kg/mo) were required to use this procedure beginning on September 25, 1990. RCRA requires the generator to sample and test for the identification of a solid waste as a hazardous waste at the Apoint of generation,@ which is defined as when the material first becomes a solid waste. For slag, this is when the molten slag is removed from the process and allowed to cool.

Hazardous waste is prohibited from land disposal by the LDR unless the waste meets certain treatment standards. Land disposal is classified as the management of waste in a land-based waste management unit, such as a landfill, surface impoundment, or waste pile (RCRA section 3004k). The LDR program applies to characteristic hazardous wastes after 1990. The treatment standards for TC metals wastes were the characteristic levels from 1990 until 1998. The more restrictive universal treatment standards were applied to these wastes after August, 1998. The major impact of LDR on TC metal wastes between 1990 and 1998 was the prohibition of dilution as a form of treatment. The mixture rule for characteristic wastes stated that the mixture of a solid waste and a hazardous waste was not a hazardous waste unless the mixture demonstrated a characteristic. Under LDR, this is not permitted if the waste is to be land disposed.

The regulations specify that a Arepresentative sample@ must be tested to determine if a solid waste demonstrates a characteristic and thus is a hazardous waste. A representative sample is defined in the regulations as a "sample of the universe or whole which can be expected to exhibit the average properties of the universe or whole." In 1986, the Agency developed guidance for sampling under RCRA in SW-846, Chapter IX. An important caveat to the use of this guidance is that the publication date of SW-846 predates the development of the LDR restrictions. Therefore, the sampling plans provided in SW-846 are not necessarily sufficient to demonstrate that the LDR restrictions are satisfied.

Chapter IX of SW-846 makes specific recommendations regarding sampling waste piles. The main emphasis of these requirements is that all material in the waste pile is equally accessible to be sampled. The guidance suggests that this may be accomplished by two means. The first is taking cores of the material to provide a complete vertical profile, and the second is to sample the material while the pile is being moved. For large volume waste piles, neither of these examples are practical. It is essentially impossible to make a static waste pile equally accessible to sample. Therefore, the Agency suggested in 1990 that for practical purposes a collection of samples of the accessible part of the pile can constitute a representative sample, even if all material was not made equally accessible to be sampled (55 FR 4443). Statistical methods can then be used to

demonstrate that the upper confidence limit on the mean of these sample values is below the regulatory limit.

The application of these techniques clearly indicates that the slag pile is a hazardous waste. Since every sample taken by the Agency is above the regulatory limit for lead, it is clear that the mean and the upper confidence limit on the mean are above the regulatory limit. It is of interest to consider what the impact of additional sampling would be on this determination. The average value of the lead sample results is 35.02, and the upper 90% confidence limit for the mean, calculated using the approach in SW-846, is 41.34. It would be necessary to gather 290 additional samples, all non-detect for lead, before it could be concluded that the slag pile was not a characteristic solid waste.

To establish a violation of LDR, it is only necessary to demonstrate that the waste at the point of generation is a hazardous waste, and not that the entire waste pile is a hazardous waste. Existing evidence supports the contention that slag material at the point of generation can be a hazardous waste. Illinois EPA has taken two samples of slag material from the water-cooling process, and both these samples have been found to be hazardous (Chris Cahnovsky, IEPA, personal communication). Although samples of slag generated from the air-cooled process have not been sampled, it is expected that these samples would also demonstrate the hazardous characteristic. The cooling rate will determine both the chemical forms of the metals in the slag material. A higher rate of cooling will generally lead to less soluble forms of the material. Very fast cooling will lead to the formation of a glass-like material (vitrification). Some secondary lead smelters exploited this process to generate samples that did not demonstrate the toxicity characteristic by vitrifying the molten slag samples, even though samples from their regular cooling process were not a hazardous waste exploited this process (cite Interstate Lead decision). The identification of slag material that is hazardous at the point of generation is consistent with the samples taken from the surface of the slag pile.

The identification of the slag pile as hazardous waste is also consistent with findings at other secondary copper smelters. The Copper Division of Southwire Co., a secondary copper smelter in Carrleton, GA, presently manages its slag as a hazardous waste. The material is shipped to an off-site Subtitle C landfill. The slag from the Southwire smelter was identified as hazardous after investigations at two off-site disposal facilities identified that previously disposed slag material failed the TCLP test. These sampling investigations faced similar challenges to those at Chemetco, in that a very large amount of material was to be investigated. These sampling plans relied upon the analysis of grab samples taken from the accessible material, much like the sampling plans used at Chemetco. The facility has since cleaned up 8 additional sites where slag material was improperly disposed.

The former Gaston Copper Recycling facility in Gaston, SC, also had identified its slag material as a hazardous waste. The company testified to this effect in a letter to the South Carolina Department of Health and the Environment (Bill Codor, SC DHEC, personal communication). In this letter, it declared that the slag material from their process would occasionally fail the TCLP test and that all material would subsequently be managed as a hazardous waste.

The elevated levels of lead of the slag material found in the TCLP are consistent with the known composition of secondary copper smelter slag. The elemental composition of slag varies depending upon the metallurgical process used. Typical secondary copper smelter slag has the following composition:

| SiO2 | Al2O3 | FeO | CaO | MgO | Pb |
|---|---|---|---|---|---|
| 23-30 | 8-14 | 35-45 | 5-15 | 1-4 | 0.5-1.5 |

Since the TCLP procedure uses a 1:20 solid/liquid ratio, the maximum lead concentration that would be found in the TCLP extraction fluid would be obtained as (5000-15,000) mg/kg * .1kg/2L = 250-750 mg/L. The actual lead that appears in solution will depend upon many different and complex factors, including solubility, pH and oxidation-reduction potential. Most lead complexes are not completely soluble under the conditions in the TCLP. Therefore, the exact amount of lead that is extracted into the TCLP procedure will depend upon a number of factors.

Slag that has been left to weather will likely show a greater TCLP value than recently produced slag. The calcium oxide (CaO) has a high pH and will neutralize much of the acetic acid in the TCLP fluid, which will raise the pH of the slag and make the lead species less soluble. As the slag is weathered, the calcium oxide will be removed, either from absorb carbon dioxide from the atmosphere, resulting in calcium carbonate, or simply being rinsed away by rainwater. The weathered slag will have less acid neutralization capacity and therefore will be more likely to fail the TCLP test. In addition, the slag will undergo particle size reduction, increasing the surface area of the material. This greater surface area will lead to increased solubility and a greater probability of failing the TCLP.

# MEMO

**To:** Chris Cahnovsky, IEPA Collinsville
**From:** Kevin Higgins, TechLaw 913/236-0006 (Kansas City)
**Re:** State ID Number for Chemetco Sampling Event
**Date:** May 21, 1998
**Pages:** 1

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U.S. EPA Region V will be generating one (1), 55-gallon drum of decontamination water and one (1), 55-gallon drum of used, personal protective equipment (PPE) associated with sampling activities at the Chemetco facility (May 28-29, 1998). Under contract to U.S. EPA, TechLaw will be performing the sampling activities and will be involved with performing the waste management activities. The drums will be shipped hazardous for RCRA metals (D004, D005, D006, D007, D008, D009, D010, D011). Patrick Kuefler, U.S. EPA, will sign the manifest associated with the transport of the two (2) drums from the Chemetco facility.

Per your request, the following information is being submitted to IEPA in order to obtain an Illinois State ID Number for this waste generating activity:

---

Generator: U.S. EPA Region V
77 West Jackson Blvd.
Chicago, IL 60604-3590
Contact: Patrick Kuefler
Phone: 312/353-6268
EPA ID No. ILP200000130

Facility: Chemetco, Inc.
3576 Chemetco Lane
Hartford, IL 62048
Phone: 618/251-2850

Transporter: Heritage Transport
EPA ID No. IND058484114
Phone: 317/381-6848

TSD: Heritage Environmental Services, Inc.
7901 West Morris Street
Indianapolis, IN 46231
EPA ID No. IND093219012

Thanks for your assistance. Please call me if you need additional information (913/236-0006)

cc: Patrick Kuefler, USEPA Region V (Chicago)

# HERITAGE ENVIRONMENTAL SERVICES, INC.
## WASTESTREAM SURVEY FORM

| Heritage Use Only | |
|---|---|
| Quote # | Approval Fee |
| Wast | P.O. |
| Sample # | Heritage Contact |

Preferred Service Location:
Indianapolis, IN ☒ (800)827-4374 | Charlotte, NC ☐ (800)827-4374 | Kansas City, MO ☐ (800)829-4374 | Lemont, IL ☐ (800)827-4374 | Williston, VT ☐ (877)436-8778

| 1. GENERATOR INFORMATION | 2. BILLING INFORMATION Quote to: Generator☐ Customer☒ Other☐ |
|---|---|
| Generator Name USEPA Region V | Customer Name HES-STL (4504) |
| Address 77 West Jackson Blvd. | Address |
| City, State, Zip Chicago, IL 60604-3590 | City, State, Zip |
| Tech. Contact Name KEVIN HIGGINS | Contact Name EDNIS NAPLCEIR |
| Phone (913) 236-0006 Fax (913) 236-0013 | Phone (314) 388-3570 Fax (314) 388-3430 |
| E-mail Address KHiggins@Techlawinc.com | 3. MANIFEST MAIL ADDRESS Generator ☒ Billing ☐ |
| US EPA ID Number ILP200000130 | Contact Name Kevin Higgins |
| State ID Numbers (In progress of obtaining) | Company Name Techlaw Inc |
| LQG ☐ SQG ☐ CESQG ☒ Non-hazardous only ☐ | Address 6901 W 137th St Suite 407 |
| SIC Code (if known) Not known | City, State, Zip Overland Park, KS 66202 |

4. Was wastestream generated under any of the following SIC Codes: 2911(Petroleum Refining), 28—(Chemical and Allied Products), 3312 (Steel Works, Blast Furnaces [including Coke Ovens], and Rolling Mills) Yes ☐ No ☒

5. Common Name Deionized Water Contaminated with heavy metals

6. Process Generating Waste Decontamination of Field Sampling Equipment

7. DOT Description (if available)

8. Chemical Composition: Using specific chemical names, list all constituents present in the wastestream. Attach available analyses or MSDSs. Total composition must equal or exceed 100%. *remaining % is deionized $H_2O$

| Constituent | Range | Units |
|---|---|---|
| Arsenic | <1 | % |
| Barium | <1 | |
| Cadmium | <1 | |
| Chromium | <1 | |
| Lead | <1 | |
| Mercury | <1 | |
| Selenium | <1 | |
| Silver | | |

9. Identify US EPA waste codes D004, D005, D006, D007, D008, D009, D010, D011

10. US EPA Form Code B19 US EPA Source Code A53

11. Identify state waste codes N/A

12. Color clear Appearance Odor mild

13. %Solids %Liquids 100 %Ash NA

14. Physical State at 70 °F Solid ☐ Liquid ☒ Sludge ☐ Semi-solid ☐ Powder ☐ Gas ☐
If liquid, how many layers does the wastestream exhibit? Single layer ☒ Double layer ☐ MultiLayer ☐ NA ☐
If solid, are there free liquids? NA ☒ Yes ☐ No ☐ (If no, will waste dump from the drum? Yes ☐ No ☐)
Is the wastestream pumpable? Yes ☒ No ☐

15. pH or pH range (If wastestream is solid, give pH of 10% slurry): 7
Flash Point: <100°F ☐ 100-140°F ☐ 141-200°F ☐ >200°F ☒
Boiling Point: <100°F ☐ >100°F ☒
Fuel Value (Btu/lb): <2000 ☒ 2000-8000 ☐ 8000-10,000 ☐ > 10,000 ☐
Specific Gravity: <0.8 ☐ 0.8-1.0 ☐ 1.1-1.3 ☒ >1.3 ☐

# HERITAGE ENVIRONMENTAL SERVICES, INC.
## WASTESTREAM SURVEY FORM

| Heritage Use Only | |
|---|---|
| Quote # | Approval Fee |
| Web | P.O. |
| Sample # | Heritage Contact |

Preferred Service Location:
Indianapolis, IN ☐ (800)827-4374 | Charlotte, NC ☐ (800)827-4374 | Kansas City, MO ☐ (800)829-4374 | Lemont, IL ☐ (800)827-4374 | Williston, VT ☐ (877)436-8779

| 1. GENERATOR INFORMATION | 2. BILLING INFORMATION Quote to: Generator☐ Customer☐ Other☐ |
|---|---|
| Generator Name USEPA Region V | Customer Name HES-STL (4504) |
| Address 77 West Jackson Blvd. | Address |
| City, State, Zip Chicago, IL 60604-3590 | City, State, Zip |
| Tech. Contact Name KEVIN HIGGINS | Contact Name ERNIE WALKER |
| Phone (913) 236-0006 Fax (913) 236-0013 | Phone (314) 388-3500 Fax (314) 388-3430 |
| E-mail Address KHiggins@Techlawinc.com | 3. MANIFEST MAIL ADDRESS Generator☑ Billing☐ |
| US EPA ID Number ILP200000130 | Contact Name Kevin Higgins |
| State ID Numbers (In progress of obtaining) | Company Name Techlaw Inc. |
| LQG ☐ SQG ☐ CESQG ☒ Non-hazardous only ☐ | Address 6901 W 23rd St. Suite 407 |
| SIC Code (if known) Not Known | City, State, Zip Overland Park, KS 66202 |

4. Was wastestream generated under any of the following SIC Codes: 2911(Petroleum Refining), 28—(Chemical and Allied Products), 3312 (Steel Works, Blast Furnaces [including Coke Ovens], and Rolling Mills) Yes ☐ No ☒

5. Common Name TYVEK/PPE CONTAMINATED WITH HEAVY METALS

6. Process Generating Waste SITE SAMPLING

7. DOT Description (if available)

8. Chemical Composition: Using specific chemical names, list all constituents present in the wastestream. Attach available analyses or MSDSs. Total composition must equal or exceed 100%. Remaining % IS PPE.

| Constituent | Range | Units |
|---|---|---|
| Arsenic | <1 | % |
| Barium | <1 | |
| Cadmium | <1 | |
| Chromium | <1 | |
| Lead | <1 | |
| Mercury | <1 | |
| Selenium | <1 | |
| Silver | | |

9. Identify US EPA waste codes D004, D005, D006, D007, D008, D009, D010, D011

10. US EPA Form Code B319 US EPA Source Code A91

11. Identify state waste codes N/A

12. Color VARIES Appearance VARIES Odor MILD

13. %Solids 100% %Liquids 0 %Ash 0

14. Physical State at 70 °F Solid ☒ Liquid ☐ Sludge ☐ Semi-solid ☐ Powder ☐ Gas ☐
If liquid, how many layers does the wastestream exhibit? Single layer ☐ Double layer ☐ Multi-layer ☐ NA ☒
If solid, are there free liquids? NA ☐ Yes ☐ No ☒ (If no, will waste dump from the drum? Yes ☒ No ☐)
Is the wastestream pumpable? Yes ☐ No ☒

15. pH or pH range (If wastestream is solid, give pH of 10% slurry): N/A
Flash Point: <100°F ☐ 100-140°F ☐ 141-200°F ☐ >200°F ☒
Boiling Point: <100°F ☐ >100°F ☒
Fuel Value (Btu/lb): <2000 ☒ 2000-6000 ☐ 6000-10,000 ☐ > 10,000 ☐
Specific Gravity: <0.8 ☐ 0.8-1.0 ☐ 1.1-1.3 ☐ >1.3 ☒

Common Name (same as item #5):

16. Does the wastestream contain asbestos? Yes ☐ No ☐ If Yes, is the asbestos friable? Yes ☐ No ☐
Does the wastestream contain human sanitary, biological, or infectious waste? Yes ☐ No ☑
Does the wastestream contain dioxins or furans or dioxin-precursors? Yes ☐ No ☐
Does the wastestream contain radioactive wastes? Yes ☐ No ☑
Does the wastestream contain PCBs? Yes ☐ No ☑ If Yes, what concentration? _____ ppm
Is the wastestream air reactive, autoignitable, pyrophoric or spontaneously combustible? Yes ☐ No ☑
Is the wastestream water reactive? Yes ☐ No ☑
Does the wastestream present other compatibility concerns? Yes ☐ No ☑ If yes, specify _____
Is the wastestream dusty? Yes ☐ No ☑

17. List all Attachments

18. Disposal Restrictions/Special Handling

19. Transporter: Heritage Transport ☑ Other ☐ *If other, complete the following:*
Transporter Name
Address
City, State, Zip
Contact/Phone
US EPA ID Number

Packaging:
Bulk Solid ☐ Bulk Liquid ☐
Container ☑ 55 Gallon
Container Type
Container Size
Annual Volume (units) 1-2

20. **CERTIFICATION** *(Initial or enter NA in the blank preceding each certification. Sign and date the overall certification.)*

NA *Used Oil Certification:* I hereby certify that the wastestream described in this survey meets the definition of used oil at 40 CFR 279.1 and has not been mixed with hazardous waste. Any hazardous constituents contained therein result from and are incident to normal use of the oil.

NA *Commercial Product Certification:* I hereby certify that the wastestream described in this survey is a commercial virgin, off-specification, outdated, obsolete, unusable, or unusable product and no waste material has been mixed herein. (A material safety data sheet is required.)

I hereby certify that all information submitted herein and attached contains true, accurate and complete descriptions of this waste. Any sample submitted for analysis is representative of the waste material being offered for approval. All relevant information regarding known or suspected hazards in the possession of the generator has been disclosed. I have reviewed the physical facilities, administrative practices, and operational procedures (or have directed the completion of such a review) and based on this review do willingly make this certification. I authorize Heritage to obtain a sample from any waste shipment for purposes of recertification. I will notify Heritage Environmental Services, Inc. if the generator status or any other information on this form changes.

Signature _____ Date _____ Company _____

Complete if Heritage provide permit

24-Hour Emergency Response Number

If wastestream carries F001, F002, F003, F004, and/or F005, mark at least one of the following:

| | | |
|---|---|---|
| Acetone ☐ | 2-Ethoxyethanol ☐ | 2-Nitropropane ☐ |
| Benzene ☐ | Ethyl Acetate ☐ | Pyridine ☐ |
| n-Butyl Alcohol ☐ | Ethyl Benzene ☐ | Tetrachloroethylene ☐ |
| Carbon Disulfide ☐ | Ethyl Ether ☐ | Toluene ☐ |
| Carbon Tetrachloride ☐ | Isobutanol ☐ | 1,1,1-Trichloroethane ☐ |
| Chlorobenzene ☐ | Methanol ☐ | 1,1,2-Trichloroethane ☐ |
| Cresol (m and p) ☐ | Methylene Chloride ☐ | Trichloroethylene ☐ |
| o-Cresol ☐ | Methyl Ethyl Ketone ☐ | 1,1,2-Trichloro-1,2,2-trifluoroethane ☐ |
| Cyclohexanone ☐ | Methyl Isobutyl Ketone ☐ | Trichlorofluoroethane ☐ |
| 1,2-Dichlorobenzene ☐ | Nitrobenzene ☐ | Xylenes (total) ☐ |

Identify Underlying Hazardous Constituents *(if applicable)*

Complete for Williston, VT

| System Type: M141 | Total Alkalinity: | TOC: | Halogens: | Sulfides: | Zn: |
|---|---|---|---|---|---|
| Hex Chrome: | Total Acidity: | HOC: | Cyanides: | Ni: | |

**Toxicity Characteristic Constituents** *Provide the TCLP results for the following constituents in mg/l:*

| | | | |
|---|---|---|---|
| D004 Arsenic | D014 Methoxychlor | D024 m-Cresol | D034 Hexachloroethane |
| D005 Barium | D015 Toxaphene | D025 p-Cresol | D035 Methyl Ethyl Keytone |
| D006 Cadmium | D016 2,4-D | D026 Cresol | D036 Nitrobenzene |
| D007 Chromium | D017 2,4,5-TP(Silvex) | D027 1,4-Dichlorobenzene | D037 Pentachlorophenol |
| D008 Lead | D018 Benzene | D028 1,2 -Dichloroethane | D038 Pyridine |
| D009 Mercury | D019 Carbon Tetrachloride | D029 1,1-Dichloroethylene | D039 Tetrachloroethylene |
| D010 Selenium | D020 Chlordane | D030 2,4-Dinitrotoluene | D040 Trichloroethylene |
| D011 Silver | D021 Chlorobenzene | D031 Heptachlor | D041 2,4,5-Trichlorophenol |
| D012 Endrin | D022 Chloroform | D032 Hexachlorobenzene | D042 2,4,6-Trichlorophenol |
| D013 Lindane | D023 o-Cresol | D033 Hexachloroethane | D043 Vinyl Chloride |

# Fax Cover Page

TechLaw, Inc. 6901 West 63rd Street Overland Park, KS 66202 Phone: 913-236-0006

**Date:** 5/21/98

**To:** Pat Kuefler

**Fax Number:**

**From:** Kevin Higgins

**Fax Number:** 913/236-0013

**Number of Pages** (including cover sheet): 6

**Subject:** IDW - Chemetco

**Message:**

Attached is memo I sent to Chris to obtain State ID # and the waste stream survey sent to Heritage Environmental to obtain manifest (2 surveys are required - 1 for each drum)

Call w/any questions

Kevin 913/236-0006

# MEMORANDUM

**DATE:** January 5, 1998

**TO:** BOL - Records Unit

**FROM:** Chris Cahnovsky - Collinsville FOS CNC

**SUBJECT:** 1198010003 -- Madison County
Chemetco, Inc.
ILD048843809
FOS FILE

On December 16, 1997, I conducted an inspection at Chemetco, Inc. Present during this inspection was Ms. Heather Young of CSD Environmental. The purpose of this inspection was to inspect the area of the zinc oxide release, the Granulated Slag Drying and Screening Plant and the area where Chemetco plans to build a new storage lot.

Ms. Young and I first proceeded to the Granulated Slag Drying and Screening Operation. I asked Ms. Young about the handling of the baghouse dust from this operation. Ms. Young stated that Chemetco is collecting the baghouse dust in hoppers and transporting the full hoppers to the Fines Building. She said that the dust is wetted in the Fines Building to control fugitive dust emissions. I asked her why the dust was being taken to the Fines Building. She assumes that the dust was being injected into the dust injection system. However, she was not sure what Chemetco did with the baghouse dust. She did state that she was keeping track of how much dust was being sent to the Fines Building. The injection of the baghouse dust into the furnace via the Dust Injection System may be a form of "sham recycling". According to a November 1989 Bureau of Air permit application for the Slag Screening and Processing Plant, Chemetco states "The remaining refinery slag is then smelted to extract black copper, lead and tin, producing a slag poor in recoverable metals which previously was slow cooled and is now granulated." It appears that the slag is poor in recoverable metals.

I then inspected the baghouse dust collection hoppers. I observed that a lid has been placed on the hopper under the #2 baghouse and a large diameter pipe is being used to convey dust from the baghouse to the hopper. A lid had also been placed on the collection hopper under the #1 baghouse and a pipe was being used to convey the dust into this hopper. I still observed dust and fines on the ground around the baghouse dust collection hoppers.

I then inquired about Chemetco's management of the under sized slag fines from this granulation process. According to Ms. Young, the undersize slag fines from the Granulated Slag Drying and Screening Operation are still being added to the furnaces in place of foundry sand. I observed fugitive dust emissions coming off the undersized slag conveyor belt on the east side of the building. The slag fines are being conveyed onto a concrete pad and being piled up one the north and northeast side of the Granulated Slag Drying and Screening building. I observed a large pile of slag fines in this area. It appears that no wind dispersal control are being used on this pile. Ms. Young did state that Chemetco produces more slag fines than can be used in the furnace. She said that Chemetco may consider on-site treatment of the under sized slag fines.

Ms. Young and I then walked toward the raw materials storage yard. On the south side of the zinc oxide bunker I observed large piles of used refractory brick. Ms. Young stated that Chemetco is in the process of make a hazardous waste determination on the used refractory brick. On the northwest side of the plant I observed some demolition work being done. Large equipment was being used to dig up a portion of the raw material storage lot. Raw materials containing copper, lead, cadmium, zinc and other metals were once stored in this area. Ms. Young said that this demolition material is going to be stock-piled on the contractors parking lot until it can be moved to the area of the proposed storage lot.

On October 17, 1997, the Agency received a letter from Cindy Davis, President of CSD Environmental Services, Inc. In this letter, Chemetco proposes to use demolition debris from inside the plant as fill material for a storage yard on the south east corner of the plant. The fill proposed by Chemetco is from the demolition of the concrete lot used to store product prior to introduction into the furnaces. Apparently, the fill material to be used for this storage yard will come from demolition activities inside the plant. The fill will also consist of soil from beneath the concrete lot. I explained to Ms. Young that it is possible that this material may not meet the definition of clean construction and demolition debris since it may be contaminated with heavy metals. I stated that she would need to sample the material before using it as fill. I also stated that the surrounding industrial facilities do not use plant demolition material as fill. Most in plant demolition material generated by other surrounding industrial facilities is sent to the landfill. In this proposal, Chemetco also intends to cover this fill material with a 6-8 inch layer of coarse slag. According to Ms. Young, Chemetco will use large ballast sized pieces of air cooled slag as fill.

I then inspected the disposal areas on the South side of the facility. I observed that the two piles of hazardous excavation waste from the refractory brick disposal area closure are still on-site. According to Ms. Young, Chemetco has no intentions of shipping these waste piles off-site. I inspected the area of the zinc oxide discharge. The waste trees and rocks from Containment Area #4 have been moved to Containment Area #1. Some grading of the hazardous waste pile has occurred in Containment Area #1. It appears that greater than 2 feet of freeboard is being maintained in Containment Area #2.

CNC/CHEM34.MEM

cc: BOL - Collinsville Region
cc: Kevin Lesko - BOL Permits Section
cc: Chris Perzan - DLC
cc: Pat Kuefler - USEPA Region V

PS97-201

**CSD Environmental Services, Inc.**

October 17, 1997

RECEIVED
OCT 21 1997
IEPA-BOL
PERMIT SECTION

Illinois Environmental Protection Agency
1021 N. Grand Avenue East
P.O. Box 19276
Springfield, IL 62794-9276

RE: 1198010003 Madison County
Chemetco, Inc,

Attention: Mr. Ted Dragovich

Dear Mr. Dragovich:

The purpose of this letter is to request the Agency's regulatory interpretation of the use of clean construction or demolition debris as defined by Section 3.78(a) of the Environmental Protection Act. Chemetco Inc. (Chemetco)is proposing to use concrete generated from a concrete replacement program within the plant as a sub-base for a new storage yard to be constructed. The yard will be constructed at the south east corner of the plant in the adjacent farm field. This area is greater than 200 feet from the setback zone of Chemetco's potable water supply. Refer to the attached figure for the proposed location of the storage yard. Spare parts, motors, scrap steel, etc.. is proposed to be stored in this yard. The storage yard is proposed to be constructed using clean concrete, i.e, all protruding rebar and wire mesh will be removed from the concrete prior to placement in the field. A base of 12 to 24 inches is proposed to be used. The base will be covered with 6 - 8 inches of coarse aggregate slag. A cross section showing the location of the proposed fill is also attached.

It is our interpretation that the use of this concrete as sub-base for the storage yard meets the definition of clean construction or demolition debris as defined by Section 3.78a of the Act (as revised by HB1887). We are respectfully requesting the Agency's regulatory interpretion of the use of the clean concrete.

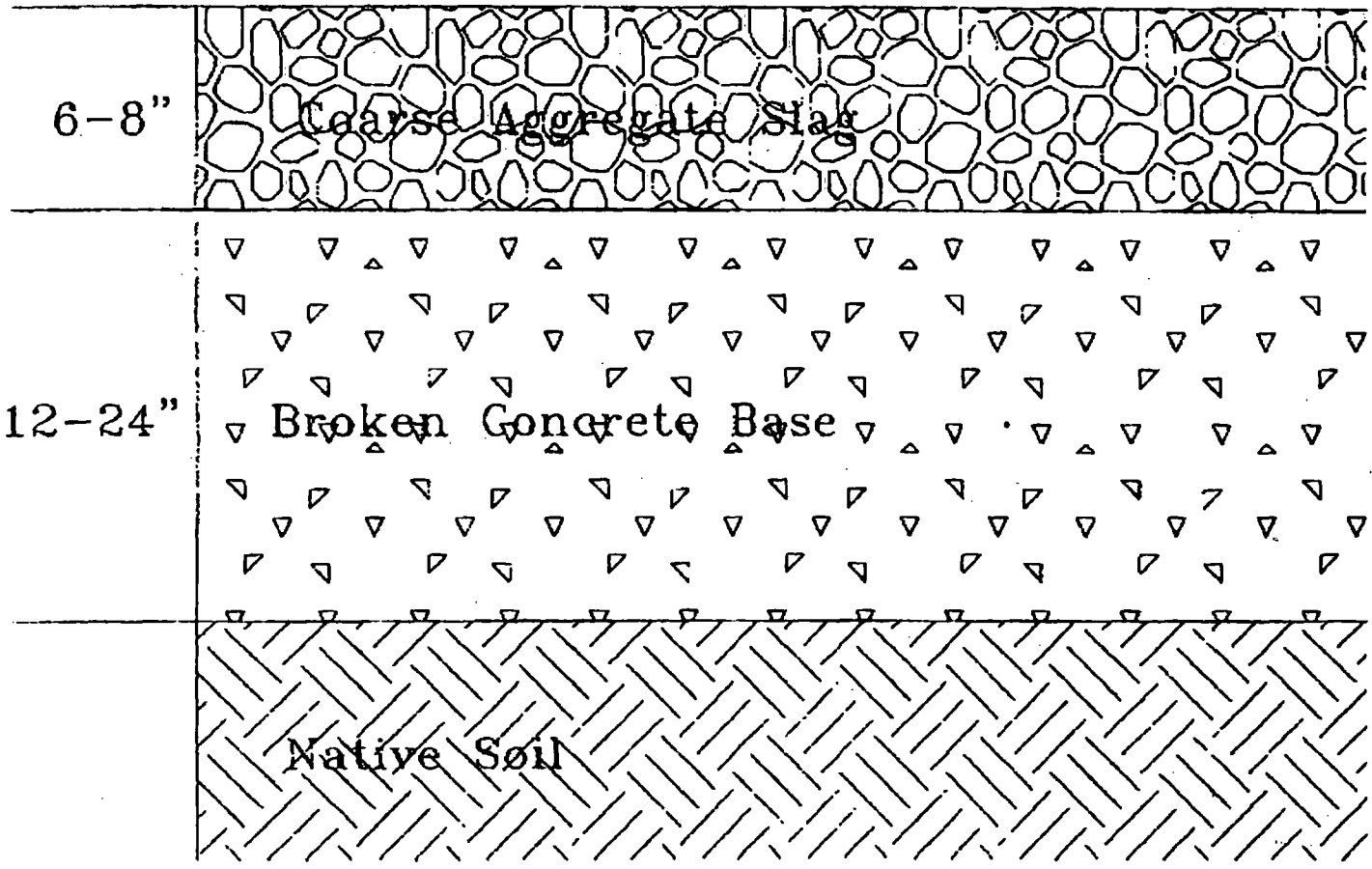
If you have any questions please contact me at the number below.

Sincerely,

Cindy S. Davis
President

CONCRETE.WPD

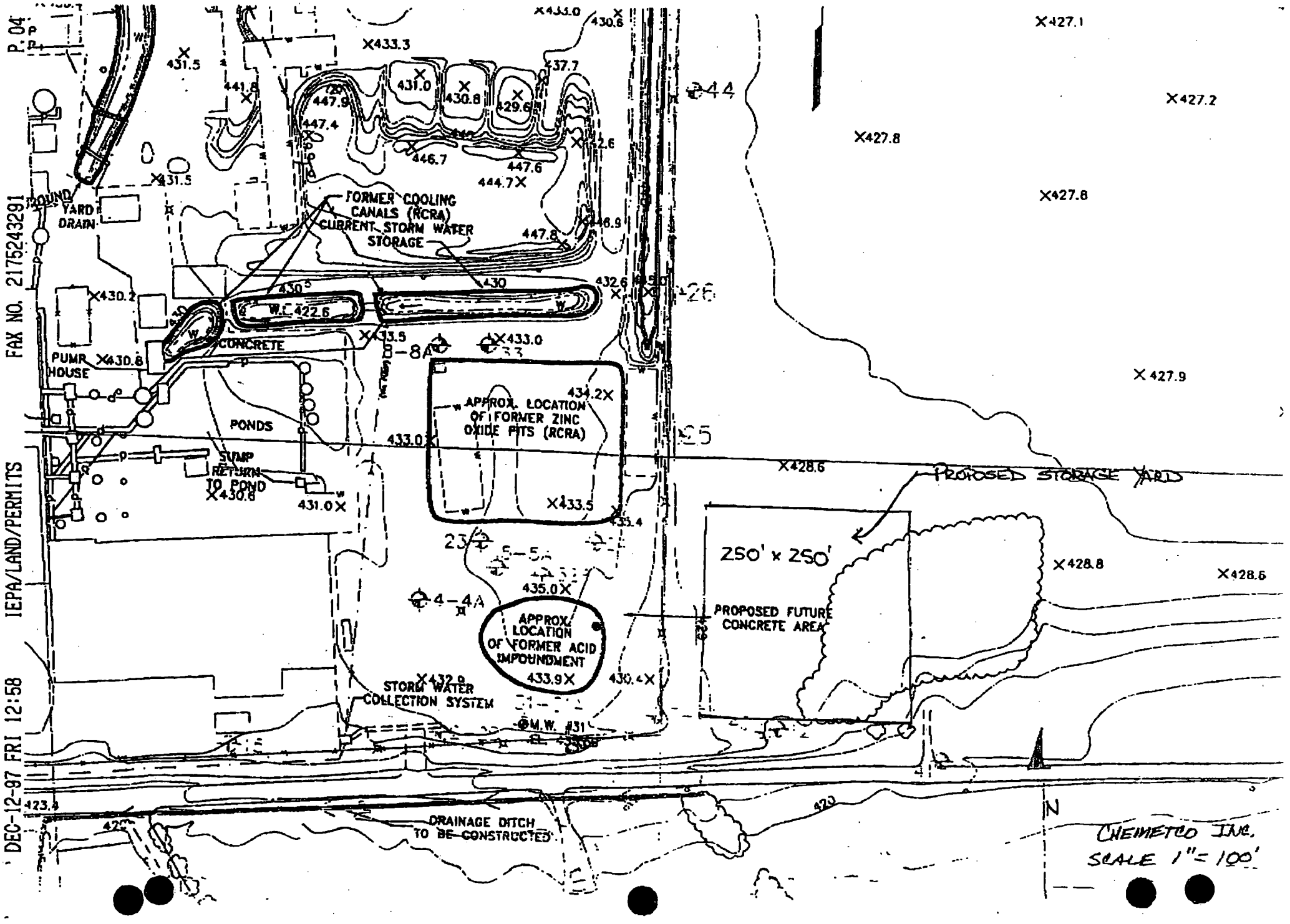
2220 Yale Blvd., Springfield, IL 62703 · Phone 217-522-4085 · FAX 217-522-4087




Chemetco, Inc.

Cross-Sectional View
Storage Yard
10/17/97

CSD Environmental Services, Inc.


FORMER COOLING CANALS (RCRA)
CURRENT STORM WATER STORAGE
YARD DRAIN
PUMP HOUSE
CONCRETE
PONDS
SUMP RETURN TO POND
APPROX. LOCATION OF FORMER ZINC OXIDE PITS (RCRA)
PROPOSED STORAGE YARD
250' x 250'
PROPOSED FUTURE CONCRETE AREA
APPROX. LOCATION OF FORMER ACID IMPOUNDMENT
STORM WATER COLLECTION SYSTEM
M.W. #31
DRAINAGE DITCH TO BE CONSTRUCTED
N
CHEMETCO INC.
SCALE 1" = 100'

October 24, 1995

Illinois Environmental Protection agency
Bureau of Land - Permit Section #33
2200 Churchill Road, P. O. Box 19276
Springfield, IL 62794-9276

RE: 1198010003 - Madison County
Chemetco, Inc.
Solid Waste Determination

Attn: Mr. Ted Dragovich

Dear Mr. Dragovich:

The purpose of this letter is to request a solid waste determination from the Illinois Environmental Protection Agency (Agency). Chemetco, Inc. (Chemetco) would like to work with the Illinois Department of Transportation (IDOT) to develop a use of the iron silicate slag (slag) they generate on a daily basis.

It is hoped this material can be used as either:

A. An ingredient in asphalt to construct and re-surface roadways. The material would act as an anti skid product in the asphaltic surface, or

B. As a construction material when it is placed above the water table and covered to minimize infiltration of surface waters.

Chemetco has been working with IDOT to develop this idea for some time. In March of 1995, IDOT met with representatives of the Agency to discuss the potential uses of Chemetco's slag. This meeting resulted in a letter dated March 29, 1995 to IDOT from the Agency outlining the Agency's concerns regarding the various uses discussed at the meeting. It is Chemetco's understanding that the Agency letter addressed two major topics:

1. The Agency suggested the use of the slag only as an aggregate in concrete or as a subbase in areas above the high water table; and

2. The proposed use of this product would have to comply with both the land disposal restrictions (LDR's) and universal treatment standards (UTS's).

Subsequent discussions with the Agency have confirmed that the LDR's and UST's would not apply to the Chemetco slag provided no listed hazardous wastes have been, or would be, received by Chemetco for reclamation. A copy of a July 15, 1988 letter from the Agency to Chemetco agreeing the slag is not hazardous is provided as Attachment #1. We would like the Agency to confirm this understanding for our future discussions with IDOT.

Attachment #2 is a copy of a report prepared for Chemetco in support of their request for various construction type uses of the slag in 1988. The information on how the material is generated, its properties and characteristics remain the same. This report also addresses the proposed use of the slag as an aggregate in paving material and as a construction material.

We request the Agency review this information and determine the use of the slag, as a paving material and construction material (as long as it is placed above the water table and covered to minimize infiltration), is considered recycling and does not pose a threat to human health or the environment.

If you need any additional information, please contact me.

Sincerely,

Harry A. Chappel, P.E.
Vice President

Attachments

Collinsville

State of Illinois
ENVIRONMENTAL PROTECTION AGENCY

Mary A. Gade, Director

2200 Churchill Road, Springfield, IL 62794-9276

217/524-3300

March 29, 1995

Mr. John R. Washburn
Illinois Department of Transportation
Design and Environment
2300 South Dirksen Parkway
Springfield, Illinois 62764

RECEIVED
IEPA
APR 04 1995
COLLINSVILLE

Re: 1198010003--Madison County
Chemetco
ILD048843809
Permit File

Dear Mr. Washburn:

This letter has been written in response to the questions you raised at our meeting of March 21, 1995, regarding the use of copper slag generated by Chemetco. Pursuant to consent order No. 88-CH-200, the Agency issued a letter dated July 15, 1988. This letter stated that the Agency had concerns with the amount of lead and cadmium found in the slag. Our letter also suggested that the use of the slag should be limited to concrete aggregate unless the slag is placed in areas located above the high water table and covered to prevent infiltration of surface waters.

The July 15, 1988, letter was written before the Land Disposal Restrictions (LDRs) became effective in Illinois. The regulations now require that all products used in a manner constituting disposal meet the applicable treatment stands in 35 Ill. Adm. Code 728.Subpart D. To further complicate matters, on February 19, 1994, federal regulations were promulgated which amend 40 CFR 268 to include different land disposal restrictions than those currently enforced by the Agency. The new set of treatment standards are referred to as the "Universal Treatment Standards or UTS." Since the UTS are not effective in Illinois, the product used in a manner constituting disposal must comply with both the LDRs and UTS.

The Agency suggests that you limit the use of copper from Chemetco to an aggregate in concrete or subbase in areas above the high water table. Prior to using the material, you

CC

Illinois Environmental Protection Agency · P.O. Box 19276, Springfield, IL 62794-9276

217/782-6762

Refer to: LPC #1198010003 -- Madison County
Chemetco
ILD048843809

July 15, 1988

Mr. David Hoff, President
Chemetco
P.O. Box 187
Alton, IL 62002

Dear Mr. Hoff:

Pursuant to the recently approved Consent Order (No. 88-CH-200) the Agency has reviewed the analytical data of the re-analysis of the slag from Chemetco's Alton facility. Based on the analysis that was run by the L.C. Metals Laboratory and the IEPA's Laboratory, we are in agreement that the slag is not a RCRA hazardous waste.

The Agency has also reviewed the document entitled "Justification for the Use of Secondary Copper Smelting Slag in Construction Projects" submitted to the Agency by Mark Haney, ERT, under a cover letter dated June 2, 1988. The document proposes four (4) types of off-site construction uses for the chunky slag from Chemetco's Alton facility. The following are the Agency's comments on the proposed off-site uses of the slag:

1. Incorporation of the slag into a solid matrix-like concrete should result in minimal leaching of lead and cadmium and is, therefore, the Agency's preferred off-site use of the slag.

2. If the slag is used as roadbed material, steps should be taken to keep the potential leaching of lead and cadmium to an absolute minimum. Care should be taken to minimize infiltration and prohibit any potential leachate from impacting the environment. It would also be necessary to use the slag only in sites which will always be above the groundwater table and which are removed from permanent surface water bodies.

3. Off-site use of the slag as parking lot or railroad ballast material may cause a violation of the Act, since these uses could result in significant amounts of lead and probably cadmium leaching into the environment. Specifically, off-site use of the slag as parking lot or railroad ballast material appears to be too "open" to the environment and runs the risk of potentially being a long-term source of lead and cadmium to any environment in which the slag might be placed.

The above comments were based on the EP Tox results for lead (all three testing regimes) indicating that leachate from the slag will not exhibit a hazardous characteristic.

The above are only offered as comments. Any final decision regarding the use of the slag rests with Chemetco. While the Agency supports beneficial uses of materials which might otherwise be classed as wastes, Chemetco would in no way be excused from any violations of the Act which may occur.

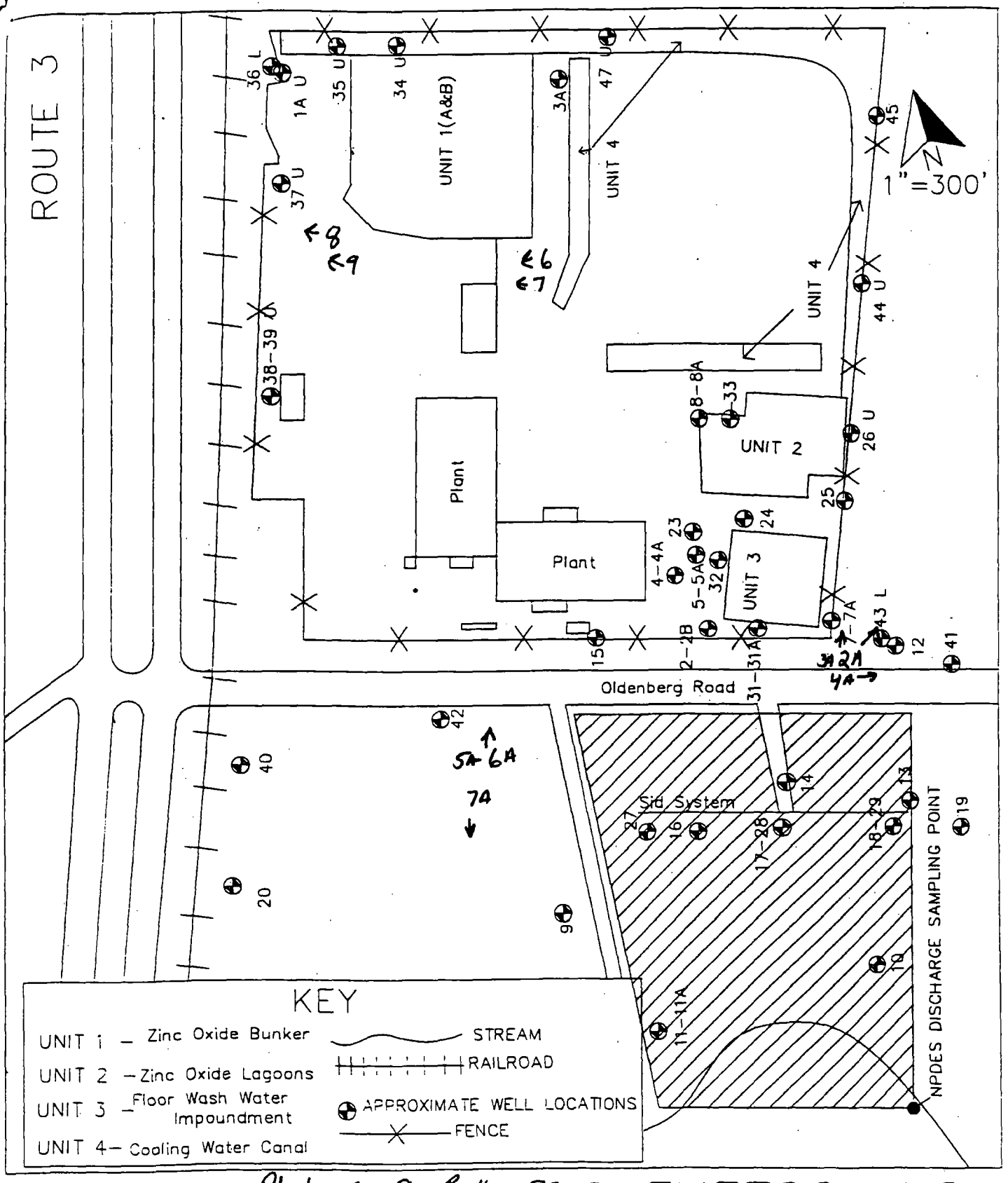
Very truly yours,

Lawrence W. Eastep

Lawrence W. Eastep, P.E., Manager
Permit Section
Division of Land Pollution Control

LWE:GTR:tk:5/11/47-3

cc: Collinsville Region
Division File
Roger Kanerva
Larry Eastep
Harry Chappel
Bruce Carlson
Glenn Savage
Bill Child
Jim O'Brien
Mark Haney, ERT




Site Location

SE 1/4 Sec. 16 T. 4 N R. 9 W of the 3rd Principal Meridian in Madison County, IL

Photos 6 – 9 = Roll 3178

Photos 2A –

CHEMETCO, INC.

Stormwater Runoff Line Drawing

Form 1 Item 11: Supplemental Map

NPDES Renewal Application

4-95 ILD048343323

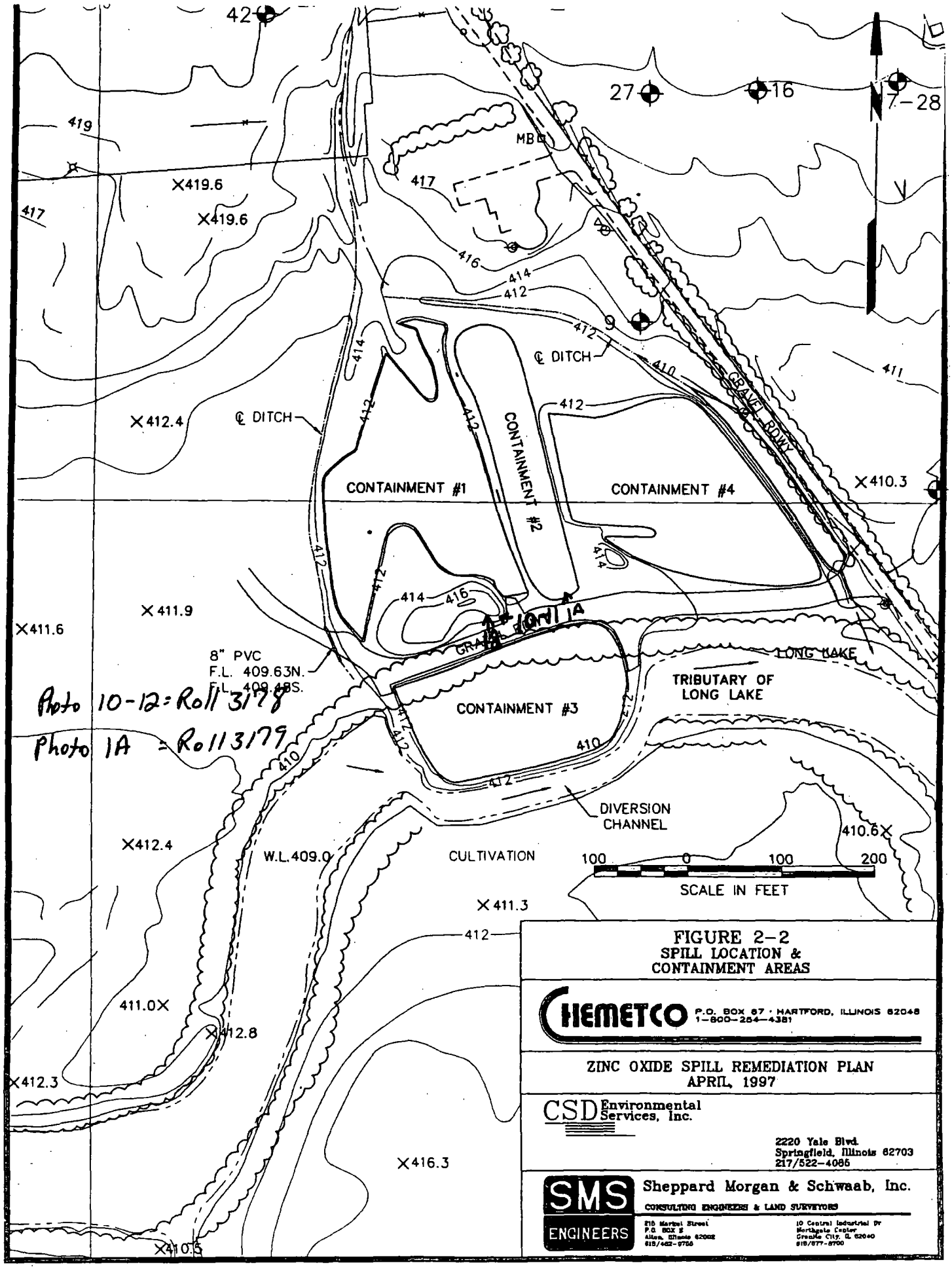



Photo 10-12 = Roll 3178

Photo 1A = Roll 3179

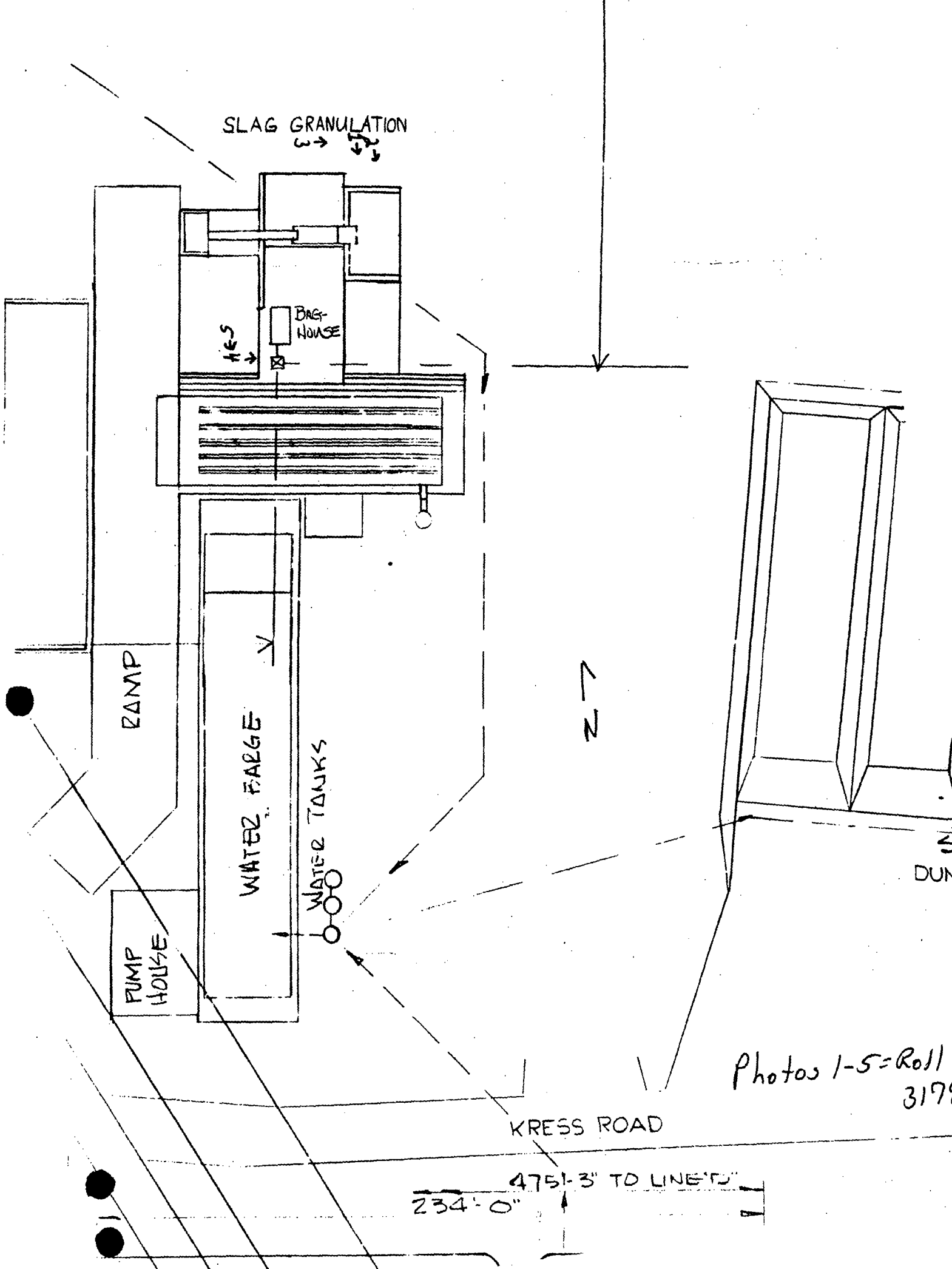
FIGURE 2-2
SPILL LOCATION &
CONTAINMENT AREAS

CHEMETCO P.O. BOX 67 : HARTFORD, ILLINOIS 62048
1-800-254-4381

ZINC OXIDE SPILL REMEDIATION PLAN
APRIL, 1997

CSD Environmental Services, Inc.
2220 Yale Blvd.
Springfield, Illinois 62703
217/522-4085

SMS ENGINEERS
Sheppard Morgan & Schwaab, Inc.
CONSULTING ENGINEERS & LAND SURVEYORS
215 Market Street
P.O. BOX 5
Alton, Illinois 62002
618/462-9755
10 Central Industrial Dr
Northgate Center
Granite City, IL 62040
618/877-8700


SLAG GRANULATION
BAG-HOUSE
RAMP
WATER BARGE
WATER TANKS
PUMP HOUSE
N
DUM
Photos 1-5=Roll
317
KRESS ROAD
475'-3" TO LINE 'D'
234'-0"

# INSPECTION PHOTOS

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| TIME: 2:30-3:30 | SITE NAME: Chemetco, Inc. |
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| COMMENTS: Pictures taken toward: South | |
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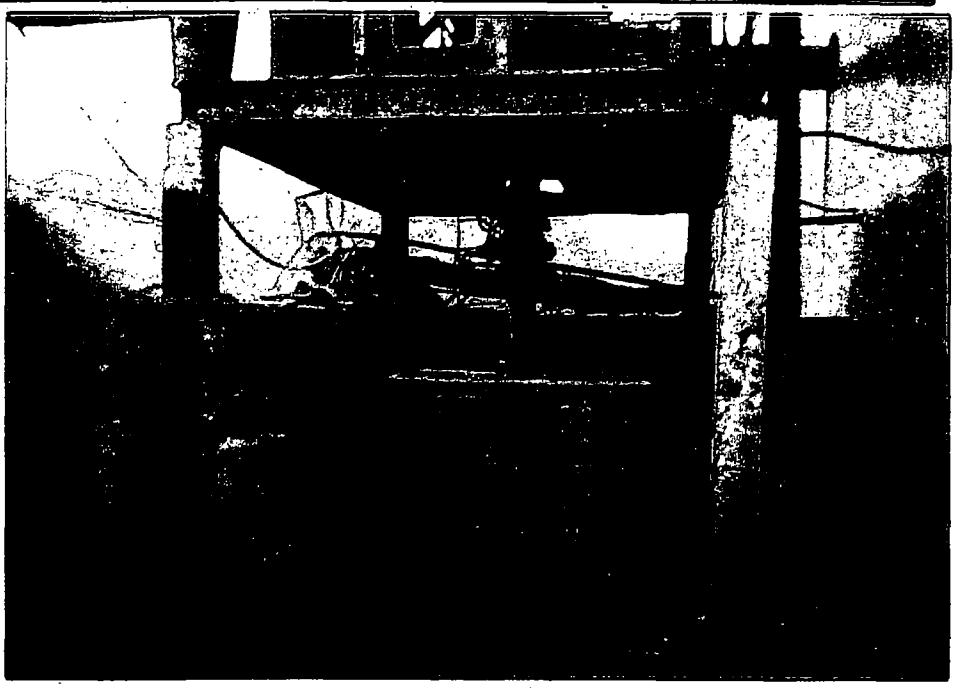

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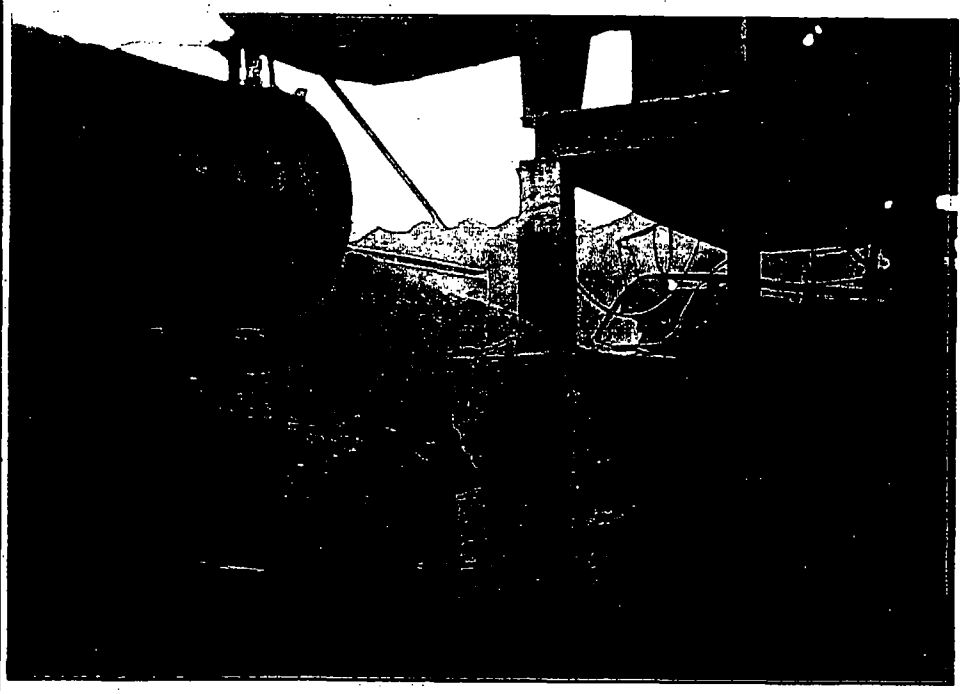

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DATE: 12 / 16 / 97

TIME: 2:30-3:30

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COMMENTS: Pictures taken toward: East

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DATE: 12 / 16 / 97

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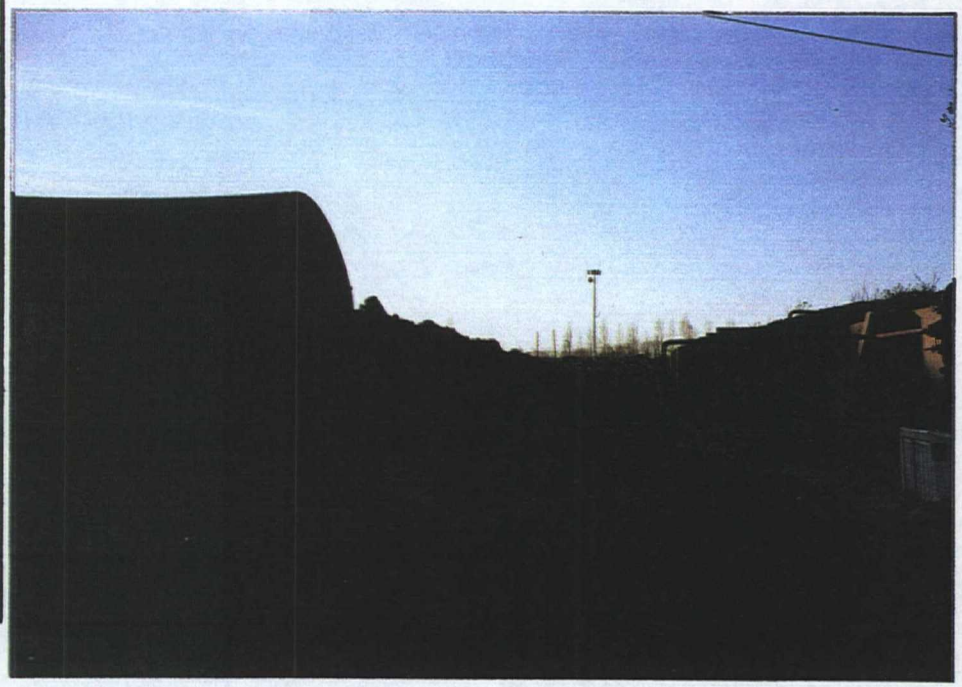

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ROLL #: 3178 PHOTO #: 7

DATE: 12 / 16 / 97

TIME: 2:30-3:30

PHOTOGRAPH TAKEN BY:

COMMENTS: Pictures taken toward: Northwest

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# INSPECTION PHOTOS

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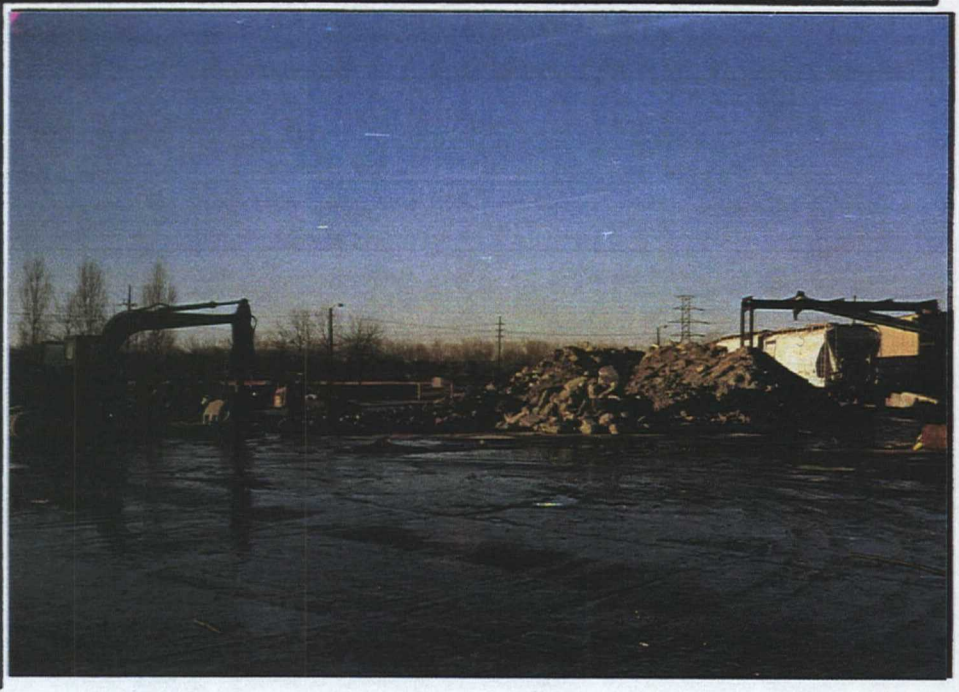

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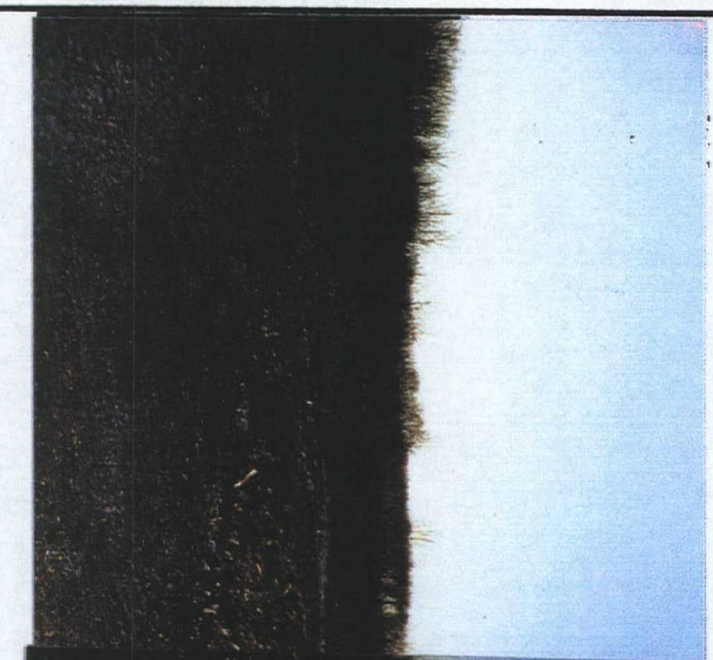

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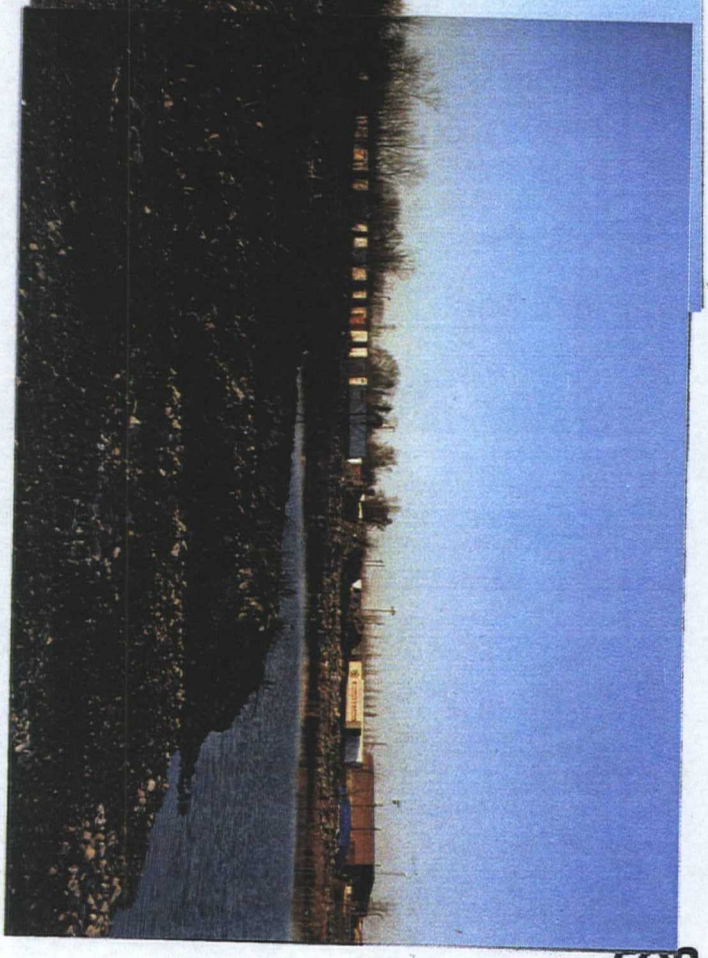

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DATE: 12 / 16 / 97

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COMMENTS: Pictures taken toward: Northeast

ROLL #: 3179 PHOTO #: 2A

CNC:jlb

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| COMMENTS: Pictures taken toward: North | |
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| ROLL #: 3179 PHOTO #: 4A |

CNC:jlb

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LPC 375 08/90

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# INSPECTION PHOTOS

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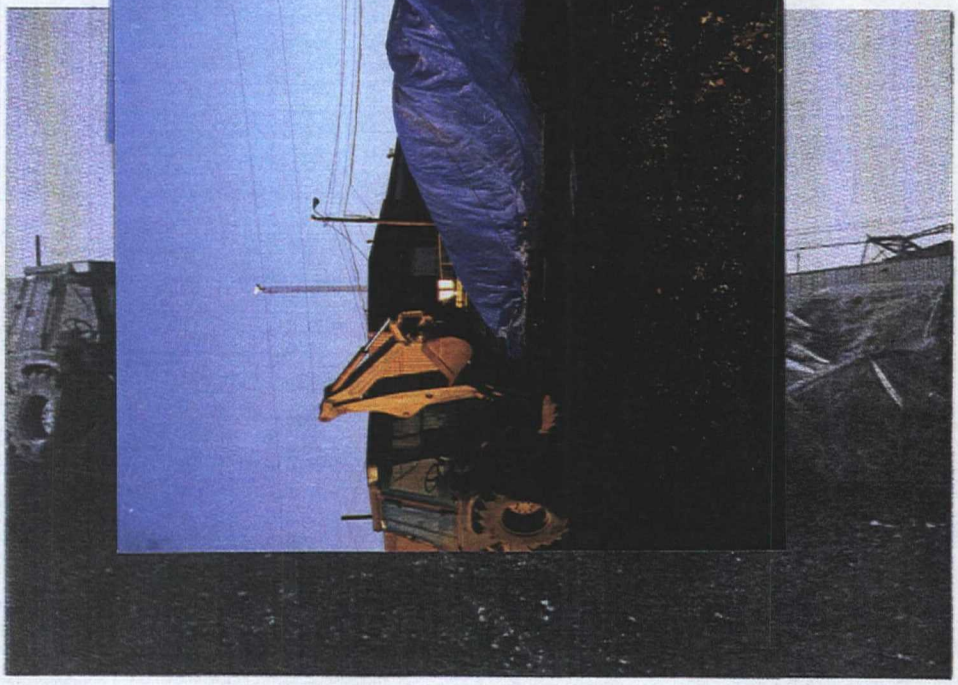

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LPC 375 08/90

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**CHEMETCO, INC.**
**WASTE ANALYSIS PLAN - TREATMENT OF SLAG FINES**
**October 23, 1997**

Slag fines exhibiting the hazardous characteristic of D008 - lead will be treated to non hazardous levels using a variety of chemical fixation products. A pilot test will be conducted on October 30 and 31 at the facility to determine the effectiveness of several chemical fixation products.

A sample of the slag fines will be collected from each roll off prior to treatment. The sample will be collected using the following procedures:

- The sampler shall wear a new pair of latex gloves;
- A one quart sample of slag fines shall be collected and placed into a plastic ziploc container;
- The ziploc container will be sealed and labeled "slag fines #1 - untreated";
- A chain of custody will be completed by the sampler; and
- The samples will be transported to the laboratory within 24 hours of collection.

The untreated slag fines will be analyzed using the TCLP method for the following metals, antimony, arsenic, barium, beryllium, cadmium, chromium (tot), cyanide (amendable), flouride, lead, mercury(retort residues), mercury (all others), nickel, sulfide, selenium, silver, thallium, vanadium, and zinc. Based upon generator knowledge of the waste stream, no other hazardous waste characteristics are expected to be of concern in the waste.

After treatment in the roll off containers is completed, three samples per roll off container will be collected and composited into one sample for analysis. The samples will be collected using the following procedures:

- The sampler shall wear a new pair of latex gloves;
- A one quart sample of slag fines shall be collected and placed into a plastic ziploc container;
- The ziploc container will be sealed and labeled "slag fines # - treated";
- A chain of custody will be completed by the sampler; and

- The samples will be transported to the laboratory within 24 hours of collection.

Treated samples will be collected for the parameters listed above.

A field notebook will be maintained by the chemist with noting the quantity of slag fines added to the roll off boxes; the amount and type of chemical reagents; mixing times; reagent times; color of slag; and any other pertinent data. A final report of the project will be prepared by the chemist.

Pursuant to 40 CFR, Part 268, D008 has a performance levels of 5.0 mg/l using the TCLP method. The analytical data will be reviewed to determine the effectiveness of the on site treatment. The analytical results will be reviewed to determine if additional treatment is required to treat the lead to less than 5.0 mg/l. In addition, to estimate compliance of underlying metal constituents which become applicable to TC metal waste code D008 in Part 2 of the Phase IV LDR rule, the test results will be compared to the attached Table 4.3 Universal Treatment Standards for Metal/Inorganic Constituents.

# CSD ENVIRONMENTAL SERVICES
# SITE HEALTH & SAFETY PLAN

The health and safety protocols established in this plan are based on the site conditions and chemical hazards known and/or anticipated to present from available site data. The possibility of undocumented disposal within the site requires a conservative approach to on-site safety procedures. The following Site Safety Plan is intended solely for use during the proposed activities herein described in the site investigation work plan Specification herein are subject to review and revision based on actual conditions encountered in the field during site characterization activities.

Before site operations begin all employees involved in these operations will have read and understood this site safety plan and all revision made. All operations and equipment will comply with OSHA regulations 29 CFR 1910.120 "Hazardous Waste Operations and Emergency Response" and applicable parts of OSHA 29 1910 and 1926.

## A. GENERAL INFORMATION (1910.120(c)(4))

| | | | |
|---|---|---|---|
| Project Name: | Chemetco, Inc. | | |
| Location: | Route 3 & Oldenburg Road - Hartford, IL | | |
| Client: | Chemetco, Inc. | | |
| Plan Prepared By: | Shane A. Thorpe | Date: | 10/22/97 |
| Plan Approved By: | | Date: | |
| Project Start Date: | 10/30/97 | | |

## B. SITE DESCRIPTION (1910.120(c)(4))

Note: On UST Projects this section should include number, size of vessels and amount of remaining material.

Facility History: Site is a secondary copper smelter located in Hartford, IL (Madison County). The facility currently does not generate any RCRA Hazardous Waste. The facility has five former RCRA storage units which are undergoing closure pursuant to 35 IL Adm. Code, Part 725.

General Site Description: The facility is located in an agricultural, light residential area south of Hartford, IL, about one mile east of the confluence of the Missouri and Mississippi Rivers. The facility was constructed in 1969 and began producing anode and cathode copper, crude lead-tin solder, zinc oxide, and slag in 1970.

## C. PROJECT OBJECTIVE(S) (1910.120(b)(3))

Description of Work Activities Planned: Pilot test for on-site treatment of slag fines. Three 25 cubic yard boxes of slag fines will be treated using sodium silicate, lime & cement kiln ~~dust~~. ASH.

**Welding/Cutting:** No — If Yes, Specify Precautions:

**Heavy Equipment Operation:** Yes — If Yes, Type of Equipment and Precautions:

trackhoe - personnel should stay as far away from trackhoe bucket as possible - hard hats should be worn at all times.

**Slip, Trip, Fall Hazards:** Yes — If Yes, Specify type, location and precautions to be taken:

slip hazard in area - proper boots required

**Overhead Utilities Present:** No — If Yes, Specify Location and Precautions to be Taken:

**Underground Utilities:** Yes

Utility Location Service: Underground utilities are present although no additional excavating will take place - thus, utilities will not be located

Name of Contact:

Phone Number:

Precautions to be Taken:

**Other hazards:** none

## G. SITE CONTROL (1910.120(d))

**Work Zones** have been established as shown on the attached **Site Diagram**.
Site Security: Security on site will be maintained by: Chemetco, Inc. Security Office

| | |
|---|---|
| | Temporary Barricades and/or Warning Tape |
| | Security Fence |
| Yes | 24 Hour Security Guard |
| | Other: |

## H. PERSONAL PROTECTIVE EQUIPMENT (1910.120(b)(4))

Based on Evaluation of potential hazards, the following levels of personal protection have been designated for the applicable work zones:

| WORK ZONE | LEVEL OF PROTECTION | REQUIRED PROTECTIVE EQUIPMENT: (specify exact type, Ex. PVC gloves) | |
|---|---|---|---|
| **Exclusion Zone** | C | Respirator: | full-facepiece air purifying |
| | | Filters/Cartridges: | HEPA |
| | | Boots: | rubber boots if in soil, steel-toed boots otherwise |
| | | Inner Gloves: | latex (if desired) |
| | | Outer Gloves: | Rubber |
| | | Protective Coverall: | tyvek suit (if deemed necessary by on-site Safety Officer) |

| | |
|---|---|
| Hard Hat: | yes |
| Eye Protection: | safety glasses |
| Other: | |

| WORK ZONE | LEVEL OF PROTECTION | REQUIRED PROTECTIVE EQUIPMENT | |
|---|---|---|---|
| **Contamination Reduction Zone** | D | Respirator: | none |
| | | Filters/Cartridges: | none |
| | | Boots: | steel-toed boots |
| | | Inner Gloves: | none |
| | | Outer Gloves: | none |
| | | Protective Coverall: | none |
| | | Hard Hat: | yes |
| | | Eye Protection: | safety glasses |
| | | Other: | |

Exceptions and Modifications:

## DECONTAMINATION (1910.120(k))

Personnel Decontamination Procedures: All personnel entering the exclusion zone shall undergo decontamination prior to leaving the site. Personnel shall proceed through the following decontamination stations:

| Decon Station: | #1 | #2 | #3 |
|---|---|---|---|
| Decon Procedure | remove PPE and place into disposable container | | |
| Decon Equipment: | wash with soap and water and air dry, place waste in plastic bags for disposal | | |

Equipment Decontamination:

Gross Removal By: Scraping

Decon Solution: Alconox and water

Decontamination Rinsate:

Collection Method: Equipment decontamination shall take place on existing decon pad near Zinc Oxide spill area. Water will be collected and containerized for disposal into the plant.

Disposal Method, Firm: Decon water to be disposed of in ponds in the plant.

## I. AMBIENT AIR MONITORING (1910.120(b)(4))

No air monitoring is proposed since respiratory protection is being used.

| Activity | Instruments | Action Level | Frequency |
|---|---|---|---|
| | | | |

Comments: _

**K. PERSONNEL AIR MONITORING** (1910.120(h))

No air monitoring is proposed since respiratory protection is being used.

| Activity/Location | Contaminant(s) | NIOSH/OSHA Protocol |
|---|---|---|
| | | |

**L. CONTINGENCY PLAN** (1910.120(l))

Emergency Communication Signals: none

Emergency Escape Routes: West on Oldenburg Road to Route 3

Emergency Equipment on Site: (Location)

First Aid Kit: CSD Environmental Truck

Fire Extinguisher: CSD Environmental Truck

Telephone: Mobile Number 217/725-3979

Eye Wash/Safety Shower: Chemetco, Inc.

Other:

**First Aid Measures:**

In the event that personnel exposure symptoms occur the following procedures will be used:

Eye contact: Flush eye immediately with copious amount of water repeat until irritation is eliminated. If prolonged irritation occurs for more than fifteen minutes, seek medical attention.

Skin contact: Wash exposed area with soap and water. If dermatitis or severe reddening occurs seek medical attention.

Inhalation: Remove person into fresh air, if symptoms occurs for more than 15 minutes seek medical attention.

Ingestion: Do not induce vomiting, seek immediate medical attention.

**Flammable Conditions**

None present.

**Re-entry to the exclusion zone after an on-site emergency shall not be permitted until the following conditions are satisfied:**

1) The conditions creating the emergency have been corrected.
2) The hazard(s) have been re-evaluated.
3) The site safety plan has been reviewed and determined adequate for the hazards encountered.
4) All site personnel have been instructed in any new hazards and changes to the site safety plan.

**SIGN-OFF**

All personnel, including subcontractor employees, have read the above plan and are familiar with its provisions. By signing below, all personnel are indicating they have received and are current with their medical surveillance and training certification; in accordance with 29 CFR (OSHA) 1910.120.

| Name | Signature |
| --- | --- |
| Cindy Davis | |
| Marc Simmering | |
| Brock Reinhard | |
| Greg Cotten | |

**UTILITIES:**

Electric:_____

Gas: _____

# M E M O R A N D U M

Madison County - Chemetco ZnO Discharge
Long Lake Sampling

To: Bureau of Water - FOS/RU

From: Nick Mahlandt, BOW-Collinsville

Date: September 24, 1996

Interviewed: Cindy Davis, CSD Environmental

On the above date, I accompanied Chris Cahnovsky, BOL, for the purpose of collecting samples of Long Lake in the vicinity of the recently started zinc oxide discharge cleanup. The following comments and observations were made:

Long Lake was first viewed and sampled at Franko Lane, which is below the facility. The water appeared normal and no flow was noted at the culvert under the lane. The second observation was made above the facility, just east of Route 3. In this segment, the lake is more of a slough and once again, no flow was noted. A sample was also collected in this area.

We then entered the Chemetco property and met with Ms. Davis, who was on-site directing the cleanup. They had already re-routed Long Lake by constructing a channel that looped around the ZnO contaminated area. The excavated soil was used to construct the berm on the inner side of this channel. A water sample was taken from just below this channel, and another was collected from this now impounded area. No flow was noted in the channel, and we were shown that a few 100 yards downstream the lake was dry. The channel was turbid from silt, while the impounded water had a grayish cast. A gray sediment was evident in this latter area.

Attached are copies of the four laboratory report sheets, B617615-18.

Nick Mahlandt

jnm
cc: BOW-Collinsville
cc: BOL-Collinsville

EN EN 30

Sheet Color: IEPA - DWPC - FOS - LAB SHEET Field ID No.:

Funding Code: W P D 6 10-Agency Routing C V 12-File Code: S T R M 13-Sample Type: S

15-Reporting: B 16-DID:Basin County Plant 17-Sampling Program: M L

18-Facility/Sample Pt: C H E M E T C O - L O N G L A K E

19-Begin Date: 9 6 0 9 2 4 (Y Y M M D D) 20-Begin 1 3 3 0 (H H M M) (24 hr.clock)

23-Instructions to Lab: 21-Collected by: J N M 22-Transported by: S a m e

Composite Sample Ending Date: 5 2 9 F 0 (Y Y M M D D)

Ending Time: 5 2 9 F 0 (H H M M) (24-hr.clock)

03-Lab Parameter Group: I N D 1 1

| Additional Lab Parameters | Field Parameters | Results |
|---|---|---|
| | 501F0 Air Temp (°C) | |
| | 502F0 Water Temp (°C) | |
| | 504F0 Dissolved $O_2$ | |
| | 503F0 Conductance | |
| | 500F0 pH | |

27-Received By: UPS Date: 9 6 0 9 2 5 (Y Y M M D D)

Received by: Date: (Y Y M M D D)

Circle One: Effluent, Stream, Influent, Process Flows, Sludge, Cooling Water — Specials: WWTP, Other

Program:

NPDES No:

Receiving Stream Name: Long Lake

Receiving Stream Conditions (velocity,etc): Slightly Turbid w silt No flow noted

Effluent Conditions:

RECEIVED IEPA OCT 28 1996 COLLINSVILLE OFFICE

Weather Conditions: PC ~ 75 F

Comments & Unusual Conditions & Severity: (If applicable, Stamp- "No Visible Problem This Visit")

Upstream side of Franko Lane

Remarks: approx 2 mi. downstream of Chemetco

Sampling Techniques: grab

Mail To:

FOR LABORATORY USE ONLY

LAB ID NO. B617615

Sample Received By:

Date Received: SEP 26 1996

Time Received: 9 AM PM

Lab Section:

Supervisor OCT 24 1996

IL 532-1575 WPC 528 8/87

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

NUMBER : B617615
LING POINT DESC. : CHEMETCO-LONG LAKE

UBMITTING SOURCE # : SITE # :
ATE COLLECTED : 960924 TIME COLLECTED : 1330 SAMPLING PROGRAM : M6

OLLECTED BY : JNM DELIVERED BY : UPS
OMMENTS :
UNDING CODE : WP06 AGENCY ROUTING : CV UNIT CODE :
AM TYPE CODE : STRM SAMPLE PURPOSE CODE : S REPORTING INDICATOR : B

ATE RECEIVED : 960926 TIME RECEIVED : 0900 RECEIVED BY : PMD
AB OBSERVATIONS : TRIP BL SAM# :
UPERVISORS INITIALS : RPF NOTE : K = LESS THAN VALUE

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 00403 | PH-LABORATORY | UNITS : | 8.3 | P00530 | SOLIDS,TOT.SUS. | MG/L : | 90 |
| 00916 | CALCIUM,TOTAL | MG/L : | 72. | P00927 | MAGNESIUM,TOTAL | MG/L : | 19. |
| 00929 | SODIUM,TOTAL | MG/L : | 64. | P00937 | POTASSIUM,TOTAL | MG/L : | 6.9 |
| 01105 | ALUMINUM,TOTAL | UG/L : | 1200 | P01007 | BARIUM,TOTAL | UG/L : | 160 |
| 01022 | BORON,TOTAL | UG/L : | 220 | P01012 | BERYLLIUM,TOTAL | UG/L : | 1K |
| 01027 | CADMIUM,TOTAL | UG/L : | 5 | P01034 | CHROMIUM,TOTAL | UG/L : | 5K |
| 01042 | COPPER,TOTAL | UG/L : | 10K | P01037 | COBALT,TOTAL | UG/L : | 10K |
| 01045 | IRON,TOTAL | UG/L : | 2000 | P01051 | LEAD,TOTAL | UG/L : | 50K |
| 01055 | MANGANESE,TOTAL | UG/L : | 710 | P01067 | NICKEL,TOTAL | UG/L : | 25K |
| 01077 | SILVER,TOTAL | UG/L : | 3K | P01082 | STRONTIUM,TOTAL | UG/L : | 220 |
| 01087 | VANADIUM,TOTAL | UG/L : | 5K | P01092 | ZINC,TOTAL | UG/L : | 100K |

EN ENI 31

Sheet Color: IEPA - DWPC - FOS - LAB SHEET Field ID No.:

Funding Code: W P O 6 10-Agency Routing C V 12-File Code: S T R M 13-Sample Type: S

Reporting: B 16-DID: Basin__ County__ Plant__ 17-Sampling Program: M 6

18-Facility/Sample Pt: C H E M E T C O - L O N G L A K E

19-Begin Date: 9 6 0 9 2 4 (Y Y M M D D) 20-Begin 1 4 2 0 (H H M M) (24 hr.clock)

23-Instructions to Lab:

21-Collected by: J N M 22-Transported by: S A M E

Composite Sample Ending Date: 5 2 9 F 0 (Y Y M M D D)

Ending Time: 5 2 9 F 0 (H H M M) (24-hr.clock)

03-Lab Parameter Group: I N D 1 1

| Additional Lab Parameters | Field Parameters | Results |
|---|---|---|
| | 501F0 Air Temp (°C) | |
| | 502F0 Water Temp (°C) | |
| | 504F0 Dissolved $O_2$ | |
| | 503F0 Conductance | |
| | 500F0 pH | |

27-Received By: UPS Date: 9 6 0 9 2 5 (Y Y M M D D)

Received by: Date: (Y Y M M D D)

Circle One: Effluent Stream Influent Process Flows Sludge Cooling Water

Specials: WWTP Other

Program:

NPDES No:

Receiving Stream Name: Long Lake

Receiving Stream Conditions (velocity,etc): Turbid w silt & algae No flow

Effluent Conditions:

RECEIVED IEPA OCT 28 1996 COLLINSVILLE OFFICE

Weather Conditions: PC ~ 75°F

Comments & Unusual Conditions & Severity: (If applicable, Stamp- "No Visible Problem This Visit")

Remarks: approx. 200 yds east of Rt 3 (at drainage from wetland pond on south side of lake).

Sampling Techniques: grab

Mail To:

FOR LABORATORY USE ONLY

LAB ID NO. B617616

Sample Received By:

Date Received: SEP 26 1996

Time Received: 9 AM PM

Lab Section:

Supervisor: OCT 24 1996

IL 532-1575 WPC 526 8/87

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

E NUMBER : B617616
PLING POINT DESC. : CHEMETCO-LONG LAKE

UBMITTING SOURCE # : SITE # :
ATE COLLECTED : 960924 TIME COLLECTED : 1420 SAMPLING PROGRAM : M6

OLLECTED BY : JNM DELIVERED BY : UPS
OMMENTS :
UNDING CODE : WP06 AGENCY ROUTING : CV UNIT CODE :
AM TYPE CODE : STRM SAMPLE PURPOSE CODE : S REPORTING INDICATOR : B

ATE RECEIVED : 960924 TIME RECEIVED : 1420 RECEIVED BY : JNM
AB OBSERVATIONS : TRIP BL SAM# :
UPERVISORS INITIALS : RPF NOTE : K = LESS THAN VALUE

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 00403 | PH-LABORATORY | UNITS | : 9.6 | P00530 | SOLIDS,TOT.SUS. | MG/L | : 48 |
| 00916 | CALCIUM,TOTAL | MG/L | : 42. | P00927 | MAGNESIUM,TOTAL | MG/L | : 15. |
| 00929 | SODIUM,TOTAL | MG/L | : 2400 | P00937 | POTASSIUM,TOTAL | MG/L | : 100. |
| 01105 | ALUMINUM,TOTAL | UG/L | : 560 | P01007 | BARIUM,TOTAL | UG/L | : 110 |
| 01022 | BORON,TOTAL | UG/L | : 7900 | P01012 | BERYLLIUM,TOTAL | UG/L | : 1K |
| 01027 | CADMIUM,TOTAL | UG/L | : 130 | P01034 | CHROMIUM,TOTAL | UG/L | : 5K |
| 01042 | COPPER,TOTAL | UG/L | : 110 | P01037 | COBALT,TOTAL | UG/L | : 10K |
| 01045 | IRON,TOTAL | UG/L | : 410 | P01051 | LEAD,TOTAL | UG/L | : 76 |
| 01055 | MANGANESE,TOTAL | UG/L | : 150 | P01067 | NICKEL,TOTAL | UG/L | : 25K |
| 01077 | SILVER,TOTAL | UG/L | : 3K | P01082 | STRONTIUM,TOTAL | UG/L | : 220 |
| 01087 | VANADIUM,TOTAL | UG/L | : 5K | P01092 | ZINC,TOTAL | UG/L | : 220 |

EN ENI 32

Sheet Color: IEPA - DWPC - FOS - LAB SHEET Field ID No.:

Funding Code: WP 06 10-Agency Routing CV 12-File Code: STRM 13-Sample Type: S

Reporting: B 16-DID: Basin ___ County ___ Plant ___ 17-Sampling Program: M6

18-Facility/Sample Pt: CHEMETCO - LONG LAKE

19-Begin Date: 960924 (Y Y M M D D) 20-Begin: 1510 (H H M M, 24 hr.clock)

23-Instructions to Lab: ___ 21-Collected by: JNM 22-Transported by: ___

Composite Sample Ending Date: 5 2 9 F 0 (Y Y M M D D)

Ending Time: 5 2 9 F 0 (H H M M, 24-hr.clock)

03-Lab Parameter Group: JND 11

| Additional Lab Parameters | Field Parameters | Results |
|---|---|---|
| | 501F0 Air Temp (°C) | |
| | 502F0 Water Temp (°C) | |
| | 504F0 Dissolved $O_2$ | |
| | 503F0 Conductance | |
| | 500F0 pH | |

27-Received By: UPS Date: 960925 (Y Y M M D D)

Received by: ___ Date: ___ (Y Y M M D D)

Circle One: Effluent, Stream, Influent, Sludge, Process Flows, Cooling Water; Specials: WWTP, Other

Program: ___

NPDES No: ___

Receiving Stream Name: Long Lake

Receiving Stream Conditions (velocity, etc): No flow noted, slight turbidity

Effluent Conditions: ___

RECEIVED IEPA OCT 28 1996 COLLINSVILLE OFFICE

Weather Conditions: PC ~ 75°F

Comments & Unusual Conditions & Severity: (If applicable, Stamp- "No Visible Problem This Visit")

Remarks: Just below (downstream) the recently constructed containment berm. This berm also channalizes the lake to the south of the area

Sampling Techniques: grab

Mail To:

FOR LABORATORY USE ONLY

LAB ID NO. B617617

Sample Received By: ___

Date Received: SEP 26 1996

Time Received: 9 AM ___ PM

Lab Section: ___

Supervisor: OCT 24 1996

IL 532-1575 WPC 526 8/87

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

NUMBER : B617617
ING POINT DESC. : CHEMETCO-LONG LAKE

BMITTING SOURCE # : SITE # :
ATE COLLECTED : 960924 TIME COLLECTED : 1510 SAMPLING PROGRAM : M6

OLLECTED BY : JNM DELIVERED BY : UPS
OMMENTS :
UNDING CODE : WP06 AGENCY ROUTING : CV UNIT CODE :
AM TYPE CODE : STRM SAMPLE PURPOSE CODE : S REPORTING INDICATOR : B

ATE RECEIVED : 960926 TIME RECEIVED : 0900 RECEIVED BY : PMD
AB OBSERVATIONS : TRIP BL SAM# :
UPERVISORS INITIALS : RPF NOTE : K = LESS THAN VALUE

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 00403 | PH-LABORATORY | UNITS | : 7.3 | P00530 | SOLIDS,TOT.SUS. | MG/L | : 126 |
| 00916 | CALCIUM,TOTAL | MG/L | : 480 | P00927 | MAGNESIUM,TOTAL | MG/L | : 98. |
| 00929 | SODIUM,TOTAL | MG/L | : 2400 | P00937 | POTASSIUM,TOTAL | MG/L | : 41. |
| 01105 | ALUMINUM,TOTAL | UG/L | : 2500 | P01007 | BARIUM,TOTAL | UG/L | : 190 |
| 01022 | BORON,TOTAL | UG/L | : 6200 | P01012 | BERYLLIUM,TOTAL | UG/L | : 1K |
| 01027 | CADMIUM,TOTAL | UG/L | : 180 | P01034 | CHROMIUM,TOTAL | UG/L | : 5K |
| 01042 | COPPER,TOTAL | UG/L | : 370 | P01037 | COBALT,TOTAL | UG/L | : 10K |
| 01045 | IRON,TOTAL | UG/L | : 1900 | P01051 | LEAD,TOTAL | UG/L | : 170 |
| 01055 | MANGANESE,TOTAL | UG/L | : 650 | P01067 | NICKEL,TOTAL | UG/L | : 96 |
| 01077 | SILVER,TOTAL | UG/L | : 3K | P01082 | STRONTIUM,TOTAL | UG/L | : 1400 |
| 01087 | VANADIUM,TOTAL | UG/L | : 7 | P01092 | ZINC,TOTAL | UG/L | : 720 |

EN EN 33

Sheet Color: IEPA - DWPC - FOS - LAB SHEET Field ID No.:

Funding Code: W P O 6 10-Agency Routing C ✓ 12-File Code: S T R M 13-Sample Type: S

Reporting: B 16-DID: Basin__ County__ Plant__ 17-Sampling Program: M L

18-Facility/Sample Pt: C H E M E T C O - L O N G L A K E

19-Begin Date: 9 6 0 9 2 4 (Y Y M M D D) 20-Begin 1 5 2 0 (H H M M) (24 hr.clock)

23-Instructions to Lab:

21-Collected by: J N M 22-Transported by:

27-Received By: UPS Date: 9 6 0 9 2 5 (Y Y M M D D)

Received by: Date: (Y Y M M D D)

Composite Sample Ending Date: 5 2 9 F 0 (Y Y M M D D)

Ending Time: 5 2 9 F 0 (H H M M) (24-hr.clock)

Circle One: Effluent, Stream, Influent, Process Flows, Sludge, Cooling Water

Specials: WWTP, Other

Program:

NPDES No:

Receiving Stream Name:

Receiving Stream Conditions (velocity, etc): grayish bottom deposits No flow noted

Effluent Conditions:

Weather Conditions: PC ~ 75°F

03-Lab Parameter Group: I N D 1 1

| Additional Lab Parameters | Field Parameters | Results |
|---|---|---|
| | 501F0 Air Temp (°C) | |
| | 502F0 Water Temp (°C) | |
| | 504F0 Dissolved $O_2$ | |
| | 503F0 Conductance | |
| | 500F0 pH | |

Comments & Unusual Conditions & Severity: (If applicable, Stamp- "No Visible Problem This Visit")

Northern side of bermed (impounded) area

Remarks:

Sampling Techniques: grab

Mail To:

FOR LABORATORY USE ONLY

LAB ID NO. B617618

Sample Received By:

Date Received: SEP 26 1996

Time Received: 9 AM PM

Lab Section:

Supervisor: OCT 24 1996

RECEIVED IEPA OCT 30 1996 COLLINSVILLE OFFICE

IL 532-1575 WPC 526 8/87

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

NUMBER : 3617618
LING POINT DESC. : CHEMETCO -LONG LAKE

UBMITTING SOURCE # : SITE # :
ATE COLLECTED : 960924 TIME COLLECTED : 1520 SAMPLING PROGRAM : M6

OLLECTED BY : JNM DELIVERED BY : UPS
OMMENTS :
UNDING CODE : WP06 AGENCY ROUTING : CV UNIT CODE :
AM TYPE CODE : STRM SAMPLE PURPOSE CODE : S REPORTING INDICATOR : B

ATE RECEIVED : 960926 TIME RECEIVED : 0900 RECEIVED BY : PMD
AB OBSERVATIONS : TRIP BL SAM# :
UPERVISORS INITIALS : RPF NOTE : K = LESS THAN VALUE

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| P00403 | PH-LABORATORY | UNITS | : 8.2 | P00530 | SOLIDS,TOT.SUS. | MG/L | : 114 |
| P00916 | CALCIUM,TOTAL | MG/L | : 84. | P00927 | MAGNESIUM,TOTAL | MG/L | : 28. |
| P00929 | SODIUM,TOTAL | MG/L | : 1700 | P00937 | POTASSIUM,TOTAL | MG/L | : 71. |
| P01105 | ALUMINUM,TOTAL | UG/L | : 1600 | P01007 | BARIUM,TOTAL | UG/L | : 75 |
| P01022 | BORON,TOTAL | UG/L | : 5900 | P01012 | BERYLLIUM,TOTAL | UG/L | : 2 |
| P01027 | CADMIUM,TOTAL | UG/L | : 1000 | P01034 | CHROMIUM,TOTAL | UG/L | : 5 |
| P01042 | COPPER,TOTAL | UG/L | : 3400 | P01037 | COBALT,TOTAL | UG/L | : 10K |
| P01045 | IRON,TOTAL | UG/L | : 2200 | P01051 | LEAD,TOTAL | UG/L | : 5300 |
| P01055 | MANGANESE,TOTAL | UG/L | : 840 | P01067 | NICKEL,TOTAL | UG/L | : 63 |
| P01077 | SILVER,TOTAL | UG/L | : 7 | P01082 | STRONTIUM,TOTAL | UG/L | : 390 |
| P01087 | VANADIUM,TOTAL | UG/L | : 5K | P01092 | ZINC,TOTAL | UG/L | : 1100 |

U.S. EPA - CLP

Dan Gillespie
244-3235

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

30

Lab Name: ARDL, INC. Contract No.: 2424

Lab Code: ARDL Case No.: ____ SAS No.: ____ SDG No.: X101

Matrix (soil/water) WATER Lab Sample ID: 2424-4

Level (low/med): LOW Date Received: 09/19/96

% Solids: 0.0

Concentration Units: (ug/L or mg/kg dry weight): UG/L

| CAS No. | Analyte | Concentration | | C | Q | M |
|---|---|---|---|---|---|---|
| 7429-90-5 | Aluminum | 689 | 689 | | | P |
| 7440-36-0 | Antimony | 98.0 | 98.0 | | | P |
| 7440-38-2 | Arsenic | 5.0 | 5.0 | U | N E | F |
| 7440-39-3 | Barium | 134 | 134 | B | | P |
| 7440-41-7 | Beryllium | 5.4 | 5.4 | | | P |
| 7440-43-9 | Cadmium | 2710 | 2710 | | | P |
| 7440-70-2 | Calcium | 23000 | 23000 | | E | P |
| 7440-47-3 | Chromium | 9.9 | 9.9 | B | | P |
| 7440-48-4 | Cobalt | 5.0 | 5.0 | U | | P |
| 7440-50-8 | Copper | 2920 | 2920 | | | P |
| 7439-89-6 | Iron | 1550 | 1550 | | | P |
| 7439-92-1 | Lead | 3310 | 3310 | | E | P |
| 7439-95-4 | Magnesium | 13700 | 13700 | | E | P |
| 7439-96-5 | Manganese | 259 | 259 | | | P |
| 7439-97-6 | Mercury | .2 6.2 | 6.2 | | | CV |
| 7440-02-0 | Nickel | 69.7 | 69.7 | | | P |
| 7440-09-7 | Potassium | 147000 | 147000 | | | P |
| 7782-49-2 | Selenium | 39.8 | 39.8 | B | N * W | F |
| 7440-22-4 | Silver | 5 5.0 | 5.0 | U | | P |
| 7440-23-5 | Sodium | 3670000 | 3670000 | | | P |
| 7440-28-0 | Thallium | 162 | 162 | | | P |
| 7440-62-2 | Vanadium | 5.0 | 5.0 | U | | P |
| 7440-66-6 | Zinc | 6310 | 6310 | | | P |
| | Cyanide | | | | | NR |

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

U.S. EPA - CLP

1

INORGANIC ANALYSIS DATA SHEET

EPA SAMPLE NO.

30

Lab Name: ARDL, INC. Contract: 2424

Lab Code: ARDL Case No.: _____ SAS No.: _____ SDG No.: X101

Matrix (soil/water): WATER Lab Sample ID: 2424-4

Level (low/med): LOW Date Received: 09/19/96

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

| CAS No. | Analyte | Concentration | C | Q | M |
|---|---|---|---|---|---|
| | pH (units) | 12.2 12.2 | | | |
| | TSS | 146000 | | | |

Color Before: _____ Clarity Before: _____ Texture: _____

Color After: _____ Clarity After: _____ Artifacts: _____

Comments:

# Attachment Q

# PCS Enforcement Actions Report

PERMIT COMPLIANCE SYSTEM - REGION V
EFFLUENT VIOLATION DATA REPORT

QL ********** QL

```
NPID      FNMS                          MADI CYNM                 PERD     PERE     BAS6  RWAT
--------- ----------------------------- ---- -------------------- -------- -------- ------ ----------------------------------
DSDG MLSD     MLED     FLSD     FLED     PIPE                           PRAM                                      FRAN  SAMP
---- -------- -------- -------- -------- ------------------------------ ----------------------------------------- ----- ----
LQUC          LQAV     LQMX     ELSD     ELED     ALLS         MLOC SEAN MODN LCUC         LCMN     LCAV     LCMX
------------- -------- -------- -------- -------- ------------ ---- ---- ---- ------------ -------- -------- --------
              LQAS     LQXS                                                                LCMS     LCAS     LCXS
              -------- --------                                                            -------- -------- --------
              MQAV     MQMX     MVDT     MVIO                           NODI COLS VDSG     MCMN     MCAV     MCMX
              -------- -------- -------- ------------------------------ ---- ---- ----     -------- -------- --------


IL0025747 CHEMETCO INC.-ALTON                HARTFORD            05/20/96 04/30/01 071800 LONG LAKE
0020                   09/01/90 05/31/95 STORMWATER RUNOFF            SOLIDS, TOTAL       SUSPENDED            02/30 08
      LBS/DY   DELMON   DELMON 09/01/90 05/31/95 YYYYYYYYYYYY 1    0    0          MG/L     DELMON       15       30
             30DA AVG DAILY MX                                                                   30DA AVG DAILY MX
                               11/30/92 NUMERIC VIOLATION                     0020                  28       28
                               12/31/92 NUMERIC VIOLATION                     0020                  16       16
                               04/30/94 NUMERIC VIOLATION                     0020                  69       69
                               05/31/94 NUMERIC VIOLATION                     0020                  27
                               05/31/95 NUMERIC VIOLATION                     0020                  52       52

0020                   09/01/90 05/31/95 STORMWATER RUNOFF            OIL AND GREASE      (SOXHLET EXTR.) TOT. 01/30 GR
      LBS/DY   DELMON   DELMON 09/01/90 05/31/95 YYYYYYYYYYYY 1    0    0          MG/L     DELMON     15.0     30.0
             30DA AVG DAILY MX                                                                   30DA AVG DAILY MX
                               11/30/93 NUMERIC VIOLATION                     0020                 41.3     41.3
                               09/30/94 NUMERIC VIOLATION                     0020                 34.6

0020                   09/01/90 05/31/95 STORMWATER RUNOFF            CADMIUM, TOTAL            (AS CD)        02/30 08
      LBS/DY   DELMON   DELMON 09/01/90 05/31/95 YYYYYYYYYYYY 1    0    0          MG/L     DELMON     0.15      0.3
             30DA AVG DAILY MX                                                                   30DA AVG DAILY MX
                               05/31/96 NUMERIC VIOLATION                     0020                0.231    0.231

0020                   09/01/90 05/31/95 STORMWATER RUNOFF            COPPER, TOTAL       (AS CU)              02/30 08
      LBS/DY   DELMON   DELMON 09/01/90 05/31/95 YYYYYYYYYYYY 1    0    0          MG/L     DELMON      0.5      1.0
             30DA AVG DAILY MX                                                                   30DA AVG DAILY MX
                               04/30/94 NUMERIC VIOLATION                     0020                 .619     .619
                               05/31/94 NUMERIC VIOLATION                     0020                 .554
                               08/31/95 NUMERIC VIOLATION                     0020                 0.51     0.51
                               04/30/96 NUMERIC VIOLATION                     0020                0.567    0.567
                               05/31/96 NUMERIC VIOLATION                     0020                0.902    0.902

0020                   09/01/90 05/31/95 STORMWATER RUNOFF            IRON, TOTAL               (AS FE)        01/30 08
      LBS/DY   DELMON   DELMON 09/01/90 05/31/95 YYYYYYYYYYYY 1    0    0          MG/L     DELMON      2.0      4.0
             30DA AVG DAILY MX                                                                   30DA AVG DAILY MX
                               04/30/94 NUMERIC VIOLATION                     0020                 4.35     4.35
                               05/31/95 NUMERIC VIOLATION                     0020                 3.47     3.47

0020                   09/01/90 05/31/95 STORMWATER RUNOFF            LEAD, TOTAL         (AS PB)              02/30 08
```

PERMIT COMPLIANCE SYSTEM - REGION V
EFFLUENT VIOLATION DATA REPORT

QL ********** QL

NPID FNMS MADI CYNM PERD PERE BAS6 RWAT

DSDG MLSD MLED FLSD FLED PIPE PRAM FRAN SAMP

LQUC LQAV LQMX ELSD ELED ALLS MLOC SEAN MODN LCUC LCMN LCAV LCMX
LQAS LQXS LCMS LCAS LCXS
MQAV MQMX MVDT MVIO NODI COLS VDSG MCMN MCAV MCMX

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LBS/DY | DELMON | DELMON | 09/01/90 | 05/31/95 | YYYYYYYYYYYY | 1 | 0 | 0 | MG/L | DELMON | 0.2 | 0.4 |
| | | 30DA AVG | DAILY MX | | | | | | | | | 30DA AVG | DAILY MX |
| | | | | 05/31/93 | NUMERIC VIOLATION | | | | | 0020 | | .27 | .28 |
| | | | | 06/30/93 | NUMERIC VIOLATION | | | | | 0020 | | .30 | .38 |
| | | | | 07/31/93 | NUMERIC VIOLATION | | | | | 0020 | | .31 | .32 |
| 0020 | | | 09/01/90 | 05/31/95 | STORMWATER RUNOFF | | | | MANGANESE, TOTAL | | | (AS MN) | 01/30 08 |
| | LBS/DY | DELMON | DELMON | 09/01/90 | 05/31/95 | YYYYYYYYYYYY | 1 | 0 | 0 | MG/L | DELMON | 1.0 | 2.0 |
| | | 30DA AVG | DAILY MX | | | | | | | | | 30DA AVG | DAILY MX |
| | | | | 01/31/93 | NUMERIC VIOLATION | | | | | 0020 | | 2.83 | 3.47 |
| | | | | 04/30/93 | NUMERIC VIOLATION | | | | | 0020 | | 1.19 | 1.19 |
| | | | | 05/31/93 | NUMERIC VIOLATION | | | | | 0020 | | 1.12 | 1.22 |
| | | | | 06/30/93 | NUMERIC VIOLATION | | | | | 0020 | | 1.09 | 1.23 |
| | | | | 07/31/93 | NUMERIC VIOLATION | | | | | 0020 | | 1.21 | 1.21 |
| | | | | 09/30/93 | NUMERIC VIOLATION | | | | | 0020 | | 1.23 | 1.23 |
| | | | | 11/30/93 | NUMERIC VIOLATION | | | | | 0020 | | 1.77 | 1.81 |
| | | | | 05/31/94 | NUMERIC VIOLATION | | | | | 0020 | | 1.55 | |
| | | | | 09/30/94 | NUMERIC VIOLATION | | | | | 0020 | | 9.93 | |
| | | | | 11/30/94 | NUMERIC VIOLATION | | | | | 0020 | | 2.07 | |
| | | | | 01/31/95 | NUMERIC VIOLATION | | | | | 0020 | | 4.25 | |
| | | | | 03/31/95 | NUMERIC VIOLATION | | | | | 0020 | | 2.44 | 2.44 |
| | | | | 08/31/95 | NUMERIC VIOLATION | | | | | 0020 | | 6.41 | 6.41 |
| | | | | 03/31/96 | NUMERIC VIOLATION | | | | | 0020 | | 8.57 | 8.57 |
| | | | | 04/30/96 | NUMERIC VIOLATION | | | | | 0020 | | 7.51 | 7.51 |
| | | | | 05/31/96 | NUMERIC VIOLATION | | | | | 0020 | | 18.4 | 18.4 |
| 0020 | | | 09/01/90 | 05/31/95 | STORMWATER RUNOFF | | | | NICKEL, TOTAL | | | (AS NI) | 02/30 08 |
| | LBS/DY | DELMON | DELMON | 09/01/90 | 05/31/95 | YYYYYYYYYYYY | 1 | 0 | 0 | MG/L | DELMON | 1.0 | 2.0 |
| | | 30DA AVG | DAILY MX | | | | | | | | | 30DA AVG | DAILY MX |
| | | | | 12/31/92 | NUMERIC VIOLATION | | | | | 0020 | | 1.17 | 1.52 |
| | | | | 01/31/93 | NUMERIC VIOLATION | | | | | 0020 | | 11.0 | 14.8 |
| | | | | 04/30/93 | NUMERIC VIOLATION | | | | | 0020 | | 2.72 | 5.25 |
| | | | | 05/31/93 | NUMERIC VIOLATION | | | | | 0020 | | 1.07 | 1.68 |
| | | | | 08/31/93 | NUMERIC VIOLATION | | | | | 0020 | | 1.13 | 1.70 |
| | | | | 09/30/93 | NUMERIC VIOLATION | | | | | 0020 | | 2.20 | 2.70 |
| | | | | 10/31/93 | NUMERIC VIOLATION | | | | | 0020 | | 1.58 | 1.58 |
| | | | | 11/30/93 | NUMERIC VIOLATION | | | | | 0020 | | 16.0 | 16.2 |
| | | | | 04/30/94 | NUMERIC VIOLATION | | | | | 0020 | | 1.64 | 1.64 |

PERMIT COMPLIANCE SYSTEM - REGION V
EFFLUENT VIOLATION DATA REPORT

QL ********** QL

```
NPID      FNMS                          MADI CYNM                PERD     PERE     BAS6   RWAT
--------- ------------------------------ ---- -------------------- -------- -------- ------ ------------------------------------
DSDG MLSD     MLED     FLSD     FLED     PIPE                          PRAM                                          FRAN  SAMP
---- -------- -------- -------- -------- ------------------------------ ------------------------------------------ ----- ----
LQUC          LQAV     LQMX     ELSD     ELED     ALLS         MLOC SEAN MODN LCUC         LCMN     LCAV     LCMX
------------ -------- -------- -------- -------- ------------ ---- ---- ---- ------------ -------- -------- --------
              LQAS     LQXS                                                                LCMS     LCAS     LCXS
              -------- --------                                                            -------- -------- --------
              MQAV     MQMX     MVDT     MVIO                          NODI COLS VDSG     MCMN     MCAV     MCMX
              -------- -------- -------- ------------------------------ ---- ---- ----     -------- -------- --------

                                05/31/94 NUMERIC VIOLATION                      0020                3.42
                                11/30/94 NUMERIC VIOLATION                      0020                3.81
                                01/31/95 NUMERIC VIOLATION                      0020                7.96
                                03/31/95 NUMERIC VIOLATION                      0020                5.35     5.35
                                08/31/95 NUMERIC VIOLATION                      0020                3.59     3.59
                                03/31/96 NUMERIC VIOLATION                      0020                9.46     9.46
                                04/30/96 NUMERIC VIOLATION                      0020                10.6     10.6
                                05/31/96 NUMERIC VIOLATION                      0020                18.9     18.9

0020                  09/01/90 05/31/95 STORMWATER RUNOFF              ZINC, TOTAL        (AS ZN)              02/30 08
     LBS/DY   DELMON   DELMON 09/01/90 05/31/95 YYYYYYYYYYYY 1    0    0          MG/L     DELMON      1.0      2.0
              30DA AVG DAILY MX                                                                  30DA AVG DAILY MX
                                12/31/92 NUMERIC VIOLATION                      0020                1.11     1.18
                                01/31/93 NUMERIC VIOLATION                      0020                2.12     2.80
                                04/30/93 NUMERIC VIOLATION                      0020                1.20     2.05
                                06/30/93 NUMERIC VIOLATION                      0020                1.04     1.14
                                07/31/93 NUMERIC VIOLATION                      0020                1.10     1.13
                                09/30/93 NUMERIC VIOLATION                      0020                1.01     1.10
                                10/31/93 NUMERIC VIOLATION                      0020                1.54     1.54
                                11/30/93 NUMERIC VIOLATION                      0020                2.45     2.47
                                05/31/94 NUMERIC VIOLATION                      0020                1.83
                                11/30/94 NUMERIC VIOLATION                      0020                1.39
                                01/31/95 NUMERIC VIOLATION                      0020                1.80
                                03/31/95 NUMERIC VIOLATION                      0020                2.14     2.14
                                05/31/95 NUMERIC VIOLATION                      0020                1.13     1.13
                                08/31/95 NUMERIC VIOLATION                      0020                1.81     1.81
                                03/31/96 NUMERIC VIOLATION                      0020                2.96     2.96
                                04/30/96 NUMERIC VIOLATION                      0020                3.72     3.72
                                05/31/96 NUMERIC VIOLATION                      0020                4.58     4.58

                                          SUB-TOTAL QUICK LOOK PRINT LINES:     96

                                           TOTAL QUICK LOOK PRINT LINES:            96
```

DISPLAY COMPLIANCE SCHEDULES

QL ********** QL

| PERMIT NUMBER | FACILITY NAME SHORT | MAJ/MIN IND | | | | |
|---|---|---|---|---|---|---|
| | CS NUM | CS EVNT CD | CS DATE | CS ACT DT | CS COMMENTS | DOCKET NUMBER |
| IL0025747 | CHEMETCO INC.-ALTON | MINOR | | | | |
| | 09 | STORMWATER CONTROL | 07/20/97 | | SWPP ANNUAL INSPECTION REPORT | |
| | 09 | STORMWATER CONTROL | 07/20/98 | | SWPP ANNUAL INSPECTION REPORT | |
| | 09 | STORMWATER CONTROL | 07/20/99 | | SWPP ANNUAL INSPECTION REPORT | |
| | 09 | STORMWATER CONTROL | 07/20/00 | | SWPP ANNUAL INSPECTION REPORT | |

SUB-TOTAL QUICK LOOK PRINT LINES: 5

TOTAL QUICK LOOK PRINT LINES: 5

Attachment R

Report of U.S. EPA CWA Compliance Evaluation

Inspection, conducted at Chemetco on September 22, 1997

Collinsville

State of Illinois
# ENVIRONMENTAL PROTECTION AGENCY

Mary A. Gade, Director

2200 Churchill Road, Springfield, IL 62794-9276

217/524-3300

March 29, 1995

Mr. John R. Washburn
Illinois Department of Transportation
Design and Environment
2300 South Dirksen Parkway
Springfield, Illinois 62764

RECEIVED
IEPA
APR 04 1995
COLLINSVILLE

Re: 1198010003--Madison County
Chemetco
ILD048843809
Permit File

Dear Mr. Washburn:

This letter has been written in response to the questions you raised at our meeting of March 21, 1995, regarding the use of copper slag generated by Chemetco. Pursuant to consent order No. 88-CH-200, the Agency issued a letter dated July 15, 1988. This letter stated that the Agency had concerns with the amount of lead and cadmium found in the slag. Our letter also suggested that the use of the slag should be limited to concrete aggregate unless the slag is placed in areas located above the high water table and covered to prevent infiltration of surface waters.

The July 15, 1988, letter was written before the Land Disposal Restrictions (LDRs) became effective in Illinois. The regulations now require that all products used in a manner constituting disposal meet the applicable treatment stands in 35 Ill. Adm. Code 728.Subpart D. To further complicate matters, on February 19, 1994, federal regulations were promulgated which amend 40 CFR 268 to include different land disposal restrictions than those currently enforced by the Agency. The new set of treatment standards are referred to as the "Universal Treatment Standards or UTS." Since the UTS are not effective in Illinois, the product used in a manner constituting disposal must comply with both the LDRs and UTS.

The Agency suggests that you limit the use of copper from Chemetco to an aggregate in concrete or subbase in areas above the high water table. Prior to using the material, you

cc

3. Off-site use of the slag as parking lot or railroad ballast material may cause a violation of the Act, since these uses could result in significant amounts of lead and probably cadmium leaching into the environment. Specifically, off-site use of the slag as parking lot or railroad ballast material appears to be too "open" to the environment and runs the risk of potentially being a long-term source of lead and cadmium to any environment in which the slag might be placed.

The above comments were based on the EP Tox results for lead (all three testing regimes) indicating that leachate from the slag will not exhibit a hazardous characteristic.

The above are only offered as comments. Any final decision regarding the use of the slag rests with Chemetco. While the Agency supports beneficial uses of materials which might otherwise be classed as wastes, Chemetco would in no way be excused from any violations of the Act which may occur.

Very truly yours,

Lawrence W. Eastep

Lawrence W. Eastep, P.E., Manager
Permit Section
Division of Land Pollution Control

LWE:GTR:tk:5/11/47-3

cc: Collinsville Region
Division File
Roger Kanerva
Larry Eastep
Harry Chappel
Bruce Carlson
Glenn Savage
Bill Child
Jim O'Brien
Mark Haney, ERT

Collinsville

Illinois Environmental Protection Agency · P.O. Box 19276, Springfield, IL 62794-9276

SLAG FILE

217/782-6762

Refer to: LPC #1198010003 -- Madison County
Chemetco
ILD048843809

July 15, 1988

RECEIVED
IEPA
JUL 1 3 1988
COLLINSVILLE OFFICE

Mr. David Hoff, President
Chemetco
P.O. Box 187
Alton, IL 62002

Dear Mr. Hoff:

Pursuant to the recently approved Consent Order (No. 88-CH-200) the Agency has reviewed the analytical data of the re-analysis of the slag from Chemetco's Alton facility. Based on the analysis that was run by the L.C. Metals Laboratory and the IEPA's Laboratory, we are in agreement that the slag is not a RCRA hazardous waste.

The Agency has also reviewed the document entitled "Justification for the Use of Secondary Copper Smelting Slag in Construction Projects" submitted to the Agency by Mark Haney, ERT, under a cover letter dated June 2, 1988. The document proposes four (4) types of off-site construction uses for the chunky slag from Chemetco's Alton facility. The following are the Agency's comments on the proposed off-site uses of the slag:

1. Incorporation of the slag into a solid matrix-like concrete should result in minimal leaching of lead and cadmium and is, therefore, the Agency's preferred off-site use of the slag.

2. If the slag is used as roadbed material, steps should be taken to keep the potential leaching of lead and cadmium to an absolute minimum. Care should be taken to minimize infiltration and prohibit any potential leachate from impacting the environment. It would also be necessary to use the slag only in sites which will always be above the groundwater table and which are removed from permanent surface water bodies.

KM
CR PMM
MG

must insure that it complies with all appropriate LDR's and UTS, including those standards established for listed wastes from which the material was derived.

If you have any questions concerning this matter, please contact Ted Dragovich, P.E. at 217/524-3300.

Sincerely,

Harry A. Chappel, P.E.
Hazardous Waste Branch Manager
Permit Section, Bureau of Land

HAC:TJD

bcc: Bureau File
Collinsville Region
Jerry Kuhn, RCRA
Ted Dragovich
Harry Chappel

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
DIVISION OF LEGAL COUNSEL
1021 NORTH GRAND AVENUE E., P.O. BOX 19276
SPRINGFIELD, ILLINOIS 62794-9276
TELEPHONE (217)782-5544•FACSIMILE (217)782-9807

DATE: 6/30/99

# FACSIMILE TRANSMITTAL SHEET

PLEASE DELIVER THE FOLLOWING PAGE(S) TO:

PARTY'S NAME: Tom Martin

FIRM/COMPANY'S NAME:

FACSIMILE NO.: 312 886-0747

TELEPHONE NO.:

FROM: Chris Pezan

TOTAL NUMBER OF PAGES (INCLUDING THIS PAGE): 5

HARD COPY ____WILL ____WILL NOT FOLLOW.

IF YOU DO NOT RECEIVE ALL OF THE PAGES, PLEASE CALL 217-782-5544.

COMMENTS: Chemtco

IMPORTANT - THIS MESSAGE IS INTENDED ONLY FOR THE USE OF THE INDIVIDUAL OR ENTITY TO WHICH IT IS ADDRESSED, AND MAY CONTAIN INFORMATION THAT IS PRIVILEGED, CONFIDENTIAL, AND EXEMPT FROM DISCLOSURE UNDER APPLICABLE LAW. IF THE READER OF THE MESSAGE IS NOT THE INTENDED RECIPIENT, OR THE EMPLOYEE OR AGENT RESPONSIBLE TO DELIVER IT TO THE INTENDED RECIPIENT, YOU ARE HEREBY NOTIFIED THAT READING, DISSEMINATING, DISTRIBUTING, OR COPYING THIS COMMUNICATION IS STRICTLY PROHIBITED. IF YOU HAVE RECEIVED THIS COMMUNICATION IN ERROR, PLEASE IMMEDIATELY NOTIFY US BY TELEPHONE, AND RETURN THE ORIGINAL MESSAGE TO US AT THE ABOVE ADDRESS VIA THE U.S. POSTAL SERVICE. THANK YOU.

Chemetco

FIRST IN PEOPLE – QUALITY – SERVICE

P.O. BOX 187 • ALTON, ILLINOIS 62002

cc: Marion
Collinsville } FOS
Region V
Dave Mick
JKM
+ return

Mailed Certified No. P 896 689 024

(6)

April 10, 1992

Kenn Liss, Manager
Groundwater Unit
Division of Land Pollution Control
Illinois Environmental Protection Agency
P. O. Box 19276
Springfield, Illinois 62794-9276

RECEIVED
JUN 29 1992
OFFICE OF RCRA
Waste Management Division
U.S. EPA, REGION V

RE: I.D. No. 1198010003 -- Madison County
Chemetco, Inc.
4/1/92 Meeting Memoranda

Dear Mr. Liss,

Following please find a memo written by myself as I understood the contents of our meeting on April 1, 1992. This is in response to your statement that written notes of the meeting and my interpretation would be helpful.

If you have any disagreements with either the contents of the "Agency Position" or my understanding and interpretation of the "Proposed Plan for Resolution", please let m earliest convenience. By phone I can be reached at 618-254-4381, Ext. 219.

4.10.92
Chemetco letter to IEPA
DKopsky

Sincerely,

Michelle

Michelle Reznack
Environmental Manager

Enclosures
cc: file

RECEIVED
APR 21 1992
IEPA-DLPC

**DATE:** April 3, 1992

**TO:** Doug Simmons, ENSR
Dave Hoff, Chemetco
Kenn Liss, IEPA
file

**FROM:** Michelle Reznack

**RE:** Memoranda from meeting 4/2/92, 1:30 p.m., IEPA offices
Concerning Chemetco Closure Plan

---

**MEETING ATTENDEES:**

Michelle Reznack, Chemetco
Doug Simmons, ENSR (for Chemetco)
Kenn Liss, IEPA
Teri Blake Myers, IEPA
Jim Moore, IEPA
David Mick, IEPA

**CHEMETCO POSITION:**

Chemetco requested this meeting to again attempt to resolve an issue surrounding the sampling and analysis of wells for the Appendix I constituents. Prior to this meeting, Chemetco submitted two closure plan modifications requesting that this one condition be changed to reflect agreements reached at a November 15, 1990 meeting at IEPA offices with Cindy Davis.

Chemetco believes that:

1) monitoring ALL wells in the detection program for Appendix I organic constituents is an arbitrary, not site specific, reading of the regulations;

2) the spirit of verbal and written agreements is not met with the inclusion of this condition and IEPA has failed to negotiate in good faith. This condition should reflect the use of the word "principally" in Glenn Savage's letter, date October 24, 1989. As used in his letter, the word implies some flexibility as the closure at Chemetco is not a strict "dirty closure" and further in the letter, the parameters to be measured, "Parameters to be monitored for in the groundwater monitoring program are those found in the closure approval letter dated December 2, 1989 from Lawrence W. Eastep. P.E.", were clearly spelled out.

3) we have given in to many Agency "wants" based on the understanding that we would NOT have an expensive organics monitoring program. These include the addition of several unneccessary monitoring wells to the program, the addition of some monitoring parameters known not to be of concern at the site, a rather expensive and extensive program to collect groundwater in an aquifer not known to be contaminated by facility activities, and continued monitoring of wells that will be considered upgradient once the collection system is completely installed and operational;

Chemetco came to the meeting on November 15 with Cindy Davis to negotiate from two distant positions with respect to Appendix I and plainly voiced two positions:

a) the inclusion of Appendix I parameters for all wells was a deal-breaker;
b) we were not doing anymore work at the facility until all aspects of the closure plan were settled. That statement was clearly said and understood to include well placement, construction, remediation, sampling and analyses, clean-up levels, etc.

Cindy enthusiastically agreed with the second statement and said the Agency didn't want Chemetco to proceed with any unapproved work. Chemetco made it clear to Cindy before we left that we had an agreement and the submitted Closure Plan would reflect those agreements **to the letter** and any surprises in the Closure approval would be considered bad faith. My instructions to Doug Simmons were to write the Closure Plan in the manner we agreed to in the meeting. He did do that explicitly.

Chemetco's position, still, is that the condition to monitor all wells for Appendix I parameters is a "deal-breaker." We had hoped to use this meeting to resolve the issue satisfactorily to both sides.

In an effort to try to bring some of the new Agency employees "up to speed" on the Chemetco site, I did a quick review of how we got to our present position.

**AGENCY POSITION:**

The Agency stated that written records do not reflect an agreement to limit organic monitoring and the regulations at 724 Subpart F, require that it be done. The Agency feels that Chemetco has not done much work, only does that that is "beneficial to Chemetco," and does not give the Agency all the work they want done. The Agency feels they have a defendable position with regards to the Appendix I monitoring and see no reason to not require that all wells be monitored.

However, Kenn Liss said that he can see that in the "interest of good science" that there may be some justification for reducing the number of wells for the Appendix I list.

Following a private meeting by the Agency personnel, they rejoined Doug and I and suggested that rather than filing an appeal, we resubmit a modification request for a fewer number of wells to be included in the organic monitoring program; however, the request must include all items listed below in the "Proposed Plan for Resolution" to be considered "complete" and reviewable. IEPA also suggested that, for the time being, Chemetco concentrate on the agreed upon work in the approval letter and that Appendix I would not be required until December of 1992.

Chemetco can also expect to receive a CIL (Compliance Inquiry Letter) for not performing Appendix I analyses in January, not filing an annual report for groundwater analyses and possibly, not being in compliance with the permit approval letter. IEPA will also be, at some future date, sending a letter to call in the Post-Closure (Part B) permit.

**PROPOSED PLAN FOR RESOLUTION:**

Chemetco will prepare and submit a request for closure plan modification to IEPA which will:

1) Address the Appendix I issue and include:

   a) justifications for a reduced number of Appendix I monitoring wells;
   b) parameter list and wells to be monitored;
   c) anything found in the groundwater and the zinc oxide waste and floor wash water impoundment samples;
   d) address the Class I and/or Class II standards and parameter list.

2) Include the current compliance status, including any remediation already in place, plans and schedules, any groundwater analyses performed, etc.

If they deny the third request (and Kenn said all of the above "doesn't mean either party can't change their minds") we can appeal and go before the Pollution Control Board if we choose.

Pg 6/8

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# Justification for the Use of Secondary Copper Smelting Slag in Construction Projects

## Chemetco, Incorporated
## Hartford, Illinois

Prepared for:

**Chemetco, Inc.**
Hartford, IL

June 1988

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APPENDIX B Letter of February 9, 1988 from IDOT
APPENDIX C Everett Report on Slag Use
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# 1. INTRODUCTION

Chemetco generates as one of its four products approximately 250 tons per day of a molten primarily iron - silicate slag. The cooled slag is a hard, dense and inert material produced in the secondary copper smelting process. As explained below, Chemetco in 1987 changed its method of handling the molten slag, thus changing the physical characteristics (primarily size) of the solidified material.

Prior to 1987, molton slag was produced in and poured from the top blown rotary converters (TBRCs), or furnaces, into a slag pot which was then hauled from the production area to slag cooling pits on the southern face of the present slag pile. The molten material was poured from the Kress slag hauler into one of the four cooling pits whereupon it slowly cooled and solidified. The solidified slag was then broken up as necessary and added to the slag pile. This process produced what has been referred to by some as "chunky slag". Chunky slag varies in size from that of sand grains to as much as four inches across or larger. Chemetco has stockpiled the material in the slag pile located on the northeast corner of the facility. The volume of material in the pile is currently estimated at 180,000 cubic yards with a weight of approximately 700,000 tons.

Beginning in September 1987, Chemetco initiated a modified process which features rapid cooling of molten slag to produce granulated slag, a product used as granules on asphalt shingles or abrasive grit for shotblasting. Molten slag is granulated by being poured as a narrow stream into a high pressure spray of ambient temperature water. The granulated slag is then screened and shipped by rail to an Alabama shingle manufacturer.

Virtually all of Chemetco's current slag production is granulated and sold. However, due to temperature or other factors an occasional heat will not be amenable to granulation. In these limited cases, the molten material is slow cooled by the former process and stored in an area

separate from the older chunky slag. This limited volume of solidified slag is charged back into the TBRCs to facilitate slagging as needed on production heats.

This proposal focuses on the slag now stored in the pile on-site. The chunky slag has physical and chemical properties that make it an appropriate material for use in the construction of various projects including highway embankments (see Appendix A for letter from IDOT), parking lots and railway embankments. The impediment to its use in that manner revolves around Illinois Environmental Protection Agency (IEPA) concerns as to the slag's possible classification as a hazardous waste and any potential environmental impact of such construction use. As described in Section 3, sampling has been completed and analyses confirm that the material is not E.P. Toxic and, therefore, not a hazardous waste. This proposal also addresses in detail IEPA's second concern as to potential for environmental impact.

This proposal summarizes IEPA/Chemetco negotiations in Section 2, describes sampling efforts and analytical results in Section 3, and covers physical and chemical properties of the chunky slag in Section 4. The proposed use of the slag in highway construction is outlined in Section 5, other construction uses are described in Section 6, and potential environmental effects are evaluated in Section 7.

A compendium of slag sampling and evaluation efforts was previously provided to IEPA in March 1987. This proposal summarizes and supplements Everett and Associates' March, 1986 "Evaluation of Environmental Processes and Consequences of Using Secondary Copper Smelter Slag in Highway Embankments, Western Madison County, Illinois". This document may be found in its entirety as Appendix C. The reader is referred to Appendix C for additional details supporting this proposal.

## 2. REGULATORY/TECHNICAL ISSUES

Samples of the slag have been analyzed on separate occasions by various laboratories for E.P. Toxicity. Sixty samples were initially analyzed in March 1985 by a laboratory affiliated with Chemetco. All sample results were below the E.P. Toxicity threshold values for lead and cadmium.

To obtain confirmation of these results, a group of 20 samples from among those showing the highest leachate concentrations was selected by U.S. EPA, Region V, for analysis by U.S. Testing Company of New Jersey. This second round of testing conducted in July 1985, also failed to show any exceedence of the maximum E.P. Toxicity levels for lead or cadmium.

Additional analyses of the selected set of 20 high concentration samples also were conducted by IEPA in June 1985 and U.S. EPA, Region V in December 1985 in their own respective laboratories. Both of these sets of analyses reported some samples with leachate concentrations that exceeded the E.P. Toxicity level for lead. It is these results that form the basis for concerns expressed by IEPA over the potential toxicity of the the Chemetco slag, the proposed classification of the slag as a hazardous waste, and the slag pile as a hazardous waste management unit.

A series of correspondence and discussions were exchanged between Chemetco and U.S. EPA during 1986 and 1987. This culminated in a June 1987 meeting held at U.S. EPA Region V offices in Chicago, during which Chemetco was informed that the issue of whether or not the slag is hazardous could be settled only by an additional round of sampling of the 60 original samples. The results of the additional sampling would supercede all previous results, and would provide the basis for a hazardous/non-hazardous declaration on the chunky slag. Results of this completed exercise are provided in Section 3.

The slag and the slag pile were further discussed in a series of technical negotiations during late 1987 and early

1988. The outcome of those negotiations is embodied in the February 1988 IEPA/Chemetco Summary of Technical Agreement. As Item 3 of the Summary indicates, Chemetco will be allowed to use the slag off-site, assuming it is non-hazardous and further assuming that Chemetco can demonstrate such off-site use will be protective of human health and the environment. As Chemetco has stated previously, it believes that use of slag in construction of highway embankments and parking lots and as railroad ballast is both an efficient method of dealing with the "old" slag pile as well as being protective of human health and the environment.

In addition to proposing off-site use of slag for construction purposes Chemetco has used slag for various projects on-site. As discussed in the technical negotiations such uses of the non-hazardous slag on-site are acceptable to IEPA and not subject to Illinois special or hazardous waste regulation.

# 3. SLAG SAMPLING/ANALYSIS

## E.P. Toxicity

In accordance with the approved Quality Assurance Project Plan (QAPP), 72 slag samples were collected from 60 previously prepared sample bags on March 3, 1988 by David Costolnick, ERT hydrogeologist. Sample containers were sealed upon completion of sampling efforts and immediately transported under chain-of-custody procedures to the U.S. EPA/IEPA approved analytical laboratory, L.C. Metals, Inc. Compositing of 60 samples into 20 samples for analysis was completed on March 4, 1988.

Chemetco was notified in writing of the approval of the L.C. Metals laboratory for E.P. toxicity testing on April 8, 1988. Preparations were then made for IEPA personnel to attend and observe the E.P. Toxicity extractions, which began on April 14, 1988. IEPA personnel observed the laboratory procedures from April 19 until April 21, 1988, taking six sample extracts for analysis for lead and cadmium in IEPA laboratories.

L.C. Metals completed E.P. Toxicity extractions and analysis of the extracts for lead and cadmium on May 13, 1988. Results of the slag testing are presented in Table 3-1.

As the analytical results indicate, the mean of 20 samples is less than 5.0 mg/l for lead and less than 1.0 mg/l for cadmium. Chemetco therefore concludes that the chunky slag is not a RCRA regulated hazardous waste.

## Simulated Leach Testing

Chemetco has conducted additional testing on slag samples aimed at simulating hypothetical situations of precipitation infiltration through the slag, and resulting leaching of metals from the slag into the infiltrate.

TABLE 3-1

SLAG PROJECT TLRU, MARCH 1988

| Comp # | Date of Analysis | Date of Extraction | Pb mg/L | Cd mg/L |
|---|---|---|---|---|
| 1 | 18-Apr | 14-Apr | 3.22 | 0.130 |
| 2 | 06-May | 04-May | 2.00 | 0.068 |
| 3 | 06-May | 05-May | 1.95 | 0.085 |
| 4 | 18-Apr | 15-Apr | 2.09 | 0.150 |
| 5 | 13-May | 12-May | 5.70 | 0.228 |
| 5 dup | 27-Apr | 26-Apr | 6.00 | 0.242 |
| 6 | 18-Apr | 17-Apr | 1.85 | 0.029 |
| 7 | 10-May | 06-May | 2.25 | 0.052 |
| 8 | 06-May | 03-May | 4.19 | 0.296 |
| 9 | 21-Apr | 18-Apr | 2.94 | 0.023 |
| 10A | 25-Apr | 19-Apr | 2.00 | 0.060 |
| 10B | 25-Apr | 20-Apr | 2.64 | 0.052 |
| 11 | 03-May | 02-May | 2.77 | 0.044 |
| 12 | 03-May | 30-Apr | 1.40 | 0.050 |
| 13 | 25-Apr | 21-Apr | 5.33 | 0.220 |
| 14 | 25-Apr | 23-Apr | 5.60 | 0.075 |
| 15A | 30-Apr | 27-Apr | 2.17 | 0.018 |
| 15B | 13-May | 09-May | 2.98 | 0.028 |
| 15C | 13-May | 10-May | 2.44 | 0.015 |
| 16 | 25-Apr | 22-Apr | 3.06 | 0.119 |
| 17 | 30-Apr | 28-Apr | 0.52 | 0.107 |
| 18 | 10-May | 07-May | 6.33 | 0.121 |
| 19 | 27-Apr | 24-Apr | 1.30 | 0.017 |
| 20A | 03-May | 29-Apr | 1.47 | 0.045 |
| 20B | 10-May | 08-May | 2.79 | 0.022 |

| | Pb | Cd |
|---|---|---|
| - Without Duplicates | | |
| Number of Duplicates | 20 | 20 |
| Σ | 58.15 | 1.937 |
| Range | 0.52-6.33 | 0.017-0.296 |
| $\bar{X}$ | 2.91 | 0.097 |
| - With Duplicates | | |
| Number of Samples | 25 | 25 |
| Σ | 75.00 | 2.296 |
| Range | 0.52-6.33 | 0.015-0.296 |
| $\bar{X}$ | 3.00 | 0.092 |

In the first test, completed January 1987, simulation of a 4.5 pH acid rain at ambient temperature for a 54-hour period was conducted. To perform this test 100 grams of chunky slag material were added to 2 liters of water in 38 glass beakers. An "acid rain" solution consisting of 2 parts sulfuric acid ($H_2SO_4$) and 1 part nitric acid ($HNO_3$) was then added to each breaker at pH 4.5. The resulting mixtures of slag, water and acid were allowed to stand, being stirred at the end of each of the first 10 hours and being checked for temperature and pH. At 54 hours after the beginning of the test aqueous samples were collected from each beaker and analyzed in L.C. Metals, Inc.'s laboratory. At the conclusion of the entire 54-hour period for 38 samples the average concentration of lead was 1.18 ppm and the average concentration of cadmium was .055 ppm, well below the threshold toxicity values for each. Of the 38 samples, most were less than 0.4 ppm. Further, no lead was found in 24 percent of the samples and 66 percent of the total lot demonstrated lead concentrations less than 1 ppm. The threshold value for lead, 5 ppm, was exceeded in only two samples at 9.26 ppm and 5.69 ppm. The average pH values for the 10-hour period for those samples were 4.05 and 3.61, respectively. Thus only under highly acidic conditions much more extreme than those prescribed in E.P. Toxicity Test procedures does the leading of lead even approach the threshold value. There is no indication of cadmium concentrations reaching the threshold even under the very acidic conditions of the test. E.P. Toxicity threshold values were never exceeded for cadmium. Results for lead and cadmium may be found in Table 3-2.

In the second test, long term testing was conducted on eleven samples, each sample lasting 28 to 30 days during which distilled water was circulated continuously through 55-gallon polyethylene drums of slag material.

In order to obtain samples for testing Chemetco excavated representative material from the slag storage pile and placed the samples in new 55-gallon drums. Each drum and its contents had an average total weight of approximately 850 pounds.

Table 3-2

Simulated Acid Rain Leach Tests

CHEMETCO INC
SLAG
SIMULATED "ACID RAIN" LEACH TEST

| DESIG-NATION | T=0HR PH | T=0HR TEMP | T=1HR PH | T=1HR TEMP | T=2HR PH | T=2HR TEMP | T=3HR PH | T=3HR TEMP | T=4HR PH | T=4HR TEMP | T=5HR PH | T=5HR TEMP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 110 | 3.9 | 14 | 4.15 | 14.5 | 4.1 | 14 | 4.55 | 15 | 4.05 | 15 | 4.55 | 16 |
| 120 | 4.05 | 14 | 3.75 | 14.5 | 3.95 | 14.5 | 4.15 | 15 | 3.95 | 15 | 4.35 | 16 |
| 130 | 8.98 | 14 | 8.2 | 14.5 | 8.9 | 14.5 | 9.65 | 15 | 9.75 | 15 | 9.55 | 16 |
| 140 | 9.19 | 14 | 8.35 | 14 | 8.75 | 14.5 | 9.3 | 15 | 9.35 | 15 | 9.35 | 16 |
| 150 | 7.95 | 14 | 8.65 | 14 | 8.7 | 14.5 | 9.15 | 15 | 9.15 | 15 | 9.15 | 16 |
| 160 | 8.45 | 14 | 8.95 | 14.5 | 8.95 | 14.5 | 9.3 | 15 | 9.25 | 15 | 9.25 | 16 |
| 170 | 8.75 | 14 | 8.85 | 14 | 9.05 | 14.5 | 9.35 | 15 | 9.35 | 15 | 9.3 | 15.5 |
| 180 | 9.1 | 14 | 8.7 | 14.5 | 8.2 | 14.5 | 9.65 | 15 | 9.55 | 15 | 9.45 | 16 |
| 210 | 4. | 14 | 4.1 | 14 | 4.35 | 14.5 | 4.8 | 15 | 5.3 | 15 | 4.85 | 15.5 |
| 220 | 4.15 | 14 | 3.75 | 14 | 4 | 14.5 | 4.25 | 15 | 4.2 | 15 | 4.35 | 15.5 |
| 230 | 8.45 | 14 | 5.9 | 14.5 | 5.95 | 14.5 | 6.45 | 15 | 6.05 | 15 | 5.95 | 15.5 |
| 240 | 8.9 | 14 | 5.85 | 14 | 6.05 | 14.5 | 6.85 | 15 | 6.55 | 15 | 6.75 | 16 |
| 250 | 6.25 | 14 | 6.65 | 14 | 7.05 | 14.5 | 7.5 | 15 | 7.0 | 15 | 7.75 | 16 |
| 260 | 7.2 | 14 | 7.55 | 14.5 | 7.6 | 14 | 8.15 | 15 | 8 | 15 | 8.1 | 15.5 |
| 270 | 7.55 | 14 | 7.65 | 14.5 | 7.85 | 14.5 | 8.35 | 15 | 8.3 | 15 | 8.35 | 15.5 |
| 280 | 7.65 | 14 | 7.85 | 14.5 | 8.2 | 14.5 | 8.45 | 15 | 8.45 | 15 | 8.45 | 16 |
| 310 | 3.75 | 14 | 3.55 | 14.5 | 3.95 | 15 | 4.15 | 15 | 4.15 | 15 | 4.5 | 15.5 |
| 320 | 3.8 | 14 | 3.5 | 14.5 | 3.7 | 15 | 3.9 | 15 | 3.85 | 15 | 4.05 | 16 |
| 330 | 7.6 | 14 | 5.5 | 14.5 | 5.6 | 14.5 | 5.05 | 15 | 5.55 | 15 | 5.75 | 16 |
| 340 | 7.7 | 14 | 6.15 | 14.5 | 6.45 | 15 | 6.75 | 15 | 7.25 | 15 | 7.25 | 16 |
| 350 | 6.55 | 13 | 7.35 | 13 | 7.2 | 13.5 | 7.6 | 14 | 7.85 | 14 | 7.95 | 14.5 |
| 360 | 7.25 | 12 | 7.8 | 13 | 7.95 | 13 | 8.05 | 13.5 | 8.25 | 14 | 8.15 | 14.5 |
| 370 | 7.65 | 13 | 7.75 | 13.5 | 8 | 13.5 | 8.2 | 14 | 8.25 | 14 | 8.25 | 15 |
| 380 | 7.85 | 13 | 7.95 | 13 | 8.15 | 13.5 | 8.4 | 14 | 8.35 | 14 | 8.35 | 14.5 |
| 410 | 3.95 | 13.5 | 3.55 | 13.5 | 3.8 | 14 | 4.05 | 14.5 | 3.9 | 15 | 4.05 | 15.5 |
| 420 | 3.75 | 13.5 | 3.45 | 13.5 | 3.5 | 14 | 3.7 | 14.5 | 3.65 | 14.5 | 3.7 | 15 |
| 430 | 5.9 | 13.5 | 5.7 | 13.5 | 5.75 | 14 | 5.95 | 14.5 | 5.65 | 14.5 | 5.95 | 15 |
| 440 | 5.65 | 14 | 5.4 | 13.5 | 5.65 | 14 | 6.15 | 14.5 | 5.75 | 14.5 | 6.2 | 15 |
| 450 | 6.4 | 13.5 | 6.05 | 13.5 | 6.75 | 14 | 7.5 | 14.5 | 7.05 | 14.5 | 7.2 | 15 |
| 460 | 6.7 | 13 | 6.55 | 13.5 | 7.25 | 13.5 | 7.9 | 14 | 7.55 | 14.5 | 8.05 | 14 |
| 470 | | | | | | | | | | | | |
| 480 | | | | | | | | | | | | |
| 510 | 7.15 | 13 | 6.9 | 13 | 7.3 | 13.5 | 7.65 | 14 | 7.55 | 14 | 7.75 | 15 |
| 520 | 3.5 | 13 | 3.4 | 13 | 3.5 | 13.5 | 3.65 | 14 | 3.6 | 14 | 3.7 | 15 |
| 530 | 3.55 | 13.5 | 3.35 | 14 | 3.55 | 14 | 3.75 | 14.5 | 3.85 | 15 | 4.15 | 15 |
| 540 | 5.6 | 13 | 5.45 | 13 | 5.85 | 13 | 5.9 | 13.5 | 5.95 | 14 | 5.95 | 14.5 |
| 550 | 5.65 | 13.5 | 5.55 | 14 | 5.9 | 14 | 6.05 | 14.5 | 6.15 | 14.5 | 6.15 | 15 |
| 560 | 6.05 | 12.5 | 6.1 | 12.5 | 6.45 | 13 | 6.6 | 13.5 | 6.4 | 14 | 6.65 | 14.5 |
| 570 | 6.4 | 13 | 6.45 | 13 | 6.85 | 13.5 | 6.9 | 14 | 6.8 | 14.5 | 7.15 | 15 |
| 580 | 6.45 | 13 | 6.65 | 13 | 6.95 | 13.5 | 7.25 | 14 | 6.95 | 14.5 | 7.35 | 15 |

CHEMETCO INC
SLAG
SIMULATED "ACID RAIN" LEACH TEST

| DESIG-NATION | T=6HR PH | T=6HR TEMP | T=7HR PH | T=7HR TEMP | T=8HR PH | T=8HR TEMP | T=9HR PH | T=9HR TEMP | T=10HR PH | T=10HR TEMP | T = 5HR LEAD (PPM/LOG) | DESIG-NATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 110 | 5.15 | 16 | 4.4 | 16.5 | 3.6 | 16.5 | 3.7 | 17 | 4.38 | 16 | 4 | 0 110 |
| 120 | 4.65 | 16.5 | 4 | 16.5 | 3.5 | 15 | 3.55 | 17 | 3.64 | 17 | 2.63 | 0 015 120 |
| 130 | 9.75 | 16 | 9.45 | 17 | 10.45 | 17 | 10.25 | 17 | 10.3 | 17 | 0.298 | 0 004 130 |
| 140 | 9.35 | 16 | 9.2 | 17 | 10.1 | 17 | 9.98 | 17 | 10.04 | 17 | 0.18 | 0 140 |
| 150 | 9.25 | 16 | 9.15 | 16.5 | 10 | 17 | 9.9 | 16.5 | 11.49 | 17 | 0.277 | 0 025 150 |
| 160 | 9.35 | 16 | 9.25 | 16.5 | 10.3 | 16.5 | 10.2 | 16.5 | 10.51 | 17 | 0.235 | 0 017 160 |
| 170 | 9.4 | 15.5 | 9.35 | 16.5 | 10.45 | 16.5 | 10.35 | 17 | 10.42 | 17 | 0.315 | 0 099 170 |
| 180 | 9.55 | 16 | 9.55 | 16.5 | 10.9 | 17 | 10.85 | 17 | 10.85 | 17 | 0.246 | 0 032 180 |
| 210 | 5.85 | 16.5 | 5.2 | 16.5 | 4.7 | 17 | 5.2 | 17 | 5 | 17 | 1.46 | 0 210 |
| 220 | 4.9 | 16 | 4.7 | 16.5 | 4.46 | 16.5 | 4.6 | 16.5 | 5.05 | 17 | 1.64 | 0 02 220 |
| 230 | 6.45 | 16 | 6.05 | 16.5 | 6.95 | 17 | 6.9 | 16.5 | 6.59 | 17 | 0.801 | 0 021 230 |
| 240 | 7.1 | 16 | 6.6 | 16.5 | 8.65 | 17 | 8.5 | 17 | 8.18 | 17 | 0.132 | 0 013 240 |
| 250 | 8.2 | 16.5 | 7.7 | 16.5 | 9.4 | 16.5 | 8.97 | 16.5 | 8.8 | 17 | 0.173 | 0 250 |
| 260 | 8.4 | 16 | 8.1 | 16.5 | 9.15 | 16.5 | 9.05 | 16.5 | 8.92 | 17 | 0.355 | 0 260 |
| 270 | 8.45 | 16 | 8.25 | 16.5 | 9.2 | 17 | 9.1 | 17 | 9.04 | 17 | 0.176 | 0 112 270 |
| 280 | 8.55 | 16.5 | 8.35 | 17 | 9.35 | 17 | 9.4 | 17 | 9.14 | 17.5 | 0.476 | 0 280 |
| 310 | 4.75 | 16.5 | 4.4 | 17 | 4.15 | 17 | 4.22 | 17 | 4.2 | 17 | 3.3 | 0 041 310 |
| 320 | 4.25 | 16.5 | 3.9 | 17 | 4 | 17 | 3.7 | 17 | 3.6 | 17 | 2.09 | 0 023 320 |
| 330 | 7.25 | 16.5 | 5.65 | 17 | 7 | 17 | 6.6 | 17 | 6.87 | 17 | 0.595 | 0 330 |
| 340 | 7.25 | 16.5 | 6.35 | 17 | 8.7 | 17 | 8.51 | 17.5 | 8.4 | 17.5 | 0.194 | 0 140 |
| 350 | 7.85 | 15 | 7.55 | 15.5 | 8.9 | 15 | 8.8 | 15.5 | 8.8 | 15 | 0.244 | 0 005 350 |
| 360 | 8.35 | 15 | 8.15 | 15 | 9.15 | 15 | 9.2 | 15 | 9.2 | 15 | 1.15 | 0 005 360 |
| 370 | 8.3 | 15 | 8.2 | 15 | 9.05 | 15 | 9.05 | 25.5 | 9.05 | 15.5 | 2.25 | 0 051 370 |
| 380 | 8.4 | 15 | 8.25 | 15.5 | 9.15 | 15.5 | 9.1 | 15.5 | 9.1 | 16 | 1.83 | 0 380 |
| 410 | 4.35 | 16 | 4.3 | 16 | 4.15 | 16 | 4 | 16.5 | 4.3 | 16.5 | 9.26 | 0 065 410 |
| 420 | 3.8 | 15.5 | 3.65 | 16 | 3.5 | 16 | 3.5 | 16.5 | 3.5 | 16 | 5.69 | 0 042 420 |
| 430 | 5.85 | 15.5 | 5.75 | 15.5 | 6.3 | 16 | 6.4 | 16 | 6.35 | 16 | 0.36 | 0 091 430 |
| 440 | 6.35 | 15.5 | 6.2 | 16 | 8.2 | 16 | 8.4 | 16 | 8.0 | 16 | 0 | 0 005 440 |
| 450 | 7.35 | 15 | 7.15 | 15.5 | 8.5 | 15.5 | 8.7 | 16 | 9 | 15.5 | 0 | 0 015 450 |
| 460 | 7.95 | 15 | 7.85 | 15.5 | 9 | 16 | 9.05 | 15.5 | 9.25 | 16 | 1.91 | 0 011 460 |
| 470 | | | | | | | | | | | | 470 |
| 480 | | | | | | | | | | | | 480 |
| 510 | 7.7 | 15 | 7.9 | 15 | 8.2 | 15.5 | 7.75 | 15.5 | 8.4 | 15.5 | 0 | 0 510 |
| 520 | 3.75 | 15 | 3.65 | 15.5 | 3.55 | 15.5 | 3.45 | 15.5 | 3.5 | 15.5 | 3.04 | 0 23 520 |
| 530 | 4.4 | 16 | 4.4 | 16 | 4.6 | 16 | 4.75 | 16 | 5 | 16 | 0 | 0 045 530 |
| 540 | 6.05 | 14.5 | 5.75 | 15 | 8.35 | 15 | 8.25 | 15 | 8.2 | 15 | 0 | 0 25 540 |
| 550 | 6.55 | 15.5 | 6.25 | 16 | 8.5 | 16 | 8.4 | 16 | 8.75 | 16 | 0 | 0 005 550 |
| 560 | 7.05 | 14.5 | 6.6 | 15 | 8.35 | 15 | 8.35 | 15 | 8.4 | 15 | 0 | 0 091 560 |
| 570 | 7.25 | 15 | 7.05 | 15.5 | 8.35 | 15.5 | 8.35 | 15.5 | 8.4 | 15 | 0 | 0 078 570 |
| 580 | 7.4 | 15 | 7.25 | 15.5 | 8.5 | 15 | 8.5 | 15.5 | 8.65 | 15 | 0 | 0 045 580 |

"NOTES"

TEMP = DEGREE CENTIGRADE
PH = "PH" UNITS
ACID RAIN SOLUTION WAS COMPRISED OF 2 PARTS OF H2SO4 AND 1 PART HNO3 ; INITIAL PH WAS 4.5 .NO PH OR TEMPS TAKEN AFTER T=10HR

Each drum was then transported to the sample preparation area. The contents of each drum were screened for separation into the following five size fractions: greater than 3"; less than 3" but greater than 1 1/2"; less than 1 1/2" but greater than 3/4"; less than 3/4" but greater than 3/8"; and less than 3/8". After separation into size fractions through screening, each resulting size fraction was weighed, and this weight was recorded.

From the contents of each drum a 100 pound representative sample was prepared by blending material from each of the size fractions in the same proportion as existed in the full drum sample. Each resulting 100 pound sample was placed in a large polyethylene bag, sealed and transported to the laboratory.

At the laboratory three samples were initially selected for testing. Each sample was emptied into a clean 55-gallon polyethylene drum. Forty-five gallons of distilled water was added to each drum, and the drum was covered with a polyethylene drum cover. Distilled water was circulated continuously through he drums at an average rate of 2-1/2 gallons per minute. At 7-day intervals a sample of the liquid was drawn for analysis for lead and cadmium. The total testing period for each sample lasted 28 days. The results of the test are shown in Table 3-3.

After the first three samples were tested, the procedure was modified. In the modified procedure, liquid samples were taken each hour of the first 10 hours and then once each day for the next nine days. Further liquid samples were taken 10 and 20 days later. Testing of additional samples was conducted following modification of the sampling procedure. In addition to analyzing liquid samples for lead and cadmium, the modified procedure included recording pH and temperature levels. The results of the later testing are also shown in Table 3-3. The distilled water leaching tests continued for a total of 58 days-28 for the first phase and 30 for the second.

Table 3-3 Long Term Water Leach Test Results

CHEMETCO INC
HARTFORD , IL
SLAG / DISTILLED WATER LEACH TEST

| DATE | TIME INTERVAL | TIME UNIT | LEAD ( PPM ) | CADMIUM ( PPM ) | TEMP ( oC ) | PH |
|---|---|---|---|---|---|---|
| | | | SAMPLE NO. 12 | | | |
| OCT13 | 7 | DAY | 0.522 | 0.083 | | |
| | 14 | DAY | 0.587 | 0.084 | | |
| | 21 | DAY | 0.341 | 0.081 | | |
| | 28 | DAY | 0.242 | 0.012 | | |
| | AVERAGE | | 0.423 | 0.065 | | |
| | DEVIATION | | 0.138005 | 0.030618 | | |
| | | | SAMPLE NO. 3 | | | |
| OCT13 | 7 | DAY | 0.01 | 0.005 | | |
| | 14 | DAY | 0.01 | 0.005 | | |
| | 21 | DAY | 0.611 | 0.126 | | 6.01 |
| | 28 | DAY | 0.284 | 0.005 | | 6.29 |
| | AVERAGE | | 0.22875 | 0.03525 | | |
| | DEVIATION | | 0.247422 | 0.052394 | | |
| | | | SAMPLE NO. 18 | | | |
| OCT13 | 7 | DAY | 0.229 | 0.025 | | |
| | 14 | DAY | 0.602 | 0.022 | | |
| | 21 | DAY | 0.848 | 0.021 | | 7.28 |
| | 28 | DAY | 0.847 | 0.005 | | 7.29 |
| | AVERAGE | | 0.6315 | 0.01825 | | |
| | DEVIATION | | 0.253075 | 0.007790 | | |
| | | | SAMPLE NO. 1 | | | |
| NOV19 | 915 | HOUR | 0.467 | 0.779 | 18 | 7.1 |
| | 1015 | HOUR | 0.482 | 0.09 | 18 | 7.05 |
| | 1115 | HOUR | 0.382 | 0.061 | 18 | 7.1 |
| | 1215 | HOUR | 0.226 | 0.206 | 18.5 | 7 |
| | 1315 | HOUR | 0.938 | 0.09 | 19 | 7.1 |
| | 1415 | HOUR | 0.579 | 0.285 | 20 | 7 |
| | 1515 | HOUR | 0.374 | 0.005 | 20 | 7.05 |
| | 1615 | HOUR | 0.331 | 0.119 | 20 | 7.1 |
| | 1715 | HOUR | 0.656 | 0.072 | 21 | 7.05 |
| | 1815 | HOUR | 0.396 | 0.054 | 21 | 7.15 |
| | 1915 | HOUR | 0.334 | 0.054 | 22 | 7.1 |
| NOV20 | 915 | HOUR | 1 | 0.005 | 24.5 | 7.8 |
| NOV21 | 915 | HOUR | 0.369 | 0.11 | 26 | 7.1 |
| NOV22 | 915 | HOUR | 0.204 | 0.143 | 20 | 7.85 |
| NOV23 | 915 | HOUR | 0.126 | 0.131 | 23 | 8.25 |
| NOV24 | 915 | HOUR | 0.151 | 0.046 | 24.75 | 7.15 |
| NOV25 | 915 | HOUR | 0.444 | 0.107 | 24.5 | 7.15 |
| NOV26 | 915 | HOUR | 0.285 | 0.052 | 23.4 | 7.15 |
| NOV27 | 915 | HOUR | 0.574 | 0.008 | 23.5 | 6.8 |

Table 3-3 (cont'd)

| | | | | | | |
|---|---|---|---|---|---|---|
| NOV28 | 915 | HOUR | 0.244 | 0.111 | 23.5 | 7.15 |
| DEC08 | 920 | HOUR | 0.805 | 0.077 | 31 | 7.35 |
| DEC18 | 915 | HOUR | 0.128 | 0.079 | 29 | 7.3 |
| | AVERAGE | | 0.431590 | 0.122 | | 7.215909 |
| | DEVIATION | | 0.239404 | 0.156486 | | |

SAMPLE NO. 22

| | | | | | | |
|---|---|---|---|---|---|---|
| | 915 | HOUR | 0.105 | 0.005 | 18 | 7.8 |
| NOV19 | 1015 | HOUR | 1.28 | 0.036 | 18.5 | 8.45 |
| | 1115 | HOUR | 2.32 | 0.005 | 18.5 | 8.35 |
| | 1215 | HOUR | 1.4 | 0.014 | 19.5 | 8.45 |
| | 1315 | HOUR | 3.96 | 0.182 | 20 | 8.55 |
| | 1415 | HOUR | 1.04 | 0.005 | 20 | 8.45 |
| | 1515 | HOUR | 3.97 | 0.049 | 21 | 8.5 |
| | 1615 | HOUR | 2.39 | 0.014 | 21 | 8.55 |
| | 1715 | HOUR | 1.47 | 0.005 | 21 | 8.55 |
| | 1815 | HOUR | 1.79 | 0.005 | 21 | 8.55 |
| | 1915 | HOUR | 1.95 | 0.012 | 21 | 8.65 |
| NOV20 | 915 | HOUR | 1.52 | 0.005 | 27 | 8.65 |
| NOV21 | 915 | HOUR | 1.23 | 0.11 | 29 | 9 |
| NOV22 | 915 | HOUR | 0.522 | 0.02 | 22 | 10.15 |
| NOV23 | 915 | HOUR | 0.452 | 0.005 | 25 | 9.7 |
| NOV24 | 915 | HOUR | 0.484 | 0.098 | 25.75 | 9.55 |
| NOV25 | 915 | HOUR | 0.551 | 0.028 | 25 | 9.53 |
| NOV26 | 915 | HOUR | 0.808 | 0.011 | 22.5 | 9.75 |
| NOV27 | 915 | HOUR | 0.911 | 0.048 | 24.5 | 9.45 |
| NOV28 | 915 | HOUR | 0.432 | 0.087 | 24.5 | 9.35 |
| DEC08 | 920 | HOUR | 1.01 | 0.092 | 21 | 8.35 |
| DEC18 | 915 | HOUR | 0.313 | 0.027 | 24 | 8.05 |
| | AVERAGE | | 1.359454 | 0.039227 | | 8.835454 |
| | DEVIATION | | 1.030498 | 0.045603 | | |

SAMPLE NO. 30

| | | | | | | |
|---|---|---|---|---|---|---|
| | 915 | HOUR | 0.158 | 0.005 | 18 | 7.3 |
| NOV19 | 1015 | HOUR | 0.222 | 0.047 | 18 | 7.5 |
| | 1115 | HOUR | 0.415 | 0.082 | 20 | 7.45 |
| | 1215 | HOUR | 0.545 | 0.037 | 20 | 7.55 |
| | 1315 | HOUR | 0.673 | 0.005 | 21 | 7.6 |
| | 1415 | HOUR | 0.548 | 0.072 | 21 | 7.75 |
| | 1515 | HOUR | 0.739 | 0.082 | 22 | 7.5 |
| | 1615 | HOUR | 0.7 | 0.091 | 22 | 8.35 |
| | 1715 | HOUR | 0.119 | 0.005 | 21 | 8.15 |
| | 1815 | HOUR | 0.54 | 0.024 | 21.5 | 8.35 |
| | 1915 | HOUR | 0.551 | 0.036 | 24 | 8.05 |
| NOV20 | 915 | HOUR | 0.482 | 0.005 | 29 | 7.85 |
| NOV21 | 915 | HOUR | 0.414 | 0.029 | 30 | 8.6 |
| NOV22 | 915 | HOUR | 0.464 | 0.092 | 21 | 8.9 |
| NOV23 | 915 | HOUR | 0.417 | 0.075 | 28 | 8.25 |
| NOV24 | 915 | HOUR | 0.32 | 0.036 | 29.5 | 8.5 |
| NOV25 | 915 | HOUR | 0.405 | 0.028 | 30 | 8.25 |
| NOV26 | 915 | HOUR | 0.362 | 0.005 | 29 | 8.5 |
| NOV27 | 915 | HOUR | 0.484 | 0.005 | 29 | 8.05 |
| NOV28 | 915 | HOUR | 0.287 | 0.052 | 30.25 | 7.8 |

Table 3-3 (cont'd)

| | | | | | | |
|---|---|---|---|---|---|---|
| DEC08 | 930 | HOUR | 0.825 | 0.193 | 27 | 8.05 |
| DEC18 | 915 | HOUR | 0.195 | 0.052 | 28 | 6.95 |
| AVERAGE | | | 0.448409 | 0.048030 | | 7.965909 |
| DEVIATION | | | 0.183935 | 0.043327 | | |

SAMPLE NO. 17

| | | | | | | |
|---|---|---|---|---|---|---|
| JAN08 | 900 | HOUR | 0.914 | 0.081 | 18 | 9.7 |
| | 1000 | HOUR | 0.379 | 0.01 | 18 | 9.35 |
| | 1100 | HOUR | 0.335 | 0.005 | 18 | 9.85 |
| | 1200 | HOUR | 0.363 | 0.005 | 18 | 9.8 |
| | 1300 | HOUR | 0.322 | 0.044 | 18 | 9.85 |
| | 1400 | HOUR | 1.8 | 0.022 | 18 | 9.85 |
| | 1500 | HOUR | 0.714 | 0.022 | 20 | 9.9 |
| | 1600 | HOUR | 0.587 | 0.053 | 20 | 9.85 |
| | 1700 | HOUR | 0.288 | 0.005 | 20 | 9.85 |
| | 1800 | HOUR | 0.247 | 0.005 | 20 | 9.85 |
| | 1900 | HOUR | 0.461 | 0.005 | 20 | 9.85 |
| JAN09 | 900 | DAY | 0.195 | 0.005 | 19 | 9.85 |
| JAN10 | 900 | | 0.249 | 0.032 | 26 | 9.9 |
| JAN11 | | | 0.233 | 0.005 | 22 | 9.9 |
| JAN12 | | | 0.432 | 0.07 | 29 | 10.05 |
| JAN13 | | | 0.405 | 0.117 | 29.5 | 9.95 |
| JAN14 | | | 0.507 | 0.005 | 30 | 9.9 |
| JAN15 | | | 0.074 | 0.005 | 30 | 9.95 |
| JAN16 | | | 0.45 | 0.005 | 28 | 10.15 |
| JAN17 | | | 0.379 | 0.042 | 29 | 10.2 |
| JAN18 | | | 0.339 | 0.005 | 30 | 10.45 |
| JAN28 | | | 0.505 | 0.005 | 26 | 6.45 |
| FEB08 | | | 0.444 | 0.005 | 23 | 6.75 |
| AVERAGE | | | 0.461826 | 0.024260 | | 9.617391 |
| DEVIATION | | | 0.333150 | 0.029882 | | |

SAMPLE NO. 8

| | | | | | | |
|---|---|---|---|---|---|---|
| JAN08 | 900 | HOUR | 1.06 | 0.005 | 18 | 9.5 |
| | 1000 | HOUR | 2.73 | 0.076 | 18 | 9.85 |
| | 1100 | HOUR | 2.35 | 0.024 | 18 | 10 |
| | 1200 | HOUR | 2.09 | 0.005 | 18 | 10 |
| | 1300 | HOUR | 1.31 | 0.005 | 19 | 10.05 |
| | 1400 | HOUR | 1.55 | 0.005 | 19 | 10.1 |
| | 1500 | HOUR | 1.61 | 0.005 | 20 | 10.05 |
| | 1600 | HOUR | 0.04 | 0.005 | 20 | 9.95 |
| | 1700 | HOUR | 2.84 | 0.005 | 20 | 9.95 |
| | 1800 | HOUR | 1.25 | 0.052 | 20 | 10.05 |
| | 1900 | HOUR | 1.41 | 0.005 | 20 | 10.1 |
| JAN09 | 900 | DAY | 1.19 | 0.005 | 19 | 9.95 |
| JAN10 | | | 2.49 | 0.037 | 26 | 10.15 |
| JAN11 | | | 1.99 | 0.005 | 24 | 10.1 |
| JAN12 | | | 4.43 | 0.299 | 29 | 10 |
| JAN13 | | | 1.09 | 0.005 | 29.5 | 10 |
| JAN14 | | | 1.99 | 0.085 | 30 | 10 |
| JAN15 | | | 1.78 | 0.005 | 30 | 10 |
| JAN16 | | | | | 28 | 10.2 |
| JAN17 | | | 0.974 | 0.023 | 29 | 10.25 |
| JAN18 | | | 1.39 | 0.015 | 30 | 10.55 |

Table 3-3 (cont'd)

| | | | | | | |
|---|---|---|---|---|---|---|
| JAN28 | | | 1.5 | 0.019 | 25 | 6.85 |
| FEB08 | | | 0.583 | 0.005 | 24 | 7 |
| | AVERAGE | | 1.711227 | 0.031590 | | 9.758635 |
| | DEVIATION | | 0.888346 | 0.062717 | | |
| | | | SAMPLE NO. 20 | | | |
| JAN08 | 900 | HOUR | 1.27 | 0.191 | 18 | 9.4 |
| | 1000 | HOUR | 1.13 | 0.012 | 18 | 9.85 |
| | 1100 | HOUR | 1.2 | 0.005 | 18 | 10.05 |
| | 1200 | HOUR | 1.49 | 0.005 | 18 | 10.1 |
| | 1300 | HOUR | 1.14 | 0.052 | 19 | 10.05 |
| | 1400 | HOUR | 0.995 | 0.051 | 19 | 10.15 |
| | 1500 | HOUR | 0.302 | 0.005 | 19 | 10.05 |
| | 1600 | HOUR | 0.435 | 0.025 | 20 | 10.05 |
| | 1700 | HOUR | 0.447 | 0.005 | 20 | 10 |
| | 1800 | HOUR | 0.621 | 0.005 | 20 | 10.05 |
| | 1900 | HOUR | 0.605 | 0.027 | 20 | 10.05 |
| JAN09 | | DAY | 0.316 | 0.028 | 19 | 10.15 |
| JAN10 | | | 0.414 | 0.005 | 26 | 10.1 |
| JAN11 | | | 0.316 | 0.005 | 24 | 10.05 |
| JAN12 | | | 0.522 | 0.005 | 29 | 9.95 |
| JAN13 | | | 0.938 | 0.005 | 29.5 | 10.05 |
| JAN14 | | | 0.397 | 0.005 | 30 | 10.05 |
| JAN15 | | | 0.444 | 0.005 | 30 | 10.15 |
| JAN16 | | | 0.112 | 0.042 | 28 | 10.25 |
| JAN17 | | | 0.379 | 0.075 | 29 | 10.3 |
| JAN18 | | | 0.302 | 0.005 | 30 | 10.6 |
| JAN28 | | | 0.59 | 0.032 | 25 | 6.65 |
| FEB08 | | | 0.621 | 0.047 | 21 | 6.85 |
| | AVERAGE | | 0.651565 | 0.027913 | | 9.780434 |
| | DEVIATION | | 0.371037 | 0.040146 | | |
| | | | SAMPLE NO. 16 | | | |
| JAN21 | 800 | HOUR | 0.672 | 0.03 | 17 | 7.4 |
| JAN21 | 900 | HOUR | 0.711 | 0.005 | 17 | 7.45 |
| JAN21 | 1000 | HOUR | 0.45 | 0.038 | 18 | 7.5 |
| JAN21 | 1100 | HOUR | 0.896 | 0.015 | 19 | 7.45 |
| JAN21 | 1200 | HOUR | 1.83 | 0.005 | 19 | 7.5 |
| JAN21 | 1300 | HOUR | 0.461 | 0.005 | 19 | 8.35 |
| JAN21 | 1400 | HOUR | 0.562 | 0.012 | 18 | 8.75 |
| JAN21 | 1500 | HOUR | 0.656 | 0.005 | 18 | 8.85 |
| JAN21 | 1600 | HOUR | 0.552 | 0.04 | 18 | 8.9 |
| JAN21 | 1700 | HOUR | 0.708 | 0.112 | 19 | 8.7 |
| JAN21 | 1800 | HOUR | 0.593 | 0.005 | 20 | 8.5 |
| JAN22 | | DAY | 1.26 | 0.03 | 29 | 8 |
| JAN23 | | DAY | 0.724 | 0.005 | 24 | 7.85 |
| JAN24 | | DAY | 0.476 | 0.032 | 29 | 7.55 |
| JAN25 | | DAY | 1.49 | 0.005 | 20 | 7.6 |
| JAN26 | | DAY | 0.593 | 0.047 | 24 | 7.5 |
| JAN27 | | DAY | 0.549 | 0.058 | 19 | 7.55 |
| JAN28 | | DAY | | | | |
| JAN29 | | DAY | | | | |
| JAN30 | | DAY | 0.432 | 0.06 | 22 | 6.7 |
| FEB07 | | DAY | 0.42 | 0.049 | 21 | 6.75 |
| FEB17 | | DAY | 0.924 | 0.005 | 22 | 7.8 |
| | AVERAGE | | 0.74795 | 0.03115 | | 7.8325 |

Table 3-3 (cont'd)

| | | | | | | |
|---|---|---|---|---|---|---|
| | DEVIATION | | 0.365195 | 0.031071 | | |

SAMPLE NO. 2

| | | | | | | |
|---|---|---|---|---|---|---|
| JAN21 | 800 | HOUR | 0.297 | 0.042 | 17 | 7.85 |
| JAN21 | 900 | HOUR | 0.914 | 0.005 | 17 | 7.85 |
| JAN21 | 1000 | HOUR | 0.01 | 0.005 | 18 | 8.35 |
| JAN21 | 1100 | HOUR | 0.184 | 0.005 | 19 | 8.4 |
| JAN21 | 1200 | HOUR | 0.203 | 0.005 | 19 | 8.7 |
| JAN21 | 1300 | HOUR | 0.97 | 0.055 | 18 | 8.8 |
| JAN21 | 1400 | HOUR | 0.522 | 0.064 | 18 | 8.9 |
| JAN21 | 1500 | HOUR | 0.328 | 0.115 | 18 | 8.9 |
| JAN21 | 1600 | HOUR | 0.447 | 0.017 | 17 | 8.5 |
| JAN21 | 1700 | HOUR | 0.774 | 0.067 | 18 | 8.1 |
| JAN21 | 1800 | HOUR | 0.095 | 0.005 | 19 | 8.05 |
| JAN22 | | DAY | 0.227 | 0.005 | 26 | 7.9 |
| JAN23 | | DAY | 0.342 | 0.005 | 22 | 7.8 |
| JAN24 | | DAY | 0.54 | 0.005 | 25 | 7.65 |
| JAN25 | | DAY | 0.214 | 0.095 | 20 | 7.55 |
| JAN26 | | DAY | 0.336 | 0.039 | 23 | 7.55 |
| JAN27 | | DAY | 0.01 | 0.051 | 24 | 7.6 |
| JAN28 | | DAY | | | | |
| JAN29 | | DAY | | | | |
| JAN30 | | DAY | 1.29 | 0.005 | 26 | 6.7 |
| FEB07 | | DAY | 0.977 | 0.063 | 22 | 7.35 |
| FEB17 | | DAY | 1.51 | 0.005 | 20 | 7.45 |
| | AVERAGE | | 0.5095 | 0.0329 | | 7.9325 |
| | DEVIATION | | 0.415539 | 0.033619 | | |

The range of pH during the distilled water leaching test demonstrates the buffering effect of the slag against acidic conditions and against the leaching of lead and cadmium. The pH for all samples ranged from a low of 6.01 to a high of 10.6 and in only one sample failed to record an upper pH value of less than 7. In most samples the upper pH values were in the 8.9 to 10.6 range. Based on results shown below, it is evident that this buffering capacity contributes to the very low leaching levels for lead and cadmium.

The highest value shown for lead was 1.7 ppm, with a low of 0.23 ppm. Cadmium values ranged from 0.12 ppm to 0.02 ppm. Average concentrations for all samples were 0.691 ppm for lead and 0.043 ppm for cadmium. Results of this testing are summarized in Table 3-3.

# 4. SLAG PROPERTIES

## Slag Production

Raw materials containing copper, lead, zinc and iron are introduced into the top blown rotary converters (TBRCs) and heated to a molten state. Lime, $CaCO_3$, is added to the molten mixture resulting in two products: "black copper" containing approximately 70-75% pure copper, and a slag containing mostly FeO, $SiO_2$, CaO, and $Al_2O_3$ which rises to the top of the molten bath.

Process control analyses are then run to determine if recoverable metals have been effectively driven into the black copper. If the slag contains significant levels of recoverable metals, additional lime is added and the smelting process extended until pre-determined levels of efficiency in metal recovery are achieved. Once effective recovery has been completed, the molten smelting slag is poured off the top from the TBRCs into a Kress slag hauler and transported from the production foundry. The slag is presently granulated; historically it was poured into slag pits and allowed to slow air cool forming what has been called chunky slag.

Slag is also produced in the refining process from refinement of the black copper. Conducted in the TBRCs, refining consists primarily of the injection of silicate materials and oxygen into the molten black copper until a high purity copper (98.9-99.5%) is produced. The pure molten copper is tapped off and cast into anodes. The remaining refinery slag is then smelted to extract black copper, lead and tin, producing a slag poor in recoverable metals which previously was slow cooled, and is now granulated.

## Slag Characteristics

The variable composition of feedstocks to the smelting process and batch processing method of operation contribute to variations in slag bulk chemistry, with differing rates of

cooling and ionic state of iron ($Fe^{+2}$ or $Fe^{+3}$) affecting glass and crystal characteristics of the slag. Slag composition varies from fragment to fragment and among the various size fractions. There are textural and composition variations within a single cooling unit of poured slag. When several cooled slag units are transferred to the slag pile, compositions and textures become mixed and more friable portions break to create sand sized and smaller fragments. As fragments decrease in grain size, glass and devitrified glass fragments become increasingly abundant and the more crystal bearing fragments become less common. The particle pulverization process reduces crystalline and glassy slag fragments into their constituent particles; the glassy material is more subject to the disintegration process, contributing a large amount of the fine-grained material, whereas more crystalline fragments appear to be relatively resistant to abrasion and disaggregation.

Two counteracting effects are present as a result of fine particle formation. When particle breakage occurs, it is commonly along crystal and metallic fragment boundaries. The result is that the finest fractions of the slag contain disproportionately large amounts of glassy fragments and of metallic grains. As a consequence, the EP Toxicity test, when conducted on these smaller fragments, shows higher metal concentrations than either an aggregated bulk sample of slag or the coarse fractions. On the other hand, the effect of higher glass fragment concentration found in the smaller particle fraction, if left to react with acidic solutions, is to neutralize the leaching effect of the acid. Continued addition of acetic acid to the E.P. Toxicity test nullifies that buffering effect, leading to higher metal concentrations than would be seen in a system in which the neutralization reaction could proceed. In addition, the large surface area-to-volume ratios of silicate minerals and glassy slag fragments contribute the significant chemical reactivity that leads to the high pH buffering of the acidic simulated acid rain solution by the finer grain sizes of slag.

The pH buffering effect of the small particles can be advantageous in the use of slag as a construction material. The buffering effect can raise the pH by up to two pH units. Lead starts to form metal complexes above a pH of five. At pH seven, over ninety percent of leachable lead has formed a metal complex.

One of the additional properties of the slag is that when iron is leached as a trace metal it will precipitate onto weathered surfaces to produce iron oxyhydroxides. Soil microbiological activity will also produce iron oxyhydroxides having a very significant trace metal scavenging capability (Aristovskaya, 1974; Huang and Keller, 1970). White and Classen (1979) have shown that for glassy rocks, the various major ions respond differently to differences in solution pH, with the rate constant for sodium diffusion decreasing somewhat with increased pH, calcium and magnesium decreasing markedly, and silica being independent of pH. In general, higher pH soil solutions tend to inhibit the rate of silica glass and silicate mineral dissolution and enhance iron, aluminum, and manganese oxyhydroxide formation, which in turn scavenges trace metals, removing them from solution. Both oxyhydroxide formation, accompanied by trace metal savenging, and sequestration of trace metals by organic soil materials operate effectively to remove trace metals at pHs well below those now present in the American Bottoms' soil profile (Kinniburgh et al., 1976).

The slag has been compared in composition to prototypical primitive basalts. More evolved (higher silica) basalts have been used for road and other heavy construction purposes for centuries, proving to be stable, competent material under loads, abrasion and weathering. Chemetco intends that its material be used for just such purposes, with the addition of a soil and concrete cover to prevent wind dispersion and minimize precipitation infiltration, when used in constructing highway embankments.

## 5. HIGHWAY EMBANKMENT CONSTRUCTION

The State of Illinois Department of Transportation (IDOT) has specific design requirements for the construction of highway embankments. In addition, the various materials for construction projects must conform to IDOT specifications before usage of such materials by contractors is allowed.

### Slag Classification

The chunky slag without screening or crushing is classed as a coarse aggregate by IDOT. The size and gradation of material in the slag pile has been reviewed by IDOT and found to be acceptable for construction purposes (see September 26, 1986 letter from Thomas McCarthy, IDOT District 8 Materials Engineer, Appendix A) based on those criteria. IDOT's definition of coarse aggregate also includes slag from the combustion of coal in wet bottom boilers, as well as air cooled blast furnace slag. Air cooled blast furnace slag is defined as consisting essentially of silicates and alumino-silicates. While not identical in composition, the chunky slag does share some characteristics with the blast furnace slag (viz., high (30-35%) silicate content and slow, air cooled method of solidification).

If the chunky slag was screened, or crushed sufficiently and screened, it could likely be classified a fine aggregate by IDOT (see February 9, 1988 letter from IDOT, Appendix B). As a fine aggregate, the slag would be useful not only as fill but as feed material for either asphaltic or concrete mix products.

IDOT has recently completed freeze-thaw testing on the slag, and found it acceptable up to a size rating of one-inch for use in concrete paving (see May 24, 1988 letter from IDOT, Appendix D). Both wet bottom boiler slag and air cooled blast furnace slag are also acceptable and have been used in these applications, provided size and grade specifications are met.

## Typical Embankment Design

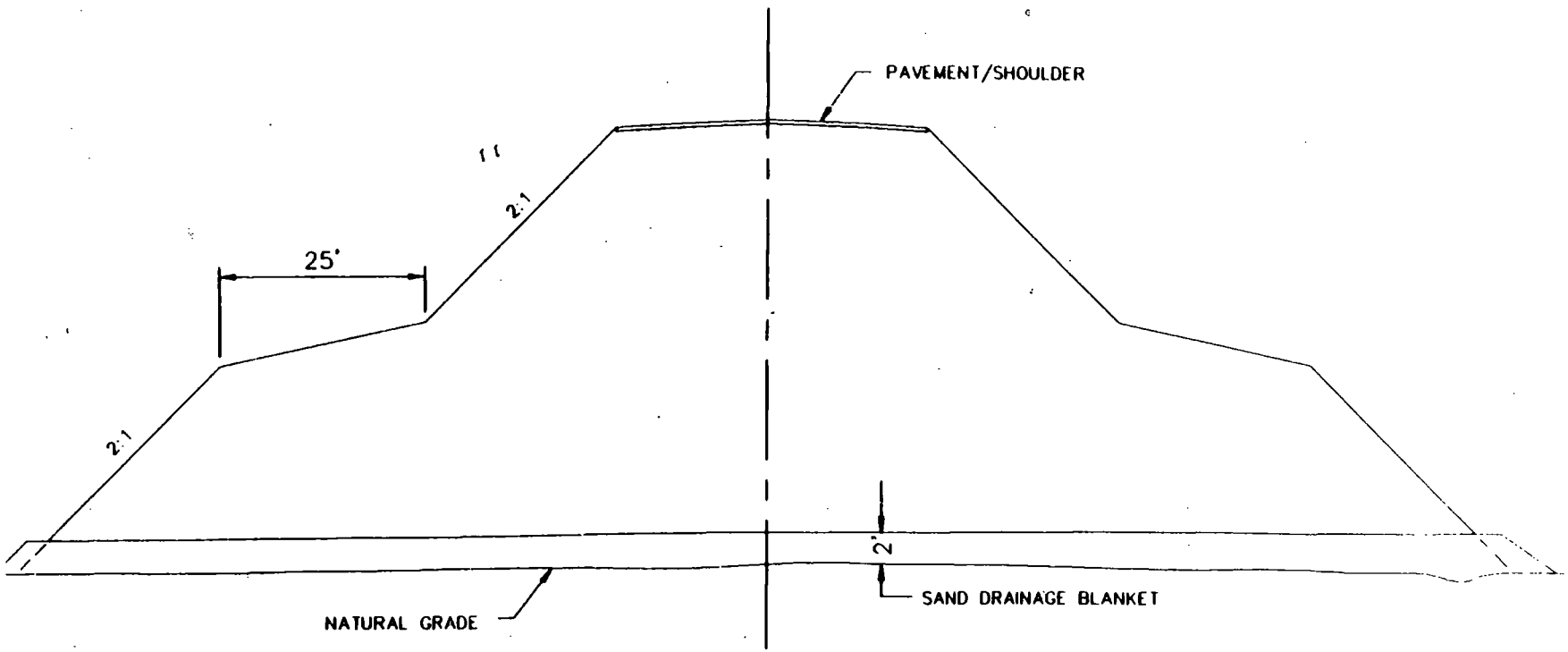
An embankment is first constructed by removing all vegetation and by compacting the entire roadway area. The contractor may then lay an optional layer of two feet of a drainage material, usually sand. The contractor then lays and compacts in one-foot lifts the embankment material until the specified height is reached. A minimum 1.5 to 3 feet layer of earthen material is placed on top of the aggregate as well as on the side slopes to support vegetative growth. A roadway is then constructed to state specification.

Engineering drawings for a proposed improvement project showing a typical cross section of a highway embankment are shown in Figure 5-1. Figure 5-2 shows the same typical cross section but superimposes upon it a contractor's proposed substitution of chunky slag for other aggregate fill material.

As the engineering drawing indicates, no slag material would be exposed to allow wind dispersion or direct contact by either humans or animals. The slag would be overlain by either a soil cover of minimal 18" thickness and generally much greater, or a concrete/bituminous roadway, or both.

## Location of Construction

When Chemetco originally proposed to IEPA to utilize chunky slag for highway construction in Spring, 1987, two projects held promise. IEPA did not grant such approval and the first, the Poag Road extension project, has subsequently been completed. The second, the I-255 extension north of I-270 is located several miles east of Chemetco's facility in the American Bottoms and is being constructed this season. Everett and Associates' "Evaluation of Environmental Processes and Consequences of Using Secondary Copper Smelter Slag in Highway Embankments, Western Madison County, Illinois", which is cited in this proposal and attached in its entirity, focused on local conditions at both project areas. Thus, it provides the environmental information IEPA needs to review in evaluating Chemetco's proposal for the I-255 construction project.




TYPICAL CROSS SECTION

VERTICAL SCALE:

5 0 5 10

SCALE IN FEET

HORIZONTAL SCALE

10 0 10 20

SCALE IN FEET

ERT®

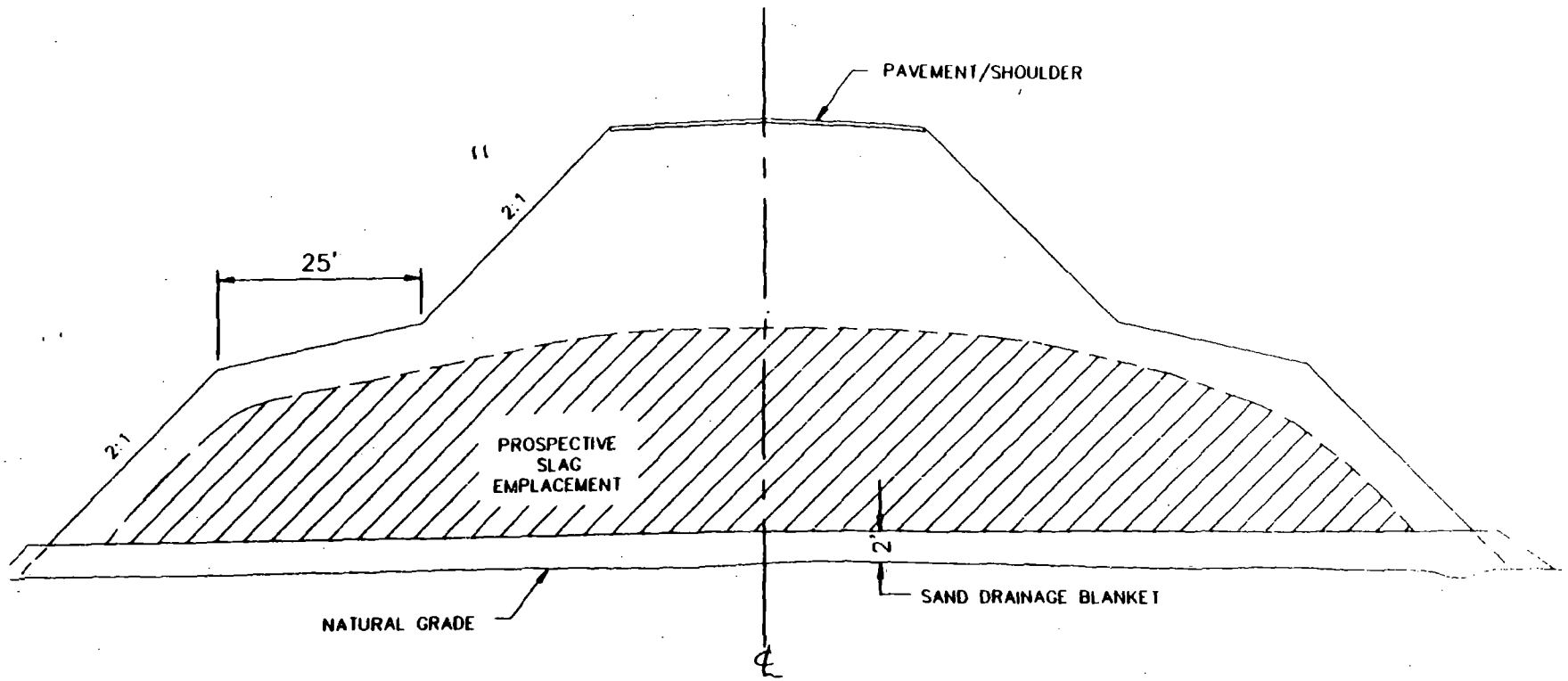
A RESOURCE ENGINEERING COMPANY

Figure 5-1

TYPICAL CROSS SECTION

| DRAWN BY | DATE | PROJECT NO |
|---|---|---|

001a




TYPICAL CROSS SECTION

VERTICAL SCALE:

5 0 5 10

SCALE IN FEET

HORIZONTAL SCALE

10 0 10 20

ERT®

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Figure 5-2

TYPICAL CROSS SECTION

## 6. OTHER CONSTRUCTION USES

A market exists for use of the non-hazardous chunky slag as embankment fill in construction of new highways. Certain grades, or sizes, of slag are also appropriate and in demand for other applications outlined below.

### Parking Lots

Chemetco has used slag extensively on-site to build above-grade parking facilities for tractor-trailers. Because the chunky slag is non-hazardous, IEPA has agreed as part of the February, 1988 IEPA-Chemetco Summary of Technical Agreement that such use of the slag is acceptable.

Several local municipalities have expressed strong interest in the slag for similar such uses. Assuming that the following considerations are met, Chemetco believes that the use of slag off-site in similar, if not identical, applications is appropriate, preferable to the use of limited landfill capacity and should be allowed by IEPA. In return for IEPA approval of such use, Chemetco will, through appropriate contract language, assure that no filling occurs in areas which contain standing water, nor in areas where slag could be placed into a surface water body.

Typical design will be filling and/or grading with non-slag materials, followed by placement and grading of the chunky slag, followed by application of a cover or binding agent, as necessary.

In this application, use of a broad range of size gradation material is forseen, with the finer-grained materials providing the added benefit of a disproportionately greater ability to buffer any inflow precipitation of less than pH 7. This will be especially significant in situations where acid rain is possible, and infiltration of rainfall into the slag is likely.

## Railroad Ballast Material

A major potential use for the slag is as ballast material for railway trackage. Chemetco has been approached by a major railroad, which has been informed of the current situation and status of the slag pile.

In this application slag would be used to support and stabilize the railroad ties and track as maintenance is conducted on existing trackage. Placement would consist of pouring uniformly graded slag from rail cars onto the track and ties, followed by grading and compaction as needed.

In return for IEPA approval of such use, Chemetco will, to the best of its ability, assure that slag application occurs neither in areas which are the site of standing water other than immediately after a rainfall or during a short, limited seasonal period, nor in areas from which the slag could migrate directly into a surface water body or be eroded into surface water.

Chemetco believes that use of slag as ballast is appropriate in terms of the generally and often heavily industrial nature of railroad rights of way and a beneficial alternative to placement in landfills while other aggregate is mined for use as railroad ballast.

## Aggregate for Paving Material

Chemetco has recently been informed by the Illinois Department of Transportation of results of freeze-thaw testing conducted on the chunky slag. A letter approving its use for concrete paving may be found in Appendix D and results of testing are shown in Appendix E.

Although sizing requirements prohibit the use of very large portions of slag, with proper crushing and screening this usage represents a significant potential marketplace. An added

benefit to such usage is the binding of slag in a concrete matrix, minimizing potential leaching of metals content, air contamination from dusting and liklihood of direct contact. Chemetco believes that this proposed usage is environmentally sound and beneficial to society, and so should be approved by IEPA.

# 7. ENVIRONMENTAL ASSESSMENT OF SLAG USE

In discussing Chemetco's proposed off-site use of the chunky slag IEPA has expressed concerns regarding potential negative environmental impacts of such use. This section of the justification focuses on potential impacts and explains the mechanisms by which such environmental impacts will be avoided as well as any preventative measures suggested or required. All media, including groundwater, surface water, soil and air, as well as direct contact issues, are addressed:

## Soil Contamination

Chemetco's environmental manager (EM) will act in a QA/QC role in conjunction with the purchasing contractor, or his designee, to assure that slag sold for off-site construction is handled in a manner consistent with the proposed intent (as described herein) and good environmental practice. The number of loads of slag leaving Chemetco each day will be tallied against the number arriving at the construction site(s) to assure that all material is being used in an application with which IEPA concurs, and is not being diverted to non-approved uses or locations. During adverse or marginal weather conditions (i.e., high velocity winds) Chemetco will conduct loading operations so as to prevent entrainment of materials into the atmosphere and excessive off-site dusting.

## Air Contamination

During loading activities at Chemetco, the EM will observe operations (especially during periods of high wind) as necessary to assure that entrainment of fines into the air and excessive off-site dustings do not occur. During periods of high wind, operations will be modified (e.g., loading in

protected areas) or discontinued at the discretion of the EM. As a precautionary measure, the EM will periodically follow and observe trucks hauling the slag. If it is determined that significant quantities of the material are being lost, covering of trailers will be initiated until more favorable conditions prevail.

Surface Water Contamination

As shown in the typical cross section (Figure 5-1) for highway construction, the chunky slag will be surrounded by either native soil or soil fill upon completion of construction activities preventing any contact with surface water, including precipitation runoff and standing water as might be encountered seasonally in drainage ditches. In addition, for other proposed uses Chemetco is committing to assuring (most likely by way of contract language plus oversight) that slag is not placed directly in surface water or in locations where runoff will carry it into a body of surface water. During construction, operations typically are not conducted during periods of significant precipitation due to equipment mobility problems and other related limitations. Potential surface water contamination by the slag is not seen as a major issue due to the relatively short exposure period before final placement at the construction site

Groundwater Contamination

IEPA concerns regarding contamination of groundwater in the American Bottoms seem to focus on two scenarios. The Agency's primary concern is that slag will be placed as fill into locations where it will be continuously or seasonally at or below the water table, allowing direct contact between

groundwater and slag. This, the Agency reasons, would potentially allow rapid leaching of metals from the slag into the shallow aquifer.

As the engineering drawings for highway construction (see Figure 5-2) indicate, slag would be used in applications above natural grade, and above a two foot thick sand drainage layer placed at grade. Use as railroad ballast and as parking lot construction material would similarly be above grade. Chemetco's environmental consultant, ERT, Inc., has extensive experience in shallow and deep groundwater monitoring of the American Bottoms. Depending, of course, upon specific location, shallow groundwater can usually be expected to be intercepted at 8-15 feet below ground surface. The lower number reflects high water table conditions encountered in the spring; the greater number represents low precipitation periods such as late fall. In addition, the deeper aquifer has been found at many locations, including Chemetco, to be under artesian conditions, limiting or prohibiting downward flow of shallow groundwater.

The principles of modern highway construction do not allow wholesale dumping of fill material into groundwater discharge or recharge areas. For other proposed uses, Chemetco is committed to prohibiting placement of slag in significant groundwater discharge or recharge areas. Extensive preparation of the sub-grade must be completed using native soil materials as fill before aggregate can be applied above the projected water table. The coarse aggregate may also be buffered by a sand drainage layer applied beneath it. In highway construction, once in place, the aggregate is then covered by a minimal 18 inch thickness of soil to support vegetative growth and prevent erosion of the embankment. In short, slag fill is not placed such that groundwater can directly contact it.

A secondary concern of IEPA is that precipitation infiltration will occur, allowing the leaching of metals from the slag into underlying soils and progressively exceeding the soils' attenuative capacities until the leachate may reach and significantly impact groundwater. Highways and parking lots are constructed to minimize the residence time of precipitation and snow melt on roadway surfaces and grade structures. Water is collected and channeled into drainage ditches away from the road and embankments. The quantity of rain water actually infiltrating through the embankment will also be limited due to the design of the embankment. The slopes of the embankment depicted in Figure 5-1 are constructed at a slope of 2h to 1v (a rise of one foot for every two feet horizontal). As embankment slopes become steeper, the quantity of runoff will increase and the quantity of infiltration will decrease.

The infiltration is also reduced by evapotranspiration, the evaporation of the water from the ground and the transpiration of water from the covering vegetation. A computer model, entitled Hydrologic Evaluation of Landfill Performance (HELP) model, performs a water balance around a landfill. The model was developed to make easier estimations of surface runoff, evapotranspiration and percolation. The model was run using the design data of the embankment. The model predicted that over 60 percent of the precipitation would either be runoff or evapotranspiration. Accordingly infiltration would be limited to less than 40 percent of the annual rainfall. The average annual rainfall for nearby East Saint Louis is 37 inches. Thus the percolation through the topsoil cover is estimated at less than 15 inches per year.

Soils of the American Bottoms have moderate organic content and in the area of the highway right-of-way consist primarily of silty clays and loams. The soils range from somewhat acidic to neutral; thus water passing through the soils and in equilibrium with them is somewhat acidic. Recent

U.S. Geological Survey data show that the pH of ground water in Madison County typically is on the order of 6.4 to 7.0. Data from a monitoring well close to the western end of Poag road showed a mean pH of about 7.3 in the summer of 1986. Acidic precipitation in this area, which has an annual average pH of 4.5 and above, is buffered first by the soil profile and then by aquifer mineral constituents to reach the present pH of the underlying ground water.

Slowly over time the slag used in highway embankments would leach, just as would carbonate rock, trap rock, or other natural rock under such conditions. The rate of trace metal migration from slag, however, is controlled by several factors, including the pH of water passing through the embankment, in a manner analogous to other natural hydrogeochemical processes. Conditions within the completed embankment can be expected to increase the pH of the embankment material and of water passing through the embankment reducing the leaching of trace metals from the slag. The present local highway embankment construction practice of mixing sand with native soil to form the embankment topsoil results in some increases in soil pH, particularly when carbonate material is present in the soil. The soil water pH also may also be increased by the intentional mixture of carbonate with the soil as part of the mixing process performed to produce a loamy soil for the embankment cover. Fine particles of slag, composed in large part of iron-rich silicate glass, are particularly effective in quickly neutralizing acidic water in a manner similar to that of limestone ($CaCO_3$). These fine particles, left in the slag, react rapidly to buffer incoming acidic solutions. Similarly, if carbonate or dolomite were added to the soil, water flowing through the completed embankment would be neutral to slightly alkaline, and hence comparable in pH to the underlying ground water. Under these circumstances, the neutralization actions

within the embankment would produce water having a weak leaching potential and posing no appreciable threat to the underlying ground water.

In addition to the reduction of trace metal leaching that will result from neutralization and buffering of water within the embankment, trace metal scavenging mechanisms would be effective in attenuating the mobility of trace metals that are released from the slag. Leaching of the slag would release iron and manganese to form their oxyhydroxides on the surfaces of the slag; oxyhydroxides are efficient scavengers of trace metals. In the soil profile these oxyhydroxides, montmorillonite clays, and organic matter combine to produce the trace metal attenuation mechanisms of adsorption and cation exchange. The effectiveness of these scavenging mechanisms would be enhanced at the pH levels that would exist under the neutralization conditions in the embankment. Estimates based on evaluation of native soil and finished embankment soil show a very substantial potential lead retention capacity for soils from the proposed construction area in its natural form. Soil from the eastern part of the American Bottoms, as modified for highway embankment use, has a similar lead retention capacity.

Direct Contact Issues

As explained previously, proposed construction practices for the I-255 highway embankments will prevent direct contact with the slag after its emplacement. Use in parking lots, as railroad ballast and in concrete pavement will also minimize, due to the nature of the application, potential for direct contact with the slag. Because the slag is a very dense material, and it is being applied as a high volume, coarse aggregate fill, movement of it will be almost exclusively by heavy equipment. Chemetco is committed to safe, efficient movement of the slag and has stated previously its intent to

control its operations as best it can to prevent entrainment of dust into the air and resultant inhalation or dermal contact by workers.

Conclusion

Evaluation of the projected interaction between the chunky slag, precipitation infiltration, cover soils and underlying native soils indicates that the slag can be successfully and safely used for construction of highway embankments, concrete pavement, and parking lots and as railroad ballast without significant leaching of metals from the slag into adjacent agricultural soils and underlying groundwater resources. Some limited mobility of trace metals within the embankments and adjacent underlying soils could be expected. However, construction and operational practices combined with the natural geochemical attenuation mechanisms provided by the construction and native materials will protect present and/or potential sources of drinking water within the American Bottoms.

Office of:
PAUL E. RAWLINS
Building, Environmental &
Zoning Administrator

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ZONING BOARD OF APPEALS

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715A Troy Road
Edwardsville, Illinois 62025
618/692-6200 Ext. 4525

Madison County
Building, Environmental & Zoning Department
118 Hillsboro Avenue - Suite 205
Edwardsville, Illinois 62025
Building & Zoning: 692-6200 Ext. 4468
Environmental: 692-6200 Ext. 4564

REPORT

CHEMETCO COPPER RECLAMATION FACILITY

RECEIVED
DEC 12 1983
ILL. E.P.A. - D.L.P.C.
STATE OF ILLINOIS

BY: CECIL LONGWISCH, ENVIRONMENTAL LABORATORY DIRECTOR

DATE: DECEMBER 5, 1983

The following is a brief outline of problems existing at Chemetco Facility along with corresponding laboratory results.

(1) SLAG PILE -- This is the waste product generated at Facility. The large pile of waste is continually growing.

The I.E.P.A. has performed a sophisticated analysis on the slag called "E.P. Toxicity". This test simulates environmental conditions and submits an idea as to what the "threat" to environment would be - not just what the Total Metal Content indicates (i.e. a piece of material could have a total lead content of 500 mg/l with E.P. Toxicity of 1.0 mg/l if the lead is not in a highly soluble form).

ALL slag samples were found to contain sufficient levels of LEAD to place them in the hazardous category. Maximum legal level is ... 5.0 mg/l. Slag sample levels were: 11.25, 21.0, 195, and 77.5 mg/l.

Two of the four samples were found to contain hazardous chemical levels of CADMIUM. Maximum legal concentration is .... 1.0 mg/l. Sample levels were: 2.0 and 4.5 mg/l.

SUMMARY

Slag waste being stored at Chemetco Facility ( and being used on the south side of Oldenburg Rd. for a new parking lot) is definitely a hazardous waste and should be treated as such.

Office of:
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Building, Environmental &
Zoning Administrator

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Madison County
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CHEMETCO COPPER RECLAMATION FACILITY

(2) LEVEE IMPOUNDMENT AROUND SLAG PILE AND HOLDING PITS .....

This is an unlined containment area with levee used as a "cooling pit" for their recirculating process water. Malfunctioning equipment has allowed canal water to overflow into nearby fields which are used for both common agriculture and truck farming.

LAB RESULTS:

Illinois EPA "E.P. Toxicity" tests of CANAL SEDIMENT have shown that it is a hazardous material with respect to CADMIUM and LEAD.

LEAD Legal Limits: 5.0 mg/l -- Reported Lab Values: 15.0, 63.75, 57.5
CADMIUM Legal Limits: 1.0 mg/l -- Reported Lab Values: 6.5, 10.0, 20.0

The water was found to contain high levels of the following: Cadmium, Lead and Zinc.

With the unlined containment of this liquid, there is a possibility of contaminating ground water which is the water supply for residents and municipalities in the area. The potential for this may be realized in next section.

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Office of:
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Director, Environmental &
Zoning Administrator

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Environmental: 692-6200 Ext. 4564



CHEMETCO COPPER RECLAMATION FACILITY

(3) SOUTH SIDE OLDENBURG ROAD .....

On the south side of Oldenburg Township Road a very vivid greenish-blue liquid is collecting in a ditch approximately 10 feet in depth. This is approximately 150 yards from the Chemetco buildings and 300-400 yards from the slag pile and containment levees. The green liquid is seeping completely underground into a trench that was dug by Chemetco. This indicates that the ground under the facility is saturated with this chemical solution and is possibly contaminating the drinking water supplies of the shallow wells in the area. The solution was found to contain the following:

| | Reported Values | Legal Limit for Drinking Water |
|---|---|---|
| COPPER | 7900; 3700; 160; 76 | 5.0 mg/l |
| IRON | 6300; 1600; 440 | 1.0 mg/l |
| NICKEL | 5400; 2400; 110; 53.3 | 1.0 mg/l (for discharge) |
| SULFATE | 47,100; 31,855; 2,455 | 250 mg/l |
| ARSENIC | 3.1; 7.2; .061 | .05 mg/l |
| CADMIUM | 2.0; 5.2; 6.2 | .01 mg/l |
| CHROMIUM | 5.4; 1.2; .06 | .05 mg/l |
| LEAD | 4.4; .05; .26 | .05 mg/l |
| ZINC | 320; 200; 440; 50.9 | 5.0 mg/l |

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STATE OF ILLINOIS

Further sampling and analysis in this area (South of Chemetco) can only determine the extent of the range of contamination, the levels revealed here alarm me!

Office of:
PAUL E. HAWKINS
Building, Environmental &
Zoning Administrator

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Edwardsville, Illinois 62025
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Environmental: 692-6200 Ext. 4564



CHEMETCO COPPER RECLAMATION FACILITY

(4) POINT DISCHARGE INTO CAHOKIA CANAL ....

This is the "Treated Effluent" which is regulated by the N.P.D.E.A. discharge permit. The following levels were found:

| | | LIMIT |
|---|---|---|
| CADMIUM | 6.0; 6.5; 0.42 | 0.5 |
| COPPER | 0.15; 0.56; 1.88 | .02 |
| LEAD | 1.29; 2.11; 0.40 | 0.1 |
| NICKEL | 1.6; 2.0; 1.52 | 1.0 |
| ZINC | 180; 120; 2.96 | 1.0 |

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STATE OF ILLINOIS

Results indicate violation of N.P.D.E.S. Limitations.

RECOMMENDATION:

1. Review of Madison County Zoning Permit, since it has been determined that the substance they are storing is a hazardous waste. This substance can only legally be stored at a Hazardous Waste Site.

2. Extensive monitoring of groundwater supplies in area for contamination.

3. Possible legal action or numerous violations as presented in text of report or support of I.E.P.A. in their case.

4. This is the most serious case I have been involved with and recommend Environmental Committee and/or Madison County Board action on this problem.

Laboratory Analytical results from I.E.P.A. and Madison County Environmental Lab.

MADISON COUNTY ENVIRONMENTAL CONTROL WATER ANALYSIS LABORATORY
[illegible] NORTH MAIN EDWARDSVILLE, ILLINOIS [illegible]
ILLINOIS STATE CERTIFIED # 17216 Tel. [illegible]

COUNTY COLLECTED IN: [illegible]
TOWNSHIP:
DATE AND TIME COLLECTED: 11-21-83
COLLECTED BY: C. [illegible]
PUBLIC FACILITY: YES NO

EFFLUENT ___ SURFACE WATER ___
DRAINAGE ___ LAKE ___
OTHER ___

ADDRESS OF SOURCE
NP46134 - Chemetco Slag NP46138 - Chemetco Levee Impoundment

MAIL REPORT TO:

NAME: OFFICE
STREET:
TOWN: ILLINOIS

REMARKS

| CHEMICAL ANALYSIS (expressed as mg/l) | | BACTERIAL ANALYSIS | |
|---|---|---|---|
| Total Nonfiltrable Residue | | Total Coliform | /100 ml |
| Biochemical Oxygen Demand | | Fecal Coliform | /100 ml |
| pH | | Fecal Streptococci | /100 ml |
| Ammonia | | Other Bacteria (non-differentiated) | /100 ml |

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[illegible] 2 1983
ILL. E.P.A. D.L.P.C.
STATE OF ILLINOIS

Reported from Lab. 12-5-83 by CL/SQ

REPORT OF ANALYSIS

| | NP46134 | NP46138 |
|---|---|---|
| Copper | 2351 mg/kg (ppm) | 1.93 mg/l (ppm) |
| Lead | 2388 mg/kg (ppm) | 0.76 mg/l (ppm) |
| Cadmium | 10.0 mg/kg (ppm) | 0.32 mg/l (ppm) |
| Nickel | 200 mg/kg (ppm) | 4.32 mg/l (ppm) |

[illegible] NORTH MAIN EDWARDSVILLE, ILLINOIS [illegible]
ILLINOIS STATE CERTIFIED # 17216 [illegible]

[illegible] Wilson

[illegible] 11-21-83

COLLECTED BY: C. Longwisch

PUBLIC FACILITY: YES NO

EFFLUENT SURFACE WATER

DRAINAGE LAKE

OTHER

ADDRESS OF SOURCE

NP4613C - Chemetco impoundment south side Oldenburg NP4613D - Chemetco Discharge into Cahokia Creek

MAIL REPORT TO:

NAME: DEFICE

STREET:

TOWN: ILLINOIS

REMARKS

CHEMICAL ANALYSIS (expressed as mg/l)

Total Nonfiltrable Residue

Biochemical Oxygen Demand

pH

Ammonia

Reported from Lab. 12-5-83 by CL/SQ

BACTERIAL ANALYSIS

Total Coliform /100 ml

Fecal Coliform /100 ml

Fecal Streptococci /100 ml

Other Bacteria (non differentiated) /[illegible] ml

RECEIVED [illegible] ILL. EPA STATE OF ILLINOIS

REPORT OF ANALYSIS

| | NP4613C | NP4613D |
|---|---|---|
| Copper | 75.65 mg/l (ppm) | 0.15 mg/l (ppm) |
| Lead | 0.70 mg/l (ppm) | 0.40 mg/l (ppm) |
| Cadmium | 0.98 mg/l (ppm) | 0.42 mg/l (ppm) |
| Nickel | 53.3 mg/l (ppm) | 1.52 mg/l (ppm) |
| pH | | 7.8mg/l (ppm) |

Office of:
PAUL E. HAWKINS
Building, Environmental &
Zoning Administrator

Office of:
ZONING BOARD OF APPEALS

Office of:
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2125A Frey Road
Edwardsville, Illinois 62025
618-692-6200 Ext. 4525

# Madison County
## Building, Environmental & Zoning Department

118 Hillsboro Avenue - Suite 205
Edwardsville, Illinois 62025
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Environmental: 692-6200 Ext. 4564

CHEMETCO
RT. #3 & OLDENBURG RD.
HARTFORD, IL

An on-site inspection was made of above facility on November 3, 1983, by Cecil Longwisch, Environmental Laboratory Director, and the following conditions were found to exist:

(1) Containment of slag pile runoff is by an unlined channel which contained a large amount of standing water. This "pooled" water with its associated leachates from the slag pile could possibly permeate the soil and reach ground-water.

It is recommended the channel be lined with an impermeable barrier AND the "pooled" water be treated according to Ill. EPA standards.

(2) Drums (contents unknown) were being stored in slag pile and possibly covered.

(3) Roadside ditch on south side of Oldenburg Rd. was filled with a green liquid of a chemical nature - substance apparently flows under road.

A pumping system is set up to pump out ditch, but we must be conversant as to chemical content; disposal site; and if ground-water is being contaminated.

(4) A very large parking lot is being constructed on south side of Oldenburg Rd. utilizing slag materials. This is a very hazardous condition due to the high metal content of the slag and high water table associated with the "bottoms" area.

This material should all be removed and re-deposited on the slag pile.

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ILL. E.P.A. - D.L.P.C.
STATE OF ILLINOIS

feet to a point; thence South 80 degrees 31½ minutes East 1317.19 feet; thence South 15 degrees 00½ minutes West 209.0 feet; thence South 14 degrees 37½ minutes West 1170.10 feet to the point of beginning; except that part thereof conveyed to the St. Louis, Chicago and St. Paul Railroad Company by deed dated March 29, 1893, recorded in Book 222 Page 15, Recorder's Office of Madison County, Illinois; containing in the part conveyed 41.13 acres, more or less, according to Sheppard Morgan and Schwab Survey No. 6504-7 dated January 1966, and resurveyed as to the part thereby conveyed during August 1969.

Subject to easements, restrictions and reservations of record.

Also subject to the right of way for a road as shown on said Sheppard Morgan and Schwab survey.

WHEREAS, it was the recommendation in the aforesaid Report of Findings of the Madison County Zoning Board of Appeals that the petition of "Chemetco, Incorporated, a Corporation, by John Suarez, Vice President, requesting a Special Use Permit in order to permit slag piles to be located on the property in an M-3 Heavy Industrial District in Chouteau Township" be granted with the following provisions; I. That if the slag pile is allowed to exist the least that should be done is containment levees and ditches to contain the run off and channel it to property treatment in the waste water treatment facility, operated by Chemetco; II. That the water should be treated before it is discharged into any stream; III. That every effort should be made to dispose of the slag as soon as possible. IV. That the Madison County Environmental Control Laboratory will make periodic lab test on the discharge into the canal.

WHEREAS, it was the opinion of the County Board of Madison County, that the findings made by the Madison County Zoning Board of Appeals should be approved and Resolution adopted.

MAY 10 11 22 AM '90
RECEIVED
DIVISION OF
WASTE MANAGEMENT

**Exmet of Kentucky, Inc.**
**c/o Dennis J. Lisack**
**3710 Trail Ridge Road**
**Louisville, Kentucky 40241**

502/426-9766

May 9, 1990

Natural Resources and Environmental
Protection Cabinet
Division of Waste Management
Fort Boone Plaza
18 Reilly Road
Frankfort, Kentucky 40601

Attn: Abbey Meyer

Dear Ms Meyer:

Exmet's Board of Directors recently asked Dr. Hugh Spencer tp study the zinc oxide material remaining at Exmet as a consequence of recent court rulings and information disclosed at those hearings.

Dr. Spencer has completed this report, a copy of which we are hereby transmitting to the Cabinet for its information. The title of this study is:

Exmet of Kentucky, Inc.
Chemical Composition of Zinc Oxide
Smelter Dust
Date: May 3, 1990

Please acknowledge the receipt of this report by signing in the space provided below and returning one copy to me.

Thank you.

Cordially,

Dennis J. Lisack
Acting President, Exmet

Received By:_____ Date:_____

# APPENDIX A

Illinois Department of Transportation
Division of Highways/District 8
9300 St. Clair Avenue/Fairview Heights, Illinois/62208

September 26, 1986

Mr. Bill Gardner
Luhr Bros., Inc.
P.O. Box 69
Columbia, IL 62236

Dear Bill:

This letter is in regards to your inquiry concerning the use of the waste slag pile at the CHEMETCO plant near Hartford, for embankment material on the Poag Road job in Madison County.

The material is satisfactory as far as size and gradation; however, in conversation with the Illinois Environmental Protection Agency, the material is, at this time, considered a hazardous waste product and we cannot approve it for embankment.

Very truly yours,

Dale L. Klohr
District Engineer

Thomas A. McCarthy

Thomas A. McCarthy
District Materials Engineer

TAM:rah/0584J

cc: Mr. John Suarez, CHEMETCO
File

# APPENDIX B

Illinois Department of Transportation
Division of Highways/District 8
1100 Eastport Plaza Drive/P.O. Box 988/Collinsville, Illinois 62234-6198

February 9, 1988

Ms. Michelle Reznack
Chemetco
Illinois Route 3
Hartford, IL 62048

Dear Ms. Reznack:

As discussed in your telephone conversation on February 2, 1988 with Paul Bauer, copper slag, subsequent to USEPA and IEPA approval, could possibly be used in the following ways.

I have attached copies of IDOT's Standard Specifications for Road and Bridge Construction, for Fine and Coarse Aggregates. As you can read in the "Description" paragraph for both fine and coarse aggregates of the various uses, the specification would have to be addended to allow the use of copper slag.

Quality tests performed to-date, indicate that B quality is attainable and maybe A quality, once freeze-thaw testing (currently in progress) is completed.

In regard to the procedures for furnishing aggregates, both asphaltic and concrete mix plants place orders directly with the producer. County, Township and Municipal agencies usually require specific requirements and are put out to bid yearly. I have attached a copy of a "Notice to Contractor's Bulletin" whereby it shows the letting date, time, place and the various items they accept bids on.

Since copper slag has a hard, brittle and silicious structure, the resulting graded products might be excessively hard on automobile tires if the product was used on a roadway surface or shoulder. Thus once, copper slag is appropriately sized and free of virgin metals, testing of its characteristics can be performed. Depending upon the results attained, uses can then be approved and specified. At that time, I can furnish you the necessary information on letting practices and procedures.

Very truly yours,

Dale L. Klohr
District Engineer

Thomas A. McCarthy

Thomas A. McCarthy
District Materials Engineer

# APPENDIX C

# EVALUATION OF ENVIRONMENTAL PROCESSES AND CONSEQUENCES OF USING SECONDARY COPPER SMELTER SLAG IN HIGHWAY EMBANKMENTS, WESTERN MADISON COUNTY, ILLINOIS

Prepared For

CHEMETCO
Hartford, Illinois

By

A. G. Everett

Everett & Associates
203 Dale Drive
Rockville, Maryland 20850

March, 1986

## EXECUTIVE SUMMARY

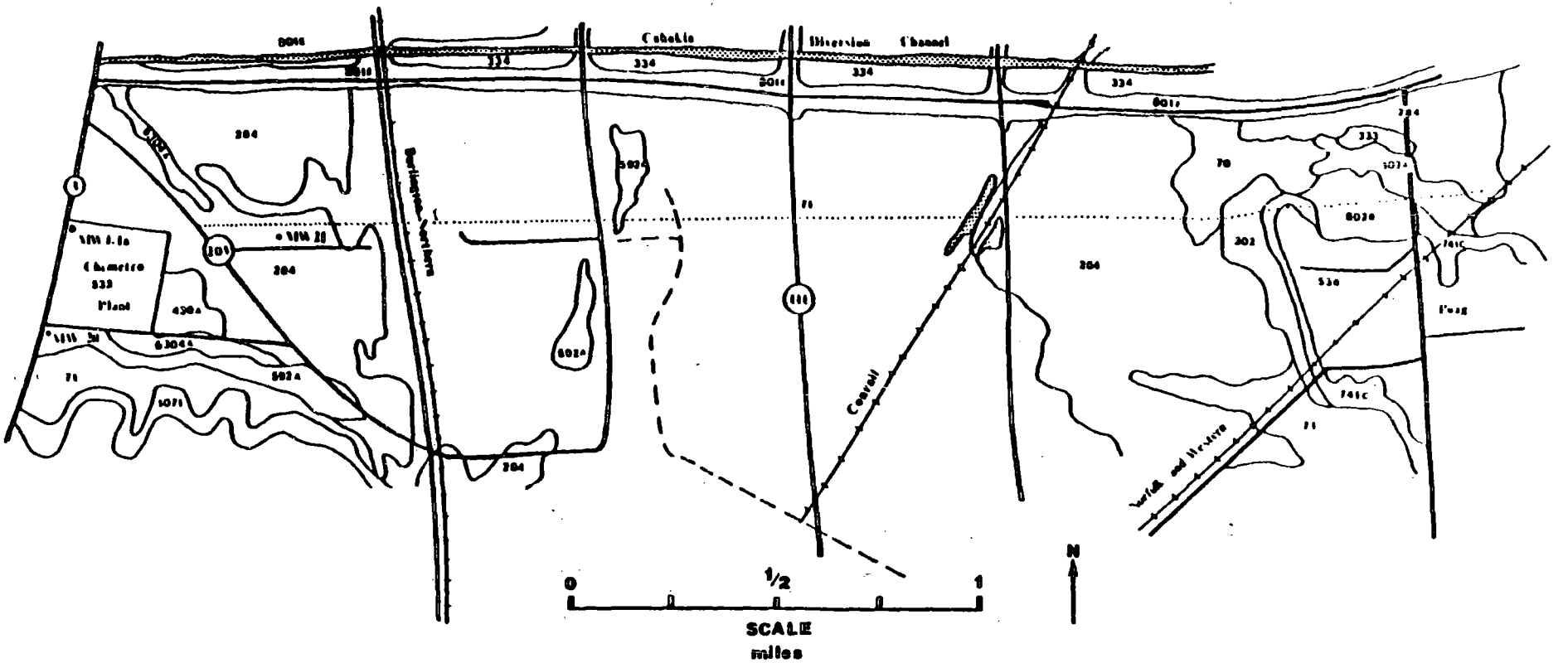
This report evaluates the environmental effects of the use of slag produced in Chemetco's secondary copper smelting operations in the construction of highway embankments for Poag road in western Madison County, Illinois, near the Chemetco plant. The analysis and conclusions of the report are also applicable to the use of Chemetco slag in embankments for the proposed construction of the I-55 extension north of I-270. The report concludes that there can be a satisfactory use of the slag for highway embankment construction without posing a hazard to local ground water or nearby agricultural soils.

The proposed design for the embankments involves placing the slag on a sand blanket that would overlie native soils, and covering the slag with soil upon which vegetation would be grown. Because the slag would thus be encapsulated, wind erosion is not a concern. Accordingly, this report considers whether adverse environmental effects may result from migration of such trace metals as lead, copper, zinc, and cadmium into the ground water and adjacent agricultural soils. The report is based upon the field samples collected from the highway construction area; upon available data in state and federal reports on the soils, water resources, and geology of the area; and upon scientific literature appropriate to evaluation of the soil and water chemical processes that would affect the slag when placed in the highway embankments.

Soils of the American Bottoms have moderate organic contents and in the area of the highway right-of-way consist primarily of silty clays and loams. The soils range from somewhat acidic to neutral and thus water passing through the soils and in equilibrium with them is somewhat acidic. Recent U.S. Geological Survey data show that the pH of ground water in the Madison County part of the American Bottoms typically is on the order of 6.4 to 7.0. Data from a monitoring well close to the western end of Poag road shows a mean pH of about 7.3 in the summer of 1986. Acidic precipitation in this area, which has an annual average pH of 4.5 and above, is buffered first by the soil profile and then by acquifer mineral constituents to reach the present pH of the underlying ground water.

Slowly over time the slag used in highway embankments would leach, just as would carbonate rock, trap rock, or other natural rock under such conditions. The rate of trace metal migration from slag, however, is controlled by several factors, including the pH of water passing through the embankment, in a manner analogous to other natural hydrogeochemical processes. Conditions within the completed embankment can be expected to "buffer," or increase the pH of the embankment material and of water passing through the embankment, thus reducing the leaching of trace metals from the slag. The present local highway embankment construction practice of mixing sand with native soil to form the embankment topsoil results in some increase in soil pH, particularly when carbonate material is

## Fig. 1 Soils map for Poag road.




**LEGEND**

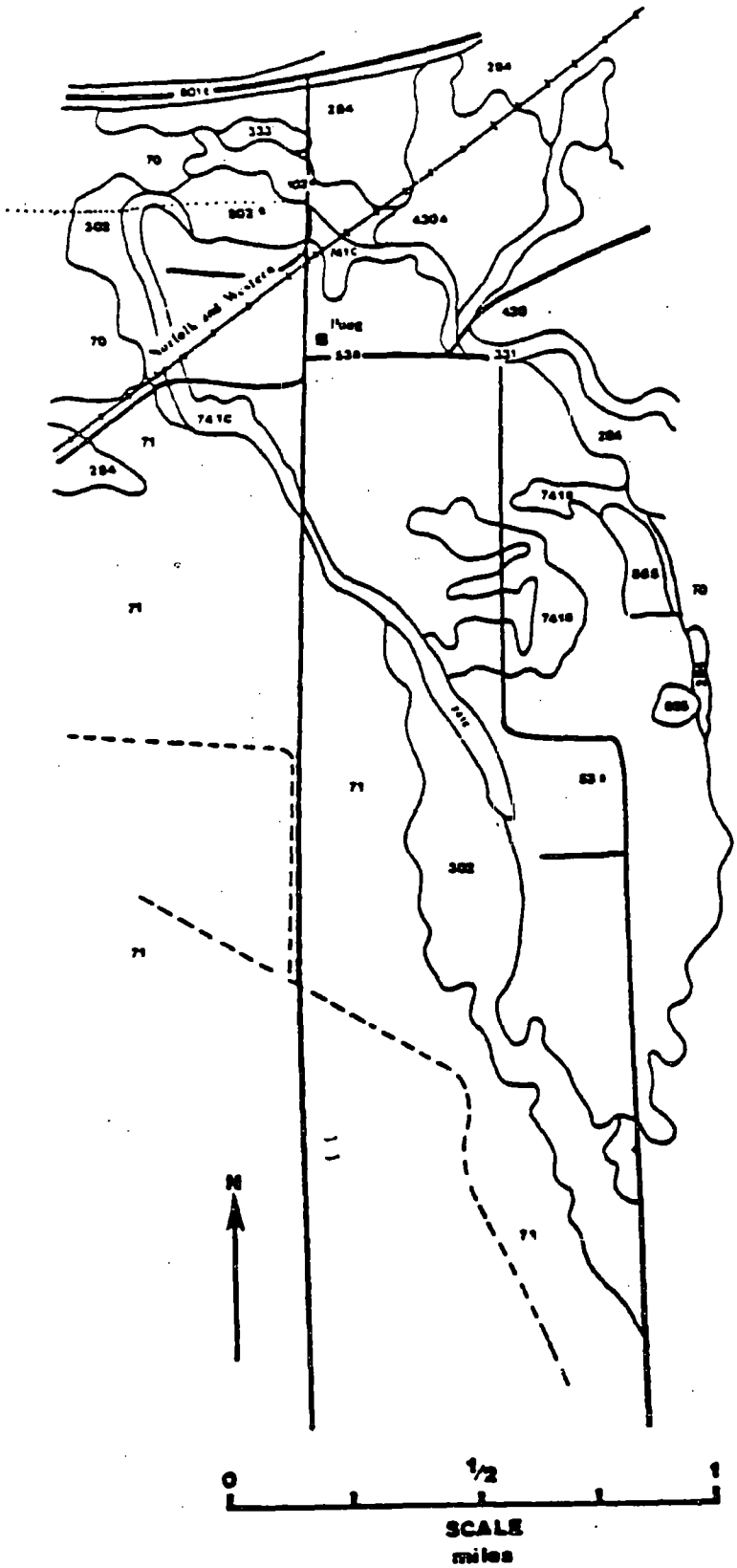
- Water
- Road
- Proposed Road
- County Ditch
- Railroad

53B : Bloomfield loamy fine sand
70 : Beaucoup silty clay loam
71 : Darwin silty clay
102A: La Hogue loam
284 : Tice silt loam
302 : Ambraw loam
331 : Haymond silt loam
333 : Wakeland silt loam
334 : Birds silt loam
430A: Raddle silt loam

533 : Urban land
592A : Nameoki silty clay
741B : Oakville fine sand
741C : Oakville fine sand
801E : Orthents silt
802B : Orthents loam
865 : Pits, gravel
1071 : Darwin silty clay
6304A: Landos Variant very fine sandy loam

(Goddard and Sabata, 1986)

**Fig. 2 Soils map for proposed I-55 corridor.**




**LEGEND**

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802B : Orthents loam
865 : Pits, gravel
1071 : Darwin silty clay
6304A: Landes Variant very fine sandy loam

(after Goddard & Sabata, 1986)

## 2. SOILS OF THE AMERICAN BOTTOMS

A comprehensive soils survey of Madison County was made by Goddard and Sabata (1986) which covers both the Poag road extension and the proposed I-55 extension to the north of I-270. The Poag road extension runs east from a junction with Illinois 203 in Section 15, R.9W, T 4N, to the community of Poag in Section 13, R.9W, T 4N (Figure 1). The I-55 extension is presently proposed to run north from I-270 within a corridor, as shown on Figure 2.

Soils along the route of the Poag road extension are Tice silt loam (type 284) and Darwin silty clay (type 71) with local occurrences of Nameoki silty clay (type 592A), Ambraw loam (type 302), and Bloomfield loamy fine sand (type 53B). Except for the Bloomfield loamy fine sand, which forms on terrace deposits such as that on which Poag is situated, the soil types are characteristic of poorly-drained flood plains, having moderate organic contents, slow to moderate drainage rates, with water tables seasonally near or at the surface. The soil:water pH (soil reaction) of the four loam and clay soils ranges from 6.1 to 7.8 while the Bloomfield loamy fine sand ranges from 5.1 to 7.8 (table 16, Goddard and Sabata, 1986). Five field samples of Tice and Darwin soils taken during a reconnaissance of the Poag road extension in late November, 1986, show a pH range from 5.5 to 6.1. Organic contents of the fine samples ranged from 2.5 to 4.6 percent. Clay, silt, and sand percentages of four of the samples are shown in Table 1. All are silty clays.

The Illinois Department of Transportation mixes bottomland clay soils with sand, modifying the textures into loam, for use as a top dressing on highway embankments. Table 1 has an example of such a top dressing taken from a recently-graded embankment at the Illinois 157 and I-270 interchange. Admixture of sand increases permeability and enhances organic matter decomposition by microorganisms. Not all of the increased pH of the finished sample is due to the reduction of organic content, however, inasmuch as the local surface material in the vicinity of the interchange includes carbonate-bearing silt eroded from loess in the nearby bluffs. However, a significant point is that pH is increased by the organic matter decrease in the finished soils, thus water percolating through such soils will have a higher equilibrium soil solution pH than would water moving through bottomland organic-rich clays into the shallow ground water of the Bottoms.

The mineralogy of the parent materials of soils formed on the Bottoms is given in part by Bergstrom and Walker (1956) in their descriptions of "glacial valley train deposits" of the Roxana-Wood River terrace and of "Recent alluvial deposits" from shallow wells near the present river channel. The bulk mineralogy of these two

TABLE 1

CHARACTERISTICS OF POAG ROAD SOILS
(After Goddard and Sabata, 1986)

| | % Clay | K (in/hr) | Soil Reaction (pH) | Organic Matter (in percent) | Sand:Silt:Clay Percentages |
|---|---|---|---|---|---|
| Bloomfield | 5-10 | 6.0-20 | 5.1-7.8 | 0.5-2.0 | |
| | 2-10 | 6.0-20 | 5.1-7.3 | | |
| Darwin | | | (5.8-6.0)[1] | | |
| | 35-45 | <0.06 | 6.1-7.8 | 4-5 | |
| | 45-60 | <0.06 | 6.1-7.8 | (2.5;4.6)[1] | 1:58:41 |
| Tice | | | (5.5-6.0)[1] | | |
| | 22-35 | 0.6-2.0 | 6.1-7.8 | 2-3 | 0:55:45 |
| | 22-35 | 0.6-2.0 | 5.6-7.8 | (3.1;3.6)[1] | 4:52:44 |
| Anbraw | 18-27 | 0.6-2.0 | 5.6-7.3 | 2-3 | |
| | 24-35 | 0.2-2.0 | 5.1-7.3 | | |
| Nameoki | 35-60 | <0.06 | 6.1-7.3 | 2-4 | |
| | 35-60 | <0.06 | 5.1-7.3 | | |
| Finished Embankment Soil | | | | 0.7 | 44:29:27 |

Soils data from analyses by the Indiana Farm Bureau Laboratory, Indianapolis.

Table 2
Mineralogy of Soil Parent Materials

| | Quartz | K-feldspar | Plagioclase feldspar | "other" | carbonate (7) | hornblende | SRFs | granite/gneiss rock fragments | mudstone | chert | VRFs | foliated MRFs | Hornfels | limonite | Fe oxides/ hydroxides | limonite stained clay |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Roxana-Hartford (1) terrace sands (medium to coarse sand with some granular gravel) | 75-80 | 8-15 | 5-10 | 2-6 (2) | | | | | | | | | | | | |
| Recent alluvial (1) deposits (textural range from clay to granular gravel) | 65-75 | 10-13 | 12-15 | 4-7 (3) | | | | | | | | | | | | |
| Roxana silt (5) (loess) | "predominant" | 13-18 | 7-10 | 0.1-2 (6) | | | | | | | | | | | | |
| Mississippi River sand (4) | 58.7 | 11.7 | 1.0 | ---- | 0.3 | 0.7 | 3.0 | 7.0 | 2.7 | 4.7 | 5.0 | 3.0 | 2.7 | --- | --- | ---- |
| alluvial fan (4) | 51.0 | 5.7 | --- | 1.7 | 11.7 | 3.0 | 10.3 | ---- | 6.7 | 0.7 | | | | 1.0 | 6.0 | ---- |
| loess (4) | 27.3 | 1.7 | --- | tr | 65.7 | 0.3 | ---- | ---- | ---- | ---- | ---- | ---- | ---- | 3.3 | 1.2 | 0.7 |

1) Bergstrom and Walker (1956)
2) Includes rhyolite porphyry, graywacke, milky chert, and calcareous material, mica
3) Includes chert, carbonate rock fragments ("limestone"), jasper, shale fragments, coal, graywacke, and heavy minerals; apparently also includes biotite and phlogopite mica.
4) This report.
5) Frye, Glass and Willman (1962)
6) Includes hornblende, epidote, tourmaline, zircon, garnet; note that although both calcite and dolomite are mentioned, they have not been quantified.
7) Calcite and dolomite have not been differentiated, both are present in the loess and alluvial fan sediments.
8) Includes biotite, muscovite, garnet, epidote, tourmaline, and kyanite.

* SRF: sedimentary rock fragments
VRF: volcanic rock fragments
MRF: metamorphic rock fragments

units is tabulated in Table 2, in conjunction with the composition of 1) recently-dredged Mississippi River sand being used in the sand blanket under the Poag road embankments, 2) stream-reworked loess in the alluvial fan west of the I-270 and Illinois 157 interchange, and 3) unweathered loess adjacent to I-270 on the east side of the Illinois 157 interchange. Clay is present in the parent materials but is most heavily concentrated in fine-grained soil materials. Montmorillonite is the predominant clay in the soil profile and parent materials, especially in the widespread Roxana loess south of Alton and in soils derived from it (Frye et al, 1962). The Missouri River contributes a large load of montmorillonite and carbonate and volcanic fragments to the Mississippi, and its alluvial valley, beginning in the northern part of the American Bottoms (Potter et al., 1975). Both montmorillonite and volcanic ash shards are present in the Peoria loess of Kansas, which is a possible upwind source area for the loess of the Bottoms (Swineford and Frye, 1951; Johnson and Kelley, 1984), thus both water and wind-borne agents of deposition are in place to influence the parent mineralogy of the soils from the mainstem Mississippi and its major tributary, the Missouri. Local variations in sediment and soil mineralogy depend upon the time-sequencing of valley fill deposition by each of these rivers in their flood stages. For example, the dredged sand used as the sand blanket for the Poag road embankments has a composition characteristic of the Mississippi River upstream of the mouth of the Missouri, most notably by its paucity of carbonate debris that would buffer both soil pH and water percolating through soils to the water table.

The influence of water recharged through the Bottoms' organic-bearing soils is reflected in Voelker's (1984) data by wells showing decreases in pH accompanying a rising water table, reflecting either the presence of dissolved organic acids, increased $CO_2$ from soil horizons, increased $CO_2$ as a result of organic decomposition in the recharging water, or a combination of all of these mechanisms. Reaction of soil water with the minerals of the aquifer horizons will result in increased pH, increased alkalinity, and increased total dissolved solids with increased time of contact. As oxygen-consuming reactions, such as dissolved organic acid decomposition, reduce the oxygen content of the water, it will decrease in Eh and can become reducing, a condition recognized most readily by a high dissolved iron content and a low nitrate concentration.

The interreaction of surface material and recharge waters is pertinent to environmental considerations concerning use of the Chemetco slag. Although it can be expected that slag, like other porous granular material, would be emplaced so as to be freely and readily drained, the custom of placing soil covers on embankments, followed by vegetation, requires an evaluation of the possible effects of such a design. Using a soil cover with vegetation will essentially encapsulate the slag. Soil:water pH measurements on Tice and Darwin soils indicates that untreated soils would produce percolating water having a pH range of 5.5 to 6.1; the finished highway embankment soil used at the I-270 and Illinois 157 interchange indicates that

modification of the soil can increase the pH by up to two pH units. Although it appears microscopically that the carbonate fraction of the soil is part of the alluvial fan silt derived from the loess exposed in the adjacent bluffs, not due to what appears to be river terrace sand added to the local soil, intentional mineralogical--thus chemical--modification of Bottoms' soil can be designed to accomplish the same result. Admixture of dredged sand in accordance with present practice plus carbonate sand to the present soil would result in both an increase in water percolation rate and an increase in pH. As shown by the results of Helling et al. (1968), increasing the pH of soil can be expected to increase the cation exchange capacity of the soil, thus increasing the capacity of the soil to retain trace metals and for through-going water to react with soil mineral and slag constituents in such a way as to inhibit trace element migration.

Based on evaluation of 60 Wisconsin soils, Helling et al. (1968) showed that cation exchange capacity (CEC) of soil is associated with both organic matter and clay concentration and that, further, at constant values of each, the CEC increases with increasing pH. For organic matter concentrations similar to those of the Tice and Darwin series soils, averaging 3.28 percent (Table 1), they found greater increases in the CEC of organic matter per unit increase in pH (from pH 2.5 to 8.0) than for clay. There was a 5.6-fold increase in the CEC of the organic matter in contrast to a 1.7-fold increase for the average CEC of clay. Tan and Dowling (1984) found that for a montmorillonitic clay soil, destruction of its organic content increased the CEC of the clay because clay adsorption of organic material had decreased the CEC of the clay.

Although the data set at hand has not been evaluated under the same test conditions as that of Tan and Dowling, it appears that the same effect could be expected in the American Bottoms soils. Comparison can be made between the average characteristics of the Poag road area native soil samples and the finished highway embankment soil sample (see Table 1). With a decrease from an average 3.6 percent organic material in the Tice and Darwin samples to 0.7 percent in the highway embankment soil, there is 5.1-fold decrease in average organic matter and a decrease of 1.7-fold in average clay content, there was a decrease in cation exchange capacity of only 1.7-fold, comparable to the decrease in amount of clay alone. Based on the findings of Helling et al. (1964), if organic matter and clay content were constant, it would be expected that there would be an increase in CEC with an increase in pH on the order of that achieved for the highway embankment soil (pH 7.8). If organic matter were decreased but clay content held constant, an equal or greater CEC to that found in the lower pH, more organic-rich, agricultural Bottoms soils would be expected in highway embankment soils modified through the addition of sand in accordance with present highway department practice, plus the addition of calcium carbonate.

## 3. GROUND WATER IN THE AMERICAN BOTTOMS ALLUVIAL AQUIFER

The geological setting of the American Bottoms area, in western Madison, St. Clair, and Monroe counties of Illinois, roughly opposite the St. Louis area, has been described by Bergstrom and Walker (1956). Constituting the Mississippi River valley bottom between Alton and Dupo, Illinois, the American Bottoms are approximately thirty miles long and eleven miles wide at their maximum width, including about 175 square miles. The Missouri and Mississippi Rivers join about five miles south of Alton. The northern part of the Bottoms is bordered on the east by erodable, bluff-forming Pennsylvanian rocks, whereas the southern bluffs portion is bordered by Mississippian carbonate rocks that also underlie much of the alluvial valley fill. The bluffs are capped by a thick cover of loess, composed largely of silt to very fine sand-sized carbonate grains.

The average surface elevation of the flood plain decreases southward from about 415 feet above mean sea level near Alton to about 405 feet near Dupo. The western two-thirds of the flood plain includes the former meanderbelt of the Mississippi River, including abandoned former meanders and channels such as Horseshoe Lake and Long Lake. The easternmost portion of the Bottoms are lowlands and back swamps related to the meanderbelt, filled with fine-grained sediments typical of such backwater areas. In the northern part, there are discontinuously-eroded terrace deposits formed of sand and gravel; these terraces stand 25 to 35 feet above the average level of the flood plain.

At the base of the bluffs bordering the eastern portion of the Bottoms are small alluvial fan deposits of eroded loess extending over portions of the eastern part of the alluvial valley fill. These fans both slope and thin westward toward the Mississippi. The loess deposits (see Table 2) are composed of a significant amount of carbonate silt, except in the upper portions where carbonate has been leached away. The fan deposits are both fine-grained and have a high carbonate content, reflecting their origin by erosion of loess in the bluffs, thus differ in both typical grain size and mineralogy from the river-deposited sands and gravels.

Bergstrom and Walker (1956) describe the basal deposits of the American Bottoms immediately overlying bedrock as being comprised of "unsorted ice-laid deposits (till),...sorted water-laid material (outwash), and...wind-transported silts (loess) (p. 16)", of Pleistocene age and related to the region's glaciation. The alluvial fill is on the order of 120 feet thick, being deepest in a trough that passes from north to south toward the mid-part of the Bottoms and becoming shallower along the eastern margin. At its deepest, the alluvial fill is on the order of 170 feet. Most of the alluvial

fill overlies Mississippian age carbonate rocks; Pennsylvanian age sediments are present along the shallower eastern margin of the floodplain. More recently, the Mississippi has reworked the glacially-related deposits, adding fine-grained sediments such as fine sands, silt and clay to backwater areas of the floodplain. As a result, the internal geometry of sedimentary units within the Bottoms is complex, with extensive interlamination of coarser-grained permeable sands and gravels and finer-grained, less permeable sediment layers that locally confine or retard vertical and horizontal movement of water. Deeper deposits tend to be coarser-grained and more permeable (Bergstrom and Walker, 1956). It is probable that coarser-grained deposits are more continuous than are the finer-grained clayey and organic deposits. For more detail, the reader should consult Bergstrom and Walker (1956) and boring logs for various parts of the Bottoms.

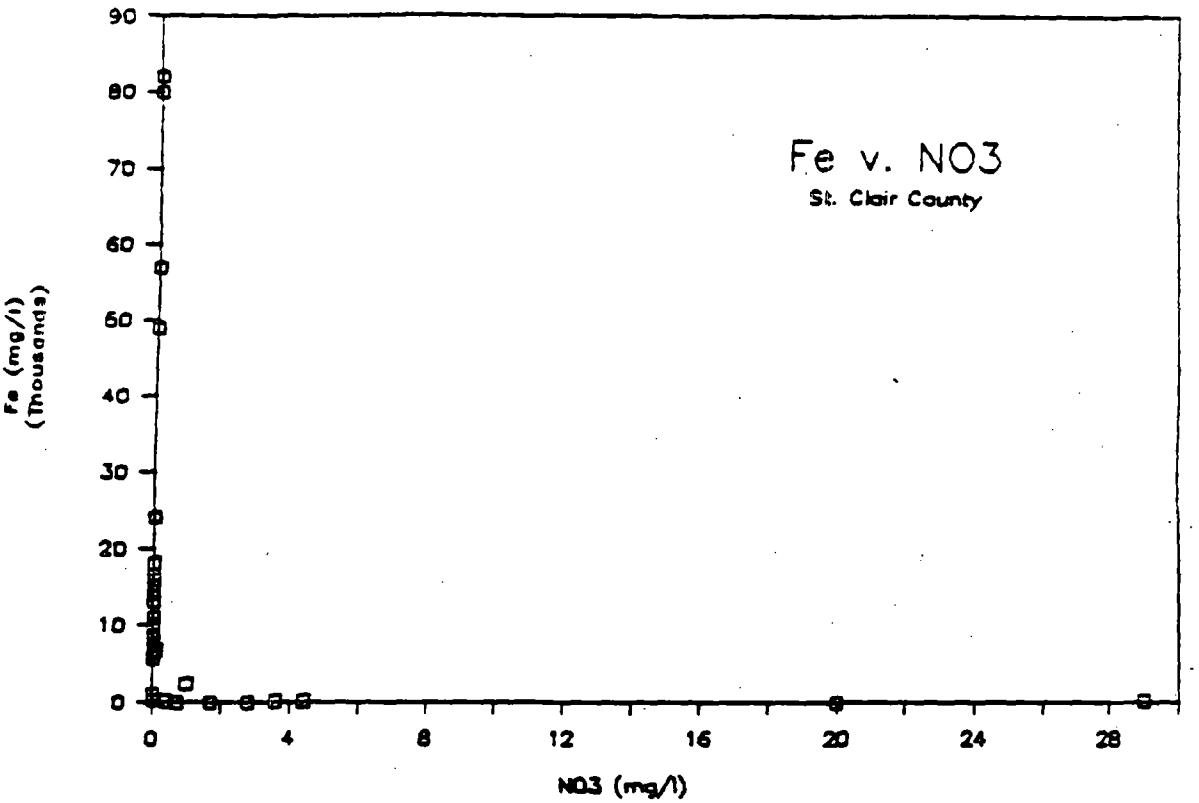
Recharge of groundwater into the alluvial aquifer has been recognized as coming from several sources. Precipitation onto the Bottoms largely seeps in or evaporates, there being little surface runoff on the alluvial plain proper. The Bottoms receive runoff from the highlands to the east, crossing the valley in streams and discharge canals that provide some local surface drainage as well as local recharge to the alluvium adjacent to and beneath the channels. Bergstrom and Walker (1956) have observed that straightening of previous stream courses, with deepening of channels and construction of levees, has decreased the amount of runoff recharge into the alluvial aquifer. Floodwaters from the Mississippi River also provide occasional recharge as does lateral inflow from the river channel in areas of high rates of well pumpage, such as near Hartford and East St. Louis. Leakage into the aquifer will be increased at times of the river's high water and will diminish at low flow. In addition, it is suggested below that there is upward leakage from the bedrock aquifer in areas of heavy pumpage and in certain parts of the southern portion of the Bottoms.

Chemical conditions can be used to evaluate the oxidation/reduction status of water sampled from different horizons within the alluvial sequence. Hem and Cropper (1959) developed in the laboratory the interrelationship of ferrous and ferric iron in water under different pH and Eh (reduction-oxidation potential), such that, for groundwaters of the pH range typical of the American Bottoms, approximately pH 6.0 to 7.5, Eh (in volts) above about 0.50 would be in the stability field of $Fe(OH)_3$ and below that, iron would be in solution in a ferrous state. They found that ferrous iron can persist in disequilibrium, especially in the presence of low pH or excess carbon dioxide in solution (Hem and Cropper, 1959; Hem, 1960). The cited papers give the details for calculating estimates of Eh from measured parameters. The point here, however, is the relative relationship of negligible-to-low dissolved iron in well-oxygenated recharge waters in contrast to higher ferrous iron concentrations in more oxygen-depleted (low Eh) waters. Water recharging through organic-rich flood plain soils can be expected to become reduced in

oxygen, with a corresponding reduction of Eh, in the saturated zone of the aquifer. Movement into confined horizons in which there is no direct interconnection of water with the atmosphere to supply oxygen, will lead to further oxygen depletion as the water reacts with aquifer constituents, thus increasing the amount of dissolved iron, if iron-bearing materials are present in the aquifer. In a regional study of the behavior of iron in the Atlantic Coastal Plain aquifer, Back and Barnes (1965) found that dissolved iron concentrations increase as Eh decreases down-dip away from the recharge area, although Eh can increase locally when aquifer water becomes mixed with more oxygenated recharge water coming from leakage from overlying horizons. When the Eh and iron concentration data are considered from the viewpoint of stratigraphy, it can be seen that both factors increase with increasing degrees of confinement of the aquifers by overlying less-permeable units, an effect documented in the Delaware portion of the Atlantic Coastal Plain aquifer by Robertson (1979), who noted an inverse relationship between dissolved iron and nitrate. He found that nitrate concentrations were high in association with negligible iron concentrations in well-oxygenated parts of the aquifer, whereas the relationship is reversed where Eh conditions are low. U.S.G.S. data by Voelker (1984) display these inverse relationships in the American Bottoms aquifer (see Figure 3), based on Voelker's data for Madison County. Plots of iron with depth and of nitrate with depth (Figures 4 and 5) show that these variations in degree of oxygenation (oxidation-reduction) are present throughout the depth of the aquifer.

Bergstrom and Walker (1956) found significant seasonal variations in the water table of the American Bottoms, which sloped westward to discharge into the Mississippi under pre-pumping conditions; by 1951, locally heavily pumped areas at Monsanto, Granite City, and East Roxana, east of Hartford, had greatly modified the water level configuration of the Bottoms (Bruin and Smith, 1953)(see Figure 9). Water in the upper part of the alluvium is unconfined, that is, in equilibrium with atmospheric pressure and is free to move upward or downward in the sediments, depending upon relative conditions of recharge and discharge. Beneath the saturated unconfined water table are permeable sedimentary horizons (aquifers) overlain by less permeable sediments that confine the underlying water under hydrostatic conditions, causing artesian conditions in which water will rise above the top of the aquifer if allowed to do so as a result of penetration of the confining horizon by a well bore. Differences in relative permeabilities between sedimentary horizons of different grain size and mineral composition will give rise to variations in both vertical and lateral permeability. In unconsolidated sedimentary deposits, such as comprise the alluvial fill of the American Bottoms, differences in vertical permeability result in pressure confinement in aquifers beneath overlying "leaky" horizons that do transmit water but only under very slow conditions. Such leaky horizons are present in strata being monitored in Chemetco's monitoring wells. Data from that site show that both draw-down

Fig. 3


Fe v. NO3
St. Clair County
Fe (mg/l)
(Thousands)
NO3 (mg/l)
0
10
20
30
40
50
60
70
80
90
0
4
8
12
16
20
24
28

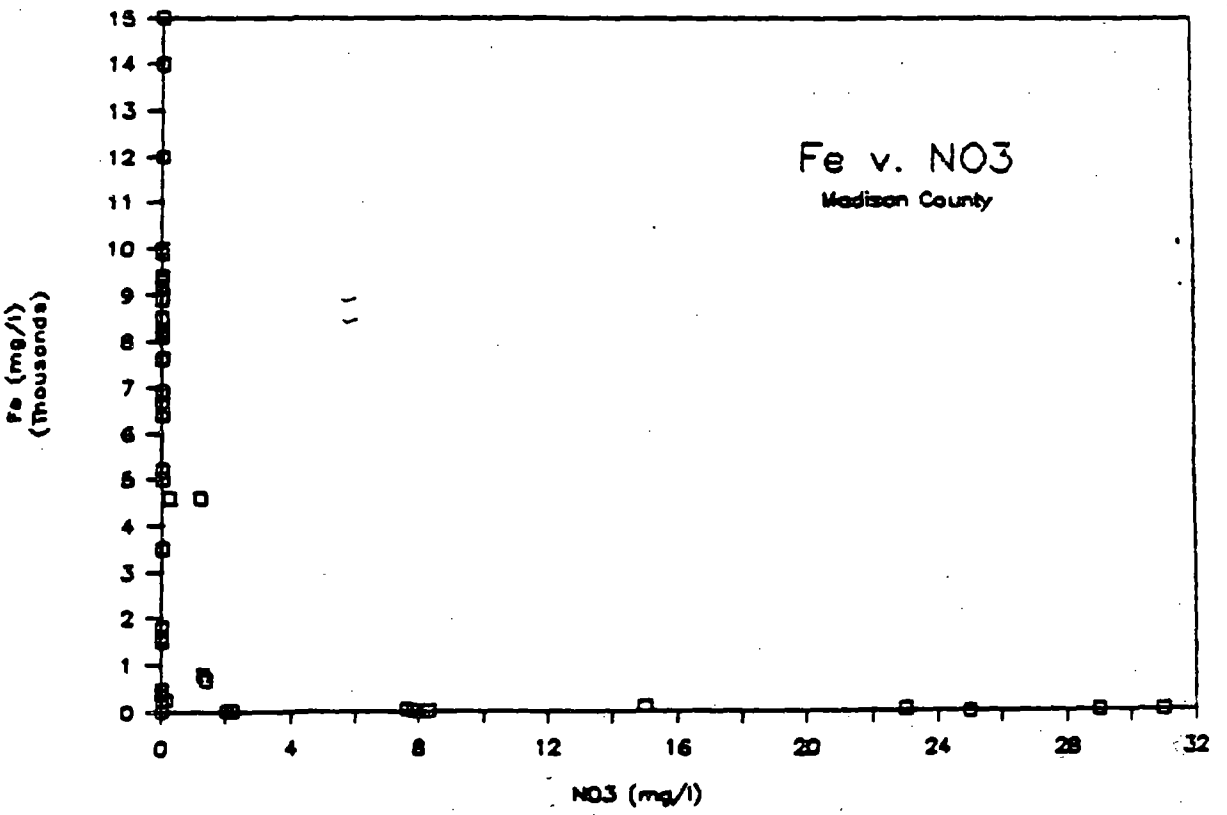

Fe v. NO3
Madison County
Fe (mg/l)
(Thousands)
NO3 (mg/l)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
0
4
8
12
16
20
24
28
32

FIG. 4 — Iron in Ground Water, Madison County

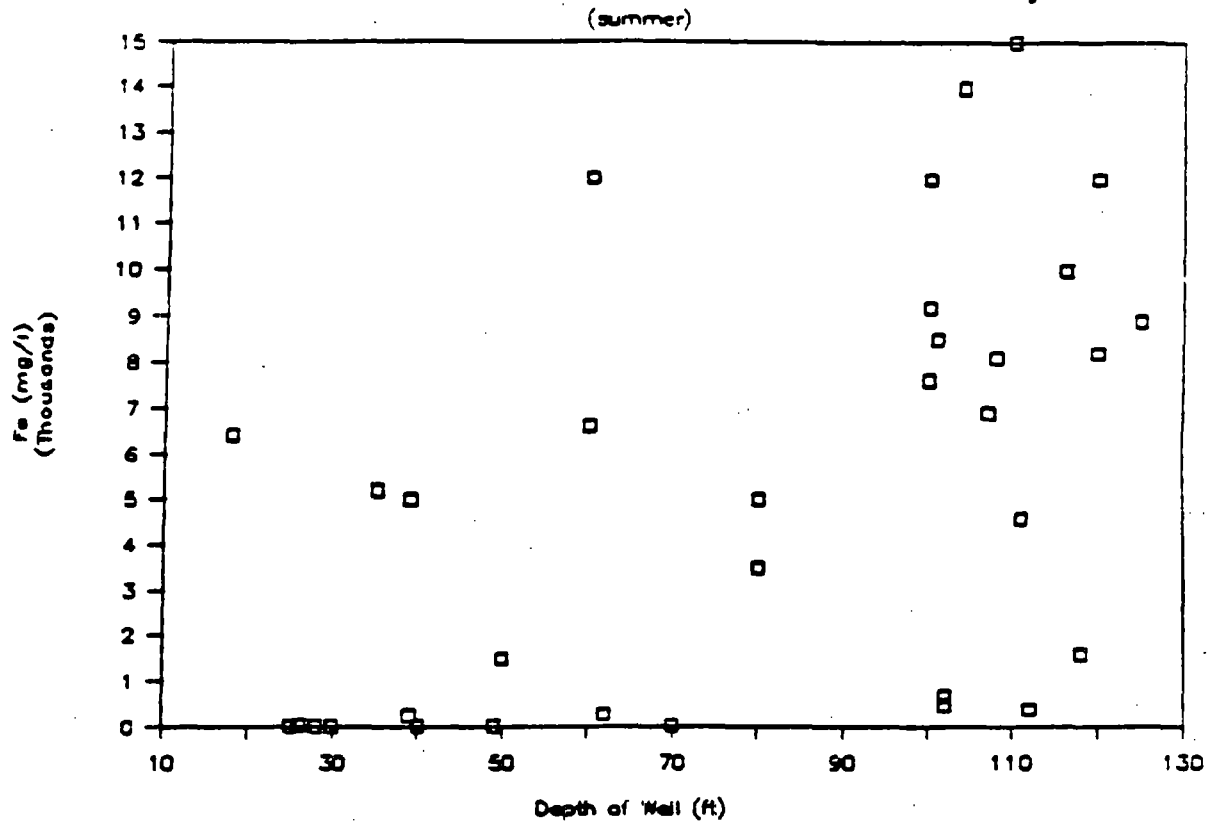
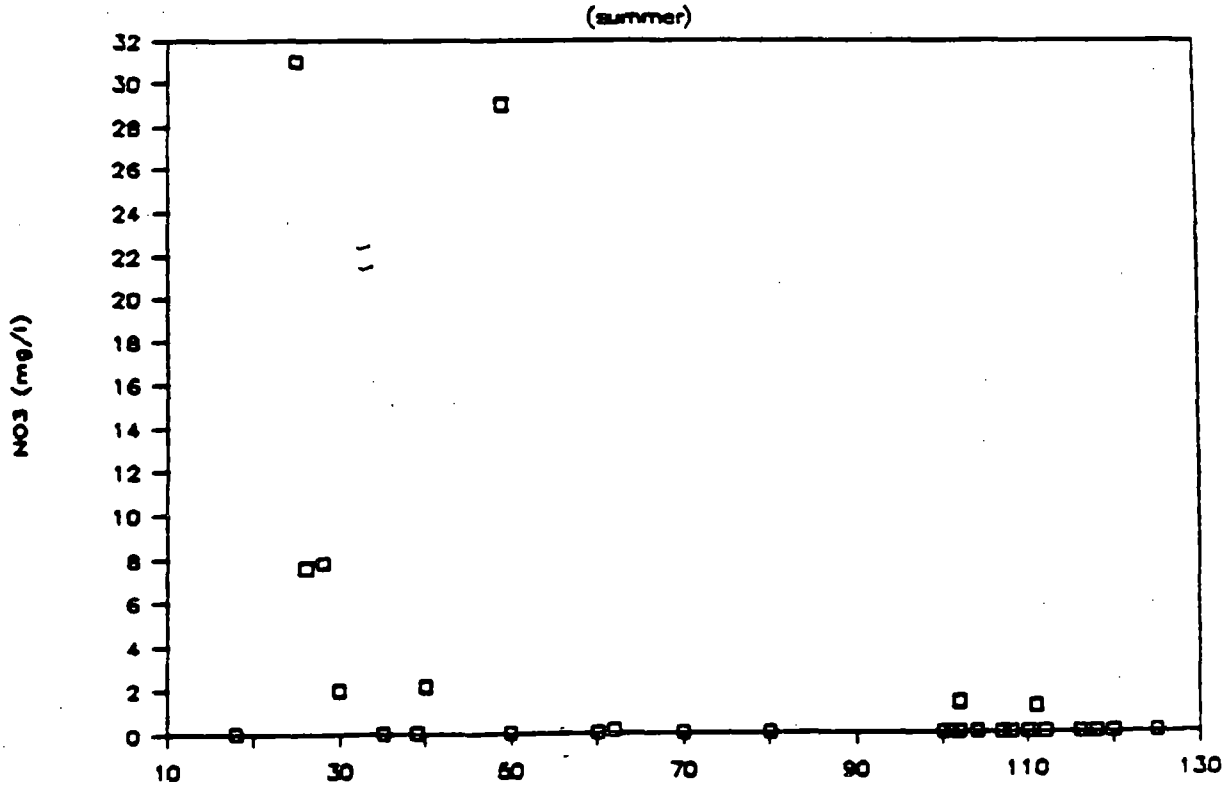



FIG. 5 — NO3 in Ground Water, Madison County



(water table declines) and recharge (water table increases) in two aquifer horizons are different within a pair of monitoring wells at a common location. The degree of "leakiness" also differs laterally at various points in the aquifers. The effect is no doubt influenced in part by the monitoring wells positions within the plant's cone of depression of its production well, which influences the local degree of "leakiness", or interconnection, of the two horizons. Bergstrom and Walker (1956) considered the valley fill material of the American Bottoms to be a single aquifer although both water table and "leaky" artesian conditions are both present. The valley fill aquifer is more productive and has better water quality than the subsurface Mississippian and Pennsylvanian bedrock underlying the alluvial fill.

Water quality in the American Bottoms alluvial aquifer is not uniform spatially either vertically within the aquifer nor in a north-south dimension. Bruin and Smith (1953) pointed out that typical well water in the Wood River area had low hardness concentrations, whereas shallow wells near East St. Louis had high chloride concentrations and were "in general quite highly mineralized", while deeper wells had high sulfate and dissolved iron. In areas of heavy pumpage, they noted high sulfate, hardness and iron, and commented that "...hardness and the total mineral content of...bailer samples increased as bedrock was approached (p. 26)." Water quality data for the Madison and St. Clair counties parts of the alluvial aquifer have been compiled by Voelker (1984). Based on a comparison with Illinois public water supply standards for iron of 300 mg/l, he showed that high iron concentrations are widespread in the Bottoms (Voelker, figure 5, p. 21), although the highest concentrations tend to be in the area of Horseshoe Lake and south through St. Clair County. Mean iron, sulfate and chloride concentrations for both Madison and St. Clair counties are shown in Table 3. These reflect the generally higher concentrations of iron and sulfate to the south, in St. Clair County. Voelker (1984) shows a local distribution of sulfate concentrations exceeding the public water supply standard of 250 mg/l (Voelker, p. 19; see his figure 4, p. 20). The high sulfate wells lie along a generally northeast to southwest trend parallel to the elongate arms of Horseshoe Lake and parallel to a widely prevalent trend of drainage alignment along and east of the bluffs bordering the Bottoms. This trend is approximately perpendicular to the axis of the Dupo anticline present in Mississippian limestones and it may represent a zone of leakage of water from Mississippian rocks into the lower portion of the Mississippi River alluvial aquifer along a regional fracture trend. Some indication of the leakage is shown in plots of sulfate, chloride, and Na/K ratios with depth (Figures 6, 7, and 8). Such upward discharge from older Paleozoic rocks into the Mississippi alluvial aquifer in southeastern Minnesota has been shown by Delin and Woodward (1984). Most of the ground water flow in the Pennsylvanian and Mississippian rocks of western Illinois is into the Illinois Basin to the east; local discharge to the Mississippi River alluvial aquifer

has not been discussed in the literature (K. Cartwright, pers. commun., 1984) other than for the discussion by Bruin and Smith (1953).

**TABLE 3**

**CONCENTRATIONS OF IRON, SULFATE AND CHLORIDE**

**(in mg/l)**

| | Iron |
|---|---|
| St. Clair County | |
| summer | 16,681 ± 21,196 |
| winter | 16,203 ± 20,010 |
| Madison County | |
| summer | 4,791 ± 4,862 |
| winter | 4,827 ± 4,521 |

| | Sulfate |
|---|---|
| St. Clair County | |
| summer | 316 ± 393 |
| winter | 292 ± 384 |
| Madison County | |
| summer | 144 ± 101 |
| winter | 151 ± 123 |

| | Chloride |
|---|---|
| St. Clair County | |
| summer | 33 ± 19 |
| winter | 39 ± 35 |
| Madison County | |
| summer | 52 ± 52 |
| winter | 52 ± 48 |

FIG. 6 — SO4 in Ground Water, Madison County

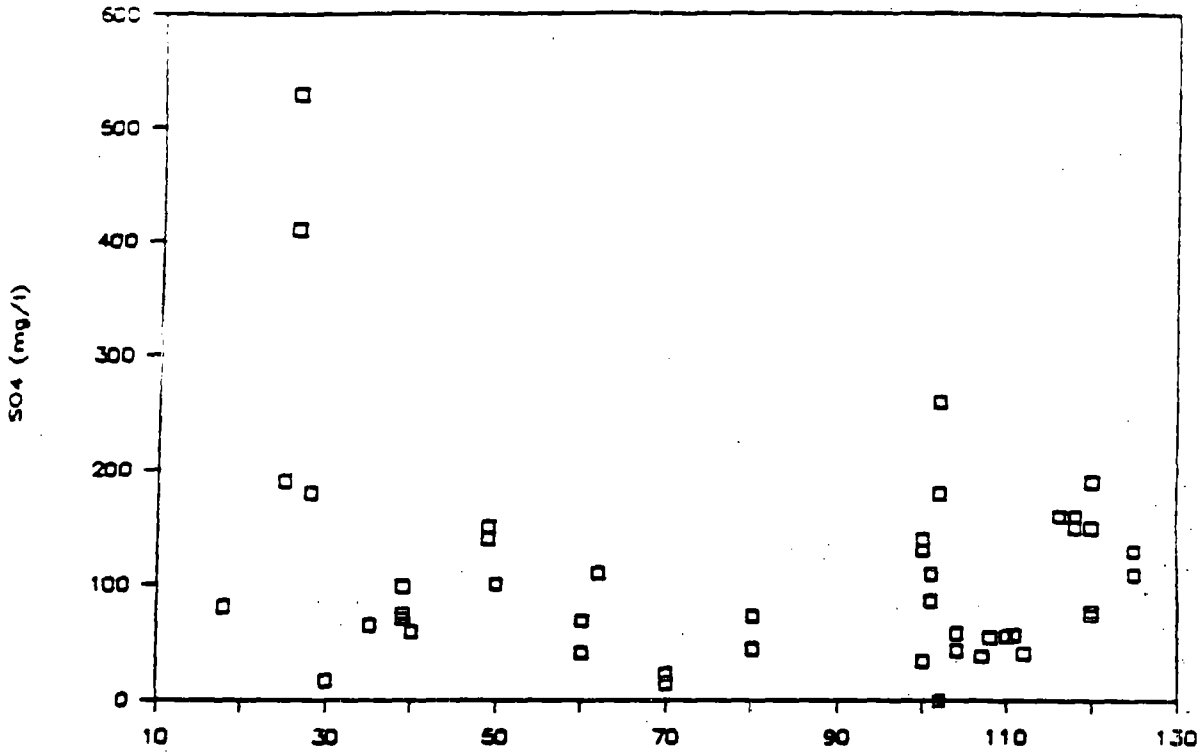



FIG. 7 — Cl in Ground Water, Madison County

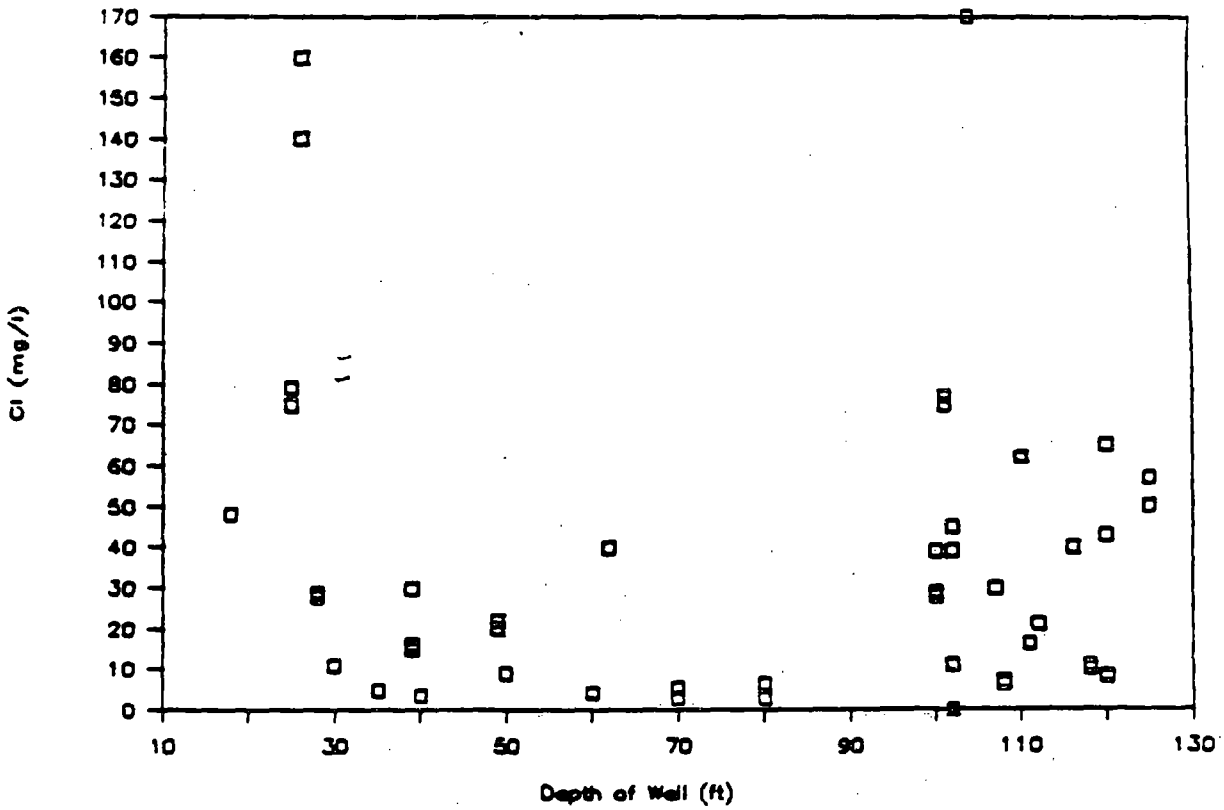
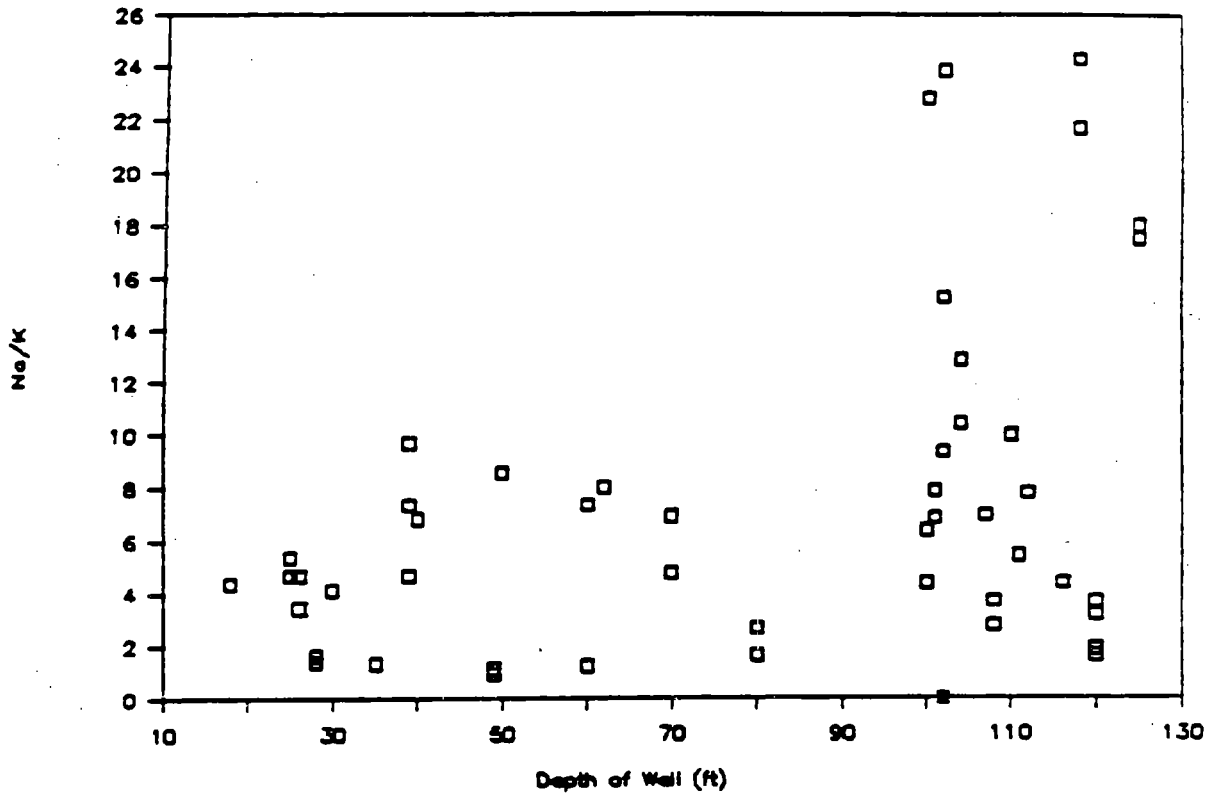


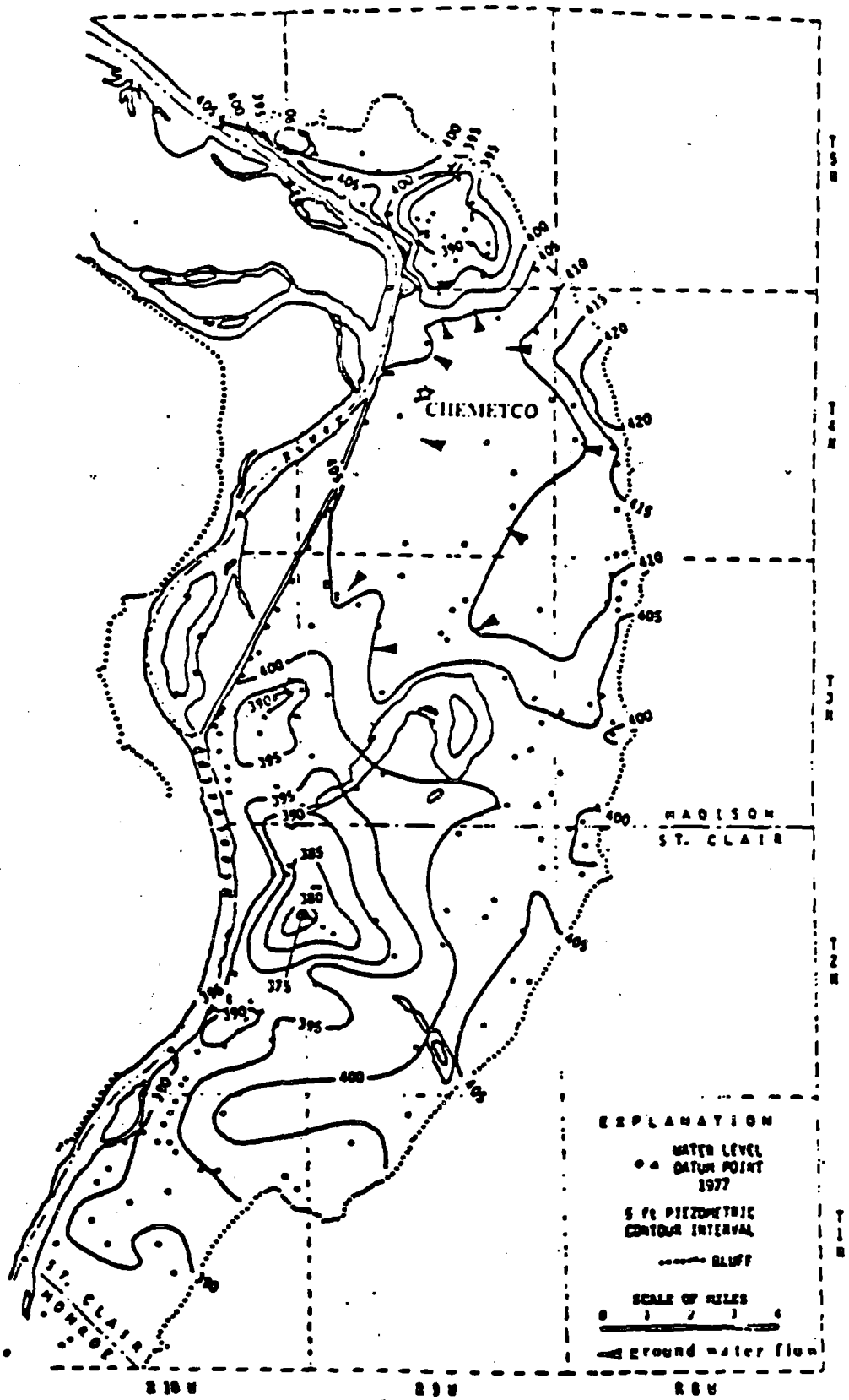
FIG. 8 – Na/K in Ground Water, Madison County



Soils are composed of a heterogeneous mixture of constituents that provide a variety of reactions with metal ions in soil solution, including chelation, ion-exchange, surface adsorption, and precipitation. Many of these reactions are pH-specific for the different metals. Thus, there will be preferential removal of metal ions that can differ as a function of pH or even of Eh (oxidation-reduction potential). The depth of soil and valley fill alluvium above significant ground water production horizons will serve to attenuate the movement of trace metals into the alluvial fill aquifers. The design or use of the slag in the Poag road embankments will effectively encapsulate the slag in soil, the slag embankment being underlain by a sand blanket that would provide dispersed flow of water moving through the pile from the vegetated upper soil cover. The presence of moderate (about 3 to 4 percent) organic material in native soils (Tice and Darwin series) will provide a soil solution pH of 5.5 to 6.1, based on laboratory test data (see data and discussion in Section 2). The use of limestone (composed of calcium or of carbonate) or dolomite (composed of calcium-magnesium carbonate) as a soil amendment will raise the pH of the through-going soil solution into the 7.0 to 7.6 range. That increase in pH will bring the soil solution into or slightly above the local area median pH of shallow ground water, as shown by monitoring data from well 20 and 21, which serve as background wells for the Chemetco site. Well 21 is particularly relevant because it is located most closely to the proposed sites of use of embankments along Poag road (see Figure 1). The groundwater mean pH for well 20 is 7.19 for the presently available monitoring period of March through July 1986 and that of well 21 is 7.32. It is apparent that bicarbonate buffering of the groundwater is occurring by reaction of the water with carbonate rock fragments present as part of the constituent particles composing the aquifer. Comparison of the pH and dissolved solids of the two wells indicates that well 20, with slightly lower pH and dissolved solids, apparently receives recharge through the soil profile through a shorter recharge path than that of well 21 (see Figure 9 for ground water patterns in Poag road area).

As is discussed in the next section both the composition of the slag and any carbonate rock fragment additions to it and/or embankment soils will keep water percolating through the embankment at or above the local pH of ground water and about 0.5 to 1.0 pH unit above the typical Madison County ground water pHs reported by Voelker (1984).

Fig. 9 - Approximate elevation of piezometric surface, November, 1977 (after Emmons, 1979)



## 4. CONSIDERATION OF ENVIRONMENTAL BEHAVIOR OF SLAG IN HIGHWAY FILL

As described in the section on soils, both the soils and the parent soil material, the alluvial valley fill of the Bottoms, are composed of a heterogeneous mixture of constituents that provide a variety of reactions with metal ions both in soil solids and in soil water solutions. Many of these reactions are pH-specific for the different metal ions. The design for the use of slag in Poag road embankments will effectively encapsulate the slag in a soil cover, with vegetated soil on the top and sides of the embankment and a sand blanket of dredged Mississippi river sand underlying the slag and overlying the soil on which the road is to be built. Thus, water draining through the soil cover will infiltrate through the pile into the sand blanket, then into the underlying soil.

The presence of a moderate amount (3-4 percent) of organic matter in the native, unmodified soil would provide a soil water solution having a pH range of 5.5 to 6.1, based on laboratory test data (see data and discussion in Section 2). The use of limestone (composed of calcium carbonate) or of dolomite (composed of calcium-magnesium carbonate) as a soil amendment would raise the pH of the through-flowing water into the range of 7.0 to 7.6. That increase would bring the pH into line with the pH of the local area ground water, as shown by the monitoring data from background wells 20 and 21, the latter in the vicinity of Poag road. For the period March through July 1986, for which there are pH data for the two wells, well 20 shows a mean pH of 7.19 and well 21 has a mean of 7.32. Comparison of the dissolved solids contents of the two wells suggests that well 20 may be closer to its source of recharge water; well 21 has both higher average pH and average dissolved solids. The increased pH and dissolved solids are indicative of bicarbonate buffering of the water as a result of reaction between the water and carbonate rock fragments, commonly noted in well logs of the area.

In order to evaluate the likely effect of acidic precipitation upon soils and slag, reference was made to published precipitation-weighted annual average pH data for the years 1982 and 1983 (NAPAP, 1983,1984). Maps of this precipitation pH data indicate that the Bottoms area lies generally in the range of 4.6 to 5.0 on the west and 4.5 to 4.6 to the east, which includes much of the recharge area of the Bottoms. In order to test the reaction of various size fractions of slag with acid rain, a simulated acid rain was formulated having a pH of 4.5 and a sulfate-to-nitrate ratio of 2:1. The simulated acid rain was added to the various size fractions of the slag that have been separated for the detailed evaluation of slag composition and texture relative to chemical composition. Most noticeable is the fact that finer size fractions reacted within the first 15 minutes to buffer the solution pH upward, with coarser fractions reacting somewhat more slowly, over a period of ten hours. Although the data are for individual size fractions (because of other

aspects of the slag comparison work), not an aggregate of all sizes, it is apparent that the slag as a whole would react rapidly to buffer incoming weakly-acidic precipitation. The design of the embankments in which the slag is to be used, however, would have the slag covered by soil. The regional ground water pH gives evidence of the soil and sediment buffering provided by those materials, as described in Sections 2 and 3 above.

The silicate dissolution and metal mobilization effects of organic soil acids have been described extensively in the soils and geochemical literature (Huang and Keller, 1970; Reuter and Perdue, 1977; Schnitzer and Kerndorff, 1981). Many systems have been studied in the laboratory and a sufficient number of field studies have been made to assure the accuracy of the laboratory observations. A significant aspect to consider with all trace metal systems is that metal complexation and mobility is increased by the presence of organic soil acids; thus consideration should be given to the design of all water-conducting systems to assure than an evaluation of potential metal mobility problems has been made. The following discussion focuses upon this issue.

Preliminary data on slag characteristics have been drawn for this report from a more extensive ongoing evaluation of slag chemical, mineralogical, and textural relationships that affect slag leachability. The batch processes and variable compositions of feedstocks in the smelter contribute to variations in slag bulk chemistry, with differing rates of cooling and of the ionic state of iron ($Fe^{+2}$ or $Fe^{+3}$) affecting glass and crystal characteristics of the slag. In the slag characterization study, a series of size fractions of five samples (55 gallon drums) of slag were taken from the top of the slag pile in November, 1986. A set of major elements and metals are routinely monitored for production purposes, using x-ray fluorescence methods for the analyses. Figures 10 and 10a show the means, standard deviations, and extreme values of approximately one year of production data (from July, 1985, to October, 1986) [SLAGANAL], comparable data for the statistically-designed sample set excavated to form the data utilized for the EP toxicity comparisons of four laboratories (Elliot and Levin, 1985) [SLAGSIUE], and the aggregate of the five samples for the slag comparison study [SLAG GRAB], with the means of each of the five samples. The mean and standard deviation values for the three data sets are in reasonable agreement, even though aberrant high or low samples can be well beyond the mean and typical distribution of most of the slag (which represents a very large data set of 3,620 analyses).

Slag composition varies from fragment to fragment and among various size fractions. There are textural and composition variations within a single cooling unit of poured slag; when several cooled slag units are transferred to the slag pile, compositions and textures become mixed and the more friable portions break to create sand sized and smaller fragments. Examples of typical compositions and textures include green glass (characterized by reduced iron, in the $Fe^{+2}$ state) containing scattered crystals of spinel; black glass with

Fig. 10

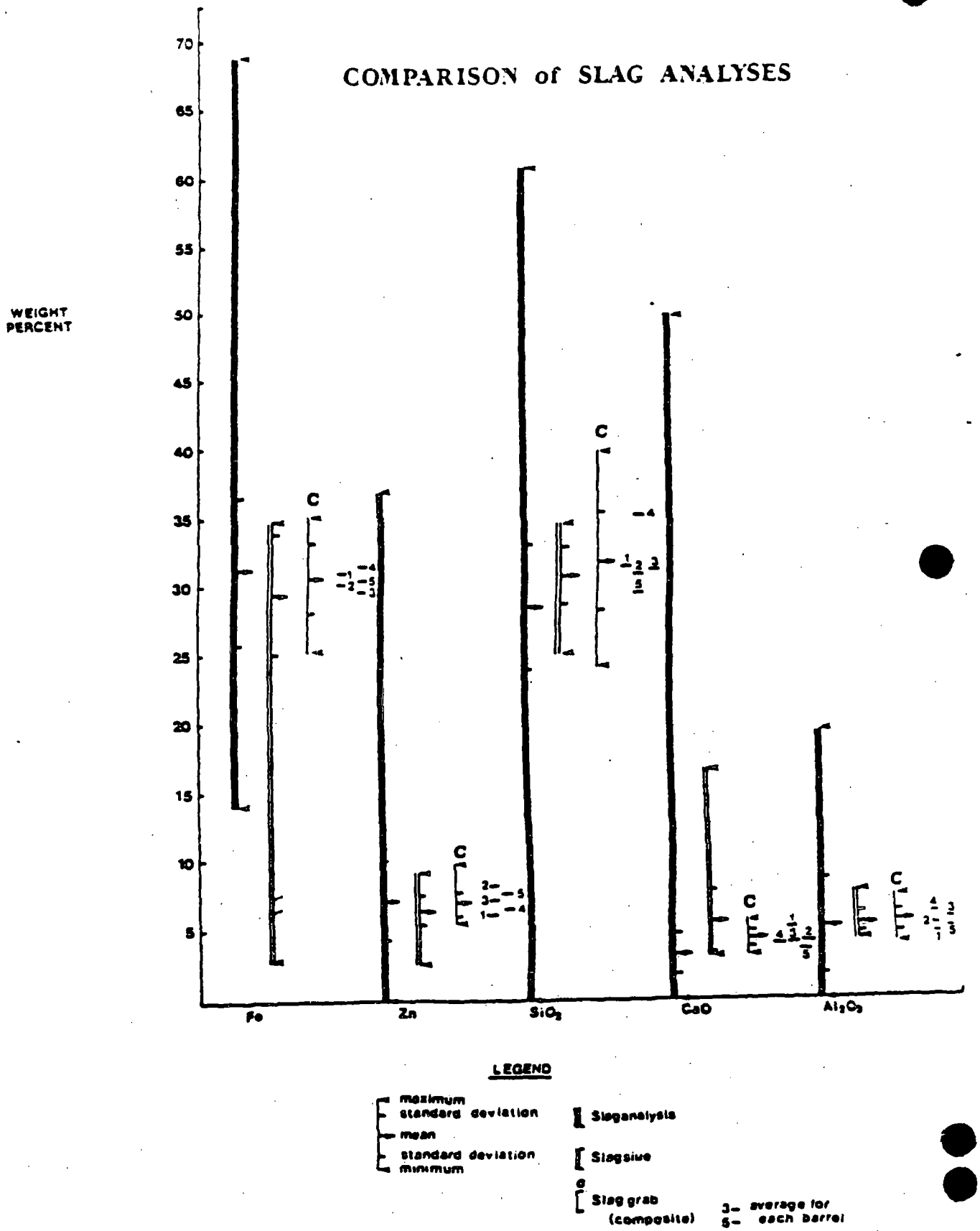
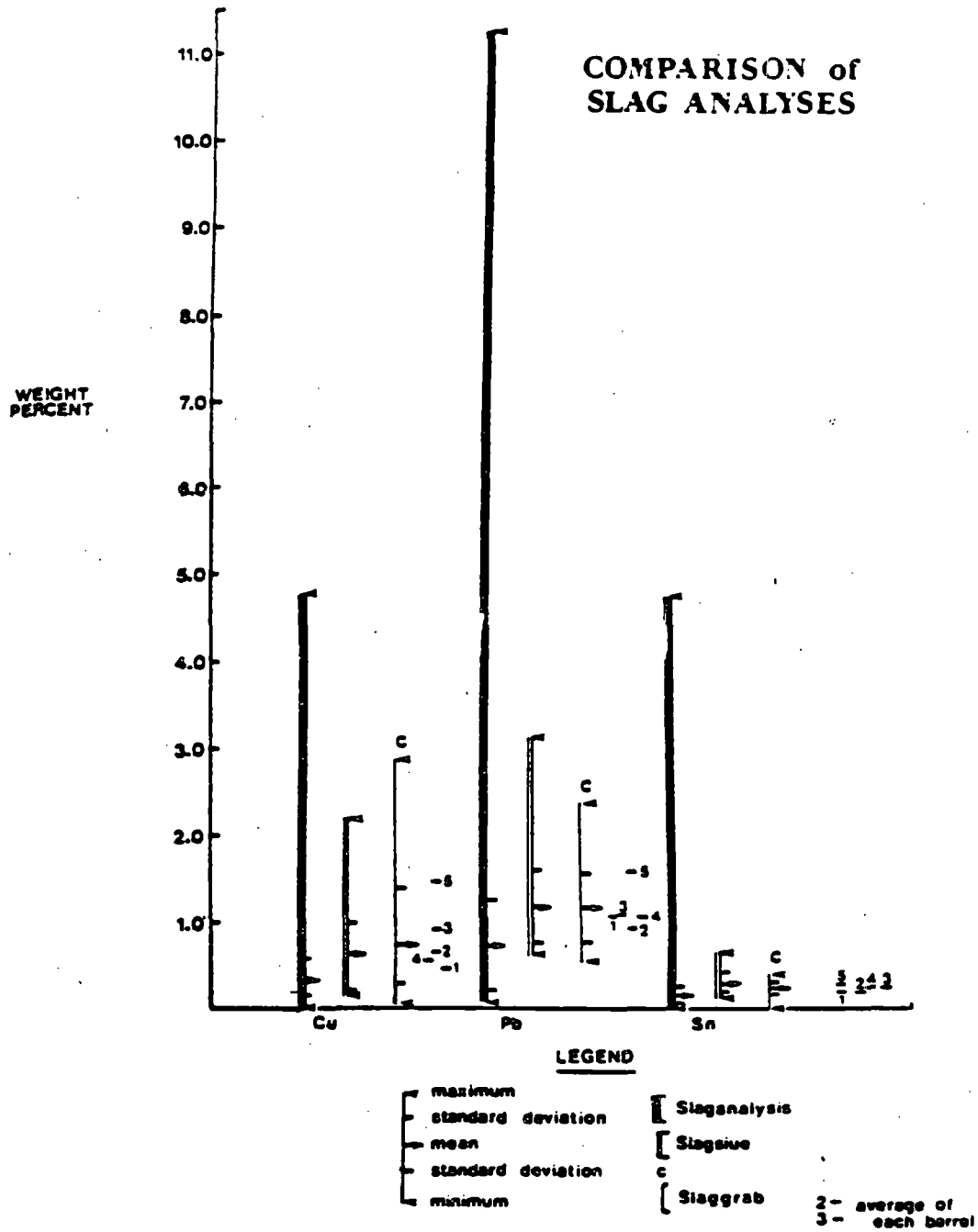

COMPARISON of SLAG ANALYSES
WEIGHT PERCENT
70
65
60
55
50
45
40
35
30
25
20
15
10
5
Fe
Zn
SiO2
CaO
Al2O3
C
LEGEND
maximum
standard deviation
mean
standard deviation
minimum
Slaganalysis
Slagsiue
Slag grab (composite)
3– average for
5– each barrel

Fig. 10 A


COMPARISON of
SLAG ANALYSES
WEIGHT PERCENT
11.0
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
Cu
Pb
Sn
c
LEGEND
maximum
standard deviation
mean
standard deviation
minimum
Slaganalysis
Slagsieve
Slaggrab
2 – average of
3 – each barrel

oxidized iron present as magnetite ($Fe^{+3}$), commonly containing 20 percent or less of well-formed (euhedral) iron-olivine (fayalite) crystals; brown to black glass with few crystals other than spinel and magnetite, traces of copper amalgam spheres and globules; translucent glass, indicative of apparent early stages of fine-grained crystal formation (devitrification), with few olivine and some magnetite and brass amalgam grains; fragments containing skeletal olivine, frequently with up to 40 percent euhedral, earlier-crystallized olivine, commonly some clinopyroxene, and abundant magnetite; and fragments containing up to about 80 percent euhedral plus skeletal olivine and pyroxene grains, with magnetite in the fine-grained intercrystal areas (ground mass). As fragments decrease in grain size, glass and devitrified glass fragments become increasingly abundant and the more crystal-bearing fragments become less common. In addition, in the finer grain sizes (6 through 8), metallic fragments of brownish-black, silver-gray, yellow and reddish brassy colors appear to become more abundant, along with individual crystals and small aggregates of coarse-grained olivine and pyroxene, quartz grains, magnetite, and hematite as alteration rims of iron-rich silicate crystals and magnetite. The particle comminution process results in reduction of crystalline and glassy slag fragments into their constituent particles but it is apparent that glassy material is more subject to the disintegration process, contributing a large amount of the fine-grained material, whereas more crystalline fragments appear to be relatively resistant to abrasion and disaggregation. Two countervailing effects are present as a result of fine particle formation. When particle breakage occurs, it is commonly along crystal and metallic fragment boundaries. The result is that the finest fractions of the slag contain disproportionately large amounts of glassy fragments and of metallic grains. As a consequence, the EP Toxicity test, when conducted on these smaller fragments, shows higher metal concentrations than either an aggregated bulk sample slag or the coarse fractions. On the other hand, the effect of higher glass fragment concentration found in the smaller particle fraction, if left to react with acidic solutions, is to neutralize the leaching effect of the acid. Continued addition of acetic acid to the EP Toxicity test nullifies that buffering effect, leading to higher metal concentrations than would be seen in a system in which the neutralization reaction could proceed. In addition, the large surface area-to-volume ratios of silicate minerals and glassy slag fragments contribute the significant chemical reactivity that leads to the high pH buffering of the acidic simulated acid rain solution by the finer grain sizes of slag.

The sequence of crystallization textures in cooled slag indicates that iron-bearing spinels from early in the liquid melt, prior to crystallization of the magnesian olivines that are the early-formed silicates. The crystallization sequence of the slag is not an equilibrium process, thus although the bulk chemistry of the basalt is similar to a very iron-rich, very low-silica, basalt, the spectrum of minerals present in cooled slag is the result of a kinetic process

as a result of rapid cooling of slag in the atmosphere. It was found that the crystallization textures and mineral phases in the slag follow closely the crystallization textures and compositions of rapidly cooled eucritic basaltic meteorites remelted and cooled experimentally. These basaltic meteorites are considered to be archetypal primitive basalts (Walker et al., 1978; Grove and Bence, 1979), thus the similarity of the matrix of the slag can be seen to be essentially an analogue of the primitive formative material of the Earth and moon. More evolved (higher silica) basalts have been widely used for road and other types of heavy construction for hundreds of years, proving to be stable, competent material under loads, abrasion, and weathering.

The initial olivine crystallization appears to be of highly magnesian composition, with later-crystallized iron olivine (fayalite) forming at lower temperatures, incorporating other divalent metal ions of appropriate charge and ionic radius. Following euhedral olivine crystal formation is a phase of rapidly chilled skeletal fayalite of markedly elongate crystal form. More slowly cooled slag appears to shift from olivine crystallization to pyroxene formation, with the usual orthorhombic pyroxene generally being bypassed in favor of monoclinic pyroxene. Plagioclase feldspar, the next expected crystal phase, is rarely seen but may be present in the very finely crystalline ground mass in which individual crystallites are not determinable by conventional petrographic methods. During rapid cooling, on the order of 150° to 600° C/hour, equilibrium crystal phases are bypassed or suppressed and the phase relationships of crystals and melt, including metal partitioning into the different phases, is kinetically controlled.

Microscopic study of the glassy phases indicates a preferential partioning of metals into the glassy melt phase, even though the metallic phases, such as the brassy amalgams, form relatively early in conjunction with iron olivine crystallization. The observations of Walker et al. (1978) on the suppression of clinopyroxene and feldspar crystallization is borne out by the abundance of olivine relative to any other silica-bearing mineral. Only magnetite ($Fe_3O_4$) is as common, the result of the high iron content of the slag. Mysen et al. (1980) found that the alkali metal content of a silicate melt affects the charge balance of iron in the melt, permitting $Fe^{3+}$ to be in the silicate network where it has a significant effect on such properties as melt viscosity, density, and the activities of the trace metals. In contrast to $Al_2O_3$, $Fe^{+3}$ can reduce melt viscosity, thus influence the degree to which other metals are held within melt phases (Mysen et al., 1985). Although sodium, potassium, and magnesium are not routinely measured in the slag, their presence is apparent from some of the minerals formed in trace amounts among both early and late-cooled crystals.

The foregoing discussion of melt crystallization is relevant to the prediction of slag behavior in construction use. Although olivine is characterized in geologic literature as an unstable mineral in weathering environments, along with pyroxenes and glasses, the

geological commentary applies to long periods of time rather than the shorter time frame in which chemical mobility is usually considered. The time frame for dissolution of the crystalline material or of hydration and crystallization of glasses is from thousands to millions of years, thus breakdown results in very slow releases of included trace metals. Because these minerals and glasses were formed under high temperature conditions, they are out of chemical equilibrium with the weathering environment in the soil profile. That means essentially that they are subject to leaching and ion migration in the presence of through-moving soil solutions. The high iron content of the fayalite, the pyroxene, and of magnetite in the glassy phase will break down to release iron to precipitate onto the weathered surface of the slag fragments as iron oxyhydroxide.

Soil microbiological activity will produce iron oxyhydroxides having a very significant trace metal scavenging capability (Aristovskaya, 1974; Huang and Keller, 1970). White and Claasen (1979) have shown that for glassy rocks, the various major ions respond differently to differences in solution pH, with the rate constant for sodium diffusion decreasing somewhat with increased pH, calcium and magnesium decreasing markedly, and silica being independent of pH. In general, higher pH soil solutions tend to inhibit the rate of silica glass and silicate mineral dissolution and enhance iron, aluminum, and manganese oxyhydroxide formation, which in turn scavenges trace metals, removing them from solution. Both oxyhydroxide formation, accompanied by trace metal scavenging, and sequestration of trace metals by organic soil materials operate effectively to remove trace metals at pHs well below those now present in the Bottoms' soil profile (Kinniburgh et al., 1976).

Several concurrent chemical effects result in the rapid neutralization of the "simulated acid rain" by the fragmental material, as shown by plots of pH against time (Figure 11) for the various size fractions of the slag. As mentioned above, it appears that the more crystalline fragmental material is present in size fractions 4 and larger (1.41 to over 100 mm. in diameter), whereas glassy fragmental material increases in abundance in the finer size fractions. Inasmuch as surface area-to-volume ratio increases rapidly with decreasing grain size, two factors are present that affect increased aqueous chemical reactivity of the finer size fraction. First there is hydration and leaching of glassy material, in which hydrogen ion is preferentially adsorbed by the glass with the release of sodium, calcium, and magnesium to the solution, where they are associated with hydroxyl ions, and, second, the increased surface area of fine particles of glass is available for reaction with the acidic solutions. The preferential release of sodium from natural volcanic glasses relative to calcium and magnesium, and especially relative to potassium, has been demonstrated by Truesdell (1966); that, in turn, can significantly influence water chemistry, producing high sodium concentrations relative to calcium, magnesium, and potassium, as well as pH values in the 8 to 9 range (White, 1979). Noble et al. (1967) have shown that chloride is preferentially leached

Fig 11 – pH of Simulated Acid Rain Solution with Slag Size Fraction

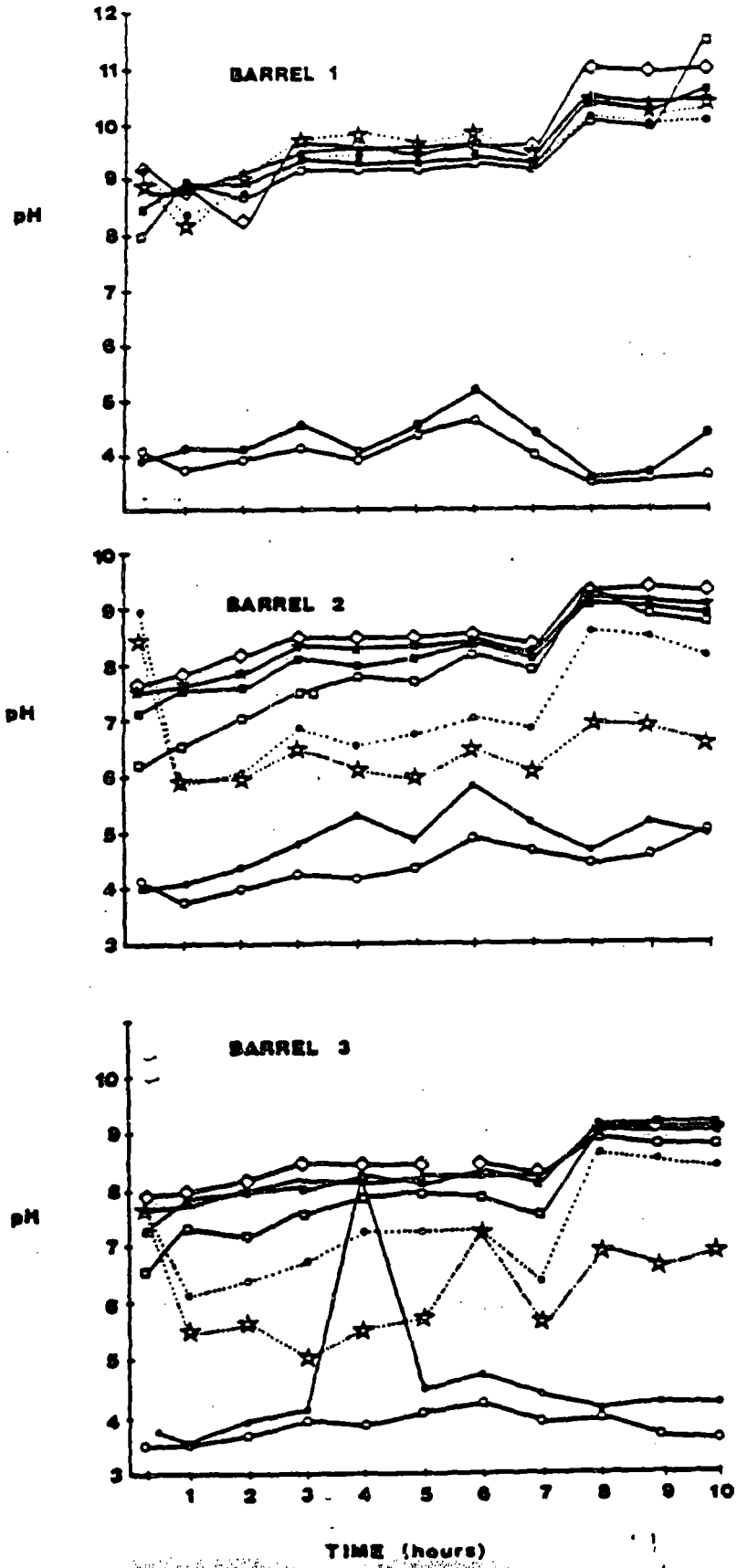
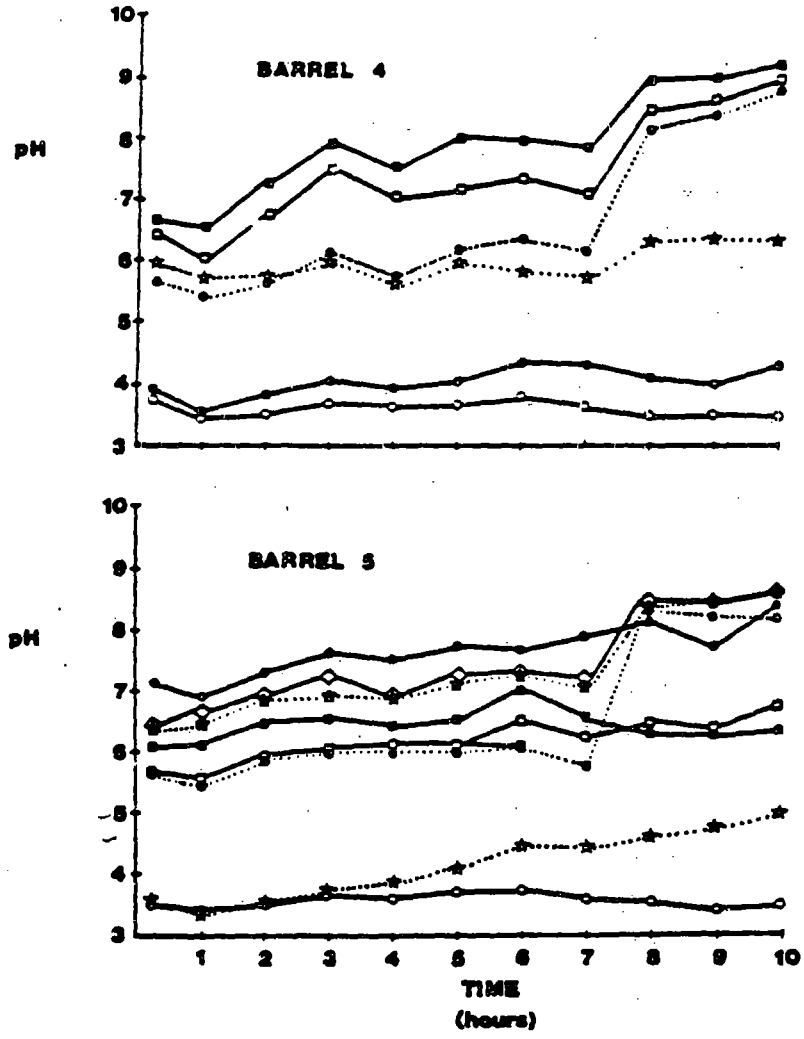


Fig II (cont.)




LEGEND

| | |
|---|---|
| BARREL 1 | BARREL 5 |
| BARREL 2 | BARREL 6 |
| BARREL 3 | BARREL 7 |
| BARREL 4 | BARREL 8 |

soil profile (McKenzie, 1977; Schwertmann and Taylor, 1977). In soils, the metal oxyhydroxides combine with clay minerals and organic matter in producing a variety of trace metal attenuation mechanisms such as exchange, adsorption, and precipitation. Numerous studies have shown that soil organic matter, clay minerals, and iron and manganese oxyhydroxides are effective in trace metal scavenging at pHs well below 7; the chemical advantage of higher pHs is that formation of insoluble trace metal hydroxides and carbonates in soil environments is usually enhanced above a pH of 7. Thus, more than one mechanism of trace metal attenuation becomes effective in retarding metal movement toward the ground water table.

The action of organic acids from water draining through soil cover into a slag embankment should be expected to mobilize aluminum, iron, and trace metals, as well as such major cations as sodium, calcium, and magnesium. The high pH of fluids reacting with fine-grained glassy fragments would provide a favorable environment for precipitation of aluminum, iron, and manganese oxides and oxyhydroxides on the surface of the fragments where scavenging of trace metals would take place. In the absence of fine slag particles that would neutralize dilute acids and render them alkaline, carbonate rock fragments could be added to the slag to provide acid neutralization and solution buffering. Limited microscopic and field observation of iron, aluminum, and manganese oxides and oxyhydroxides in Madison County indicates that goethite (limonite) or an amorphous yellowish iron oxyhydroxide is present but is at least locally less common than a dark brown to black oxyhydroxide that probably represents a mixture of iron and manganese. This manganese-bearing material is particularly apparent as a cement in the alluvial fan channel deposits that are part of the soil parent material. Organic acids are effective in inhibiting or blocking crystallization of aluminum oxyhydroxides and oxides (Violante and Violante, 1980; Lind and Hem, 1975). That effectiveness was enhanced in laboratory experiments below a pH of 7, thus explaining the absence of visible $Al(OH_3)$ polymorphs in the soils. Organically-complexed amorphous Al gels may be present in some of the soils, however. Violante and Jackson (1979) demonstrated that crystallization of two $Al(OH)_3$ polymorphs in neutral and alkaline solutions were catalyzed by the presence of montmorillonite, the type of clay that is widespread in American Bottoms soils.

The sequence of stability constants for trace metals and alkaline earths with soil at fulvic acid pHs indicates that Cu > Pb > Fe > Ni > Mn $\approx$ Co > Ca > Zn > Mg (Schnitzer and Skinner, 1966, 1967). To the extent that fulvic acids represent an organic complexing constituent of soils, the commonly observed trace metal concentrations of shallow organic-rich soils can be explained, with calcium, magnesium, and zinc being more mobile. This relationship appears to explain the close correspondence of calcium and zinc in the 30-foot deep aquifer of Madison County, the only aquifer with a significant zinc concentration in the county. Voelker's (1984) water chemistry data for Madison County show a correlation coefficient of 0.62113 for the

calcium versus zinc linear correlation, and may reflect that a common process of leaching through the soil profile is a significant source of these two cations. At least one other significant source of calcium must be present as well, however, because of the amount of co-variation in the two cations provided. Thus, it is probable that mineral phases not containing zinc in soils, the aquifer, or both also provide calcium to the ground water. Copper and lead show no preferred near-surface or deeper distribution in the alluvial aquifer. The two metals are well correlated with each other but not with other reported dissolved constituents in the county's ground water.

The design of the proposed embankments, with a sand blanket overlying native soils, provides a significant trace metal sink for any heavy metals that would move through the embankment with through-flowing soil-water. An approximation of the metal attenuation capacity for various trace metals can be made from the empirical equation developed by Zimdahl and Skogerboe (1977) for the retention of lead in soils.

In order to evaluate the potential lead retention capacity of the soils along the Poag road extension, the cation exchange capacity and soil:water pH have been used in the empirical lead-retention equation for soils that was developed by Zimdahl and Skogerboe (1977) (see Table 4). This equation has been used by the Soil Conservation Service, U.S. Department of Agriculture, for estimation of the lead retention capacity of soils adjacent to highways (R. K. Skogerboe, personal communication, 1984.). The empirical predictive relationship uses both the cation exchange capacity and soil:water pH as the primary soil characteristics controlling lead retention by soils. The predictive equation is:

$$N^* \text{ (mol/g)} = 2.81 \times 10^{-6}(\text{CEC})(\text{meq/100g}) + 1.07 \times 10^{-5}(\text{pH}) - 4.93 \times 10^{-5}$$

In contrast with the parameters CEC and soil pH that Zimdahl and Skogerboe found to be significant in lead retention, their study suggested that lead precipitation as lead carbonate and adsorption by iron and manganese oxyhydroxides were of secondary importance. In other soils and locations, such as loams, these processes have been found to be effective in conjunction with CEC and pH (Scokart et al., 1983; Miller and McFee, 1983). Table 4 presents the soil parameters and calculated estimates of lead retention capacity for Tice and Darwin series soils as well as the finished soil top dressing on the highway interchange embankment of I-270 and Illinois 1. These estimates show a very substantial potential lead retention capacity in both natural and modified soils.

Consideration of slag characteristics, site soils and hydrogeology, and anticipated interaction of slag encapsulated in a soil covered embankment indicates that there can be a satisfactory use of slag without hazard to local ground water chemistry or of migration of trace metals in slag away from the road right-of-way into agricultural soils. While some mobility of trace metals within the limited environment of the embankments or subjacent soils can

TABLE 4

ESTIMATED LEAD RETENTION CAPACITY
OF
SOILS ALONG POAG ROAD

| IPLE NO. | CEC | ORGANIC MATTER (%) | pH | N* x $10^{-5}$ MOLES OF LEAD | ESTIMATED Pb RETENTION CAPACITY (in ppm) |
|---|---|---|---|---|---|
| Embankment soil, jct. of I-270 with Illinois 157, exit 9: | 17.3 | 0.7 | 7.8 | 8.247 | 17,071 |
| Stockpiled organic topsoil, Poag road embankment: | 29.4 | 4.3 | 6.1 | 9.858 | 20,406 |
| Darwin soil, east side of B.N. railroad at embankment: | 26.8 | 4.6 | 6.0 | 9.020 | 17,684 |
| Darwin soil, east side of B.N. railroad at embankment: | 31.2 | 2.5 | 5.8 | 10.04 | 20,789 |
| Tice soil, west side of B.N. railroad at embankment: | 33.7 | 3.1 | 5.5 | 10.425 | 21,579 |
| Tice soil, west side of B.N. railroad at embankment | 26.8 | 3.6 | 6.0 | 9.021 | 18,673 |

be expected, with modification of overlying soils and slag to provide for a neutralization of through-flowing water, natural geochemical attenuation mechanisms would provide protection to both ground water and nearby agricultural soils.

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# APPENDIX D

Illinois Department of Transportation
Division of Highways/District 8
1100 Eastport Plaza Drive/P.O. Box 988/Collinsville, Illinois 62234-6198

May 24, 1988

International Milling Service
4203 Earth City Expressway
Earth City, MO 63045

ATTN: Ed Golish

Dear Ed:

Attached is a copy of the recently completed freeze-thaw testing on the copper slag from Chemco at Hartford, IL.

Based on the attached freeze-thaw results, Chemco copper slag could have a top size rating of 1" for use in Illinois concrete paving projects. Of course this copper slag still has to be given both Federal and State EPA approval, stockpile needs to be appropriately sized and free metals need to be removed.

If you have any question concerning this matter, please contact this office.

Very truly yours,

Dale L. Klohr
District Engineer

Thomas A. McCarthy
District Materials Engineer

PHB:rah/0271a

attachment

# APPENDIX E

# Illinois Department of Transportation

## Memorandum

| | | | |
|---|---|---|---|
| To: | D. L. Klohr | Attn: | T. A. McCarthy |
| From: | J. G. Gehler | By: | W. E. Chastain, Jr. |
| Subject: | Freeze-Thaw Test Results | | |
| Date: | May 6, 1988 | | |

Attached are freeze-thaw test results from Chemco, Hartford, Illinois, P/S #77000-98. The gradations tested were CA07 and CA11 sampled from copper slag.

Based on the attached freeze-thaw results, Chemco copper slag meets the 1" rating. Please notify Chemco of their freeze-thaw test results.

W E Chastain

WMS/blb

Attachments (2)

UNCL [illegible] GRADATION [illegible] STANDARD BAR LENGTH 15.41.26

URCE NAME Chicago, Hartford, IL DATE CAST 3-3-88

SLUMP, INCHES 2 1/2

AIR, % 6.6

STRENGTH, P.S.I. 16.53

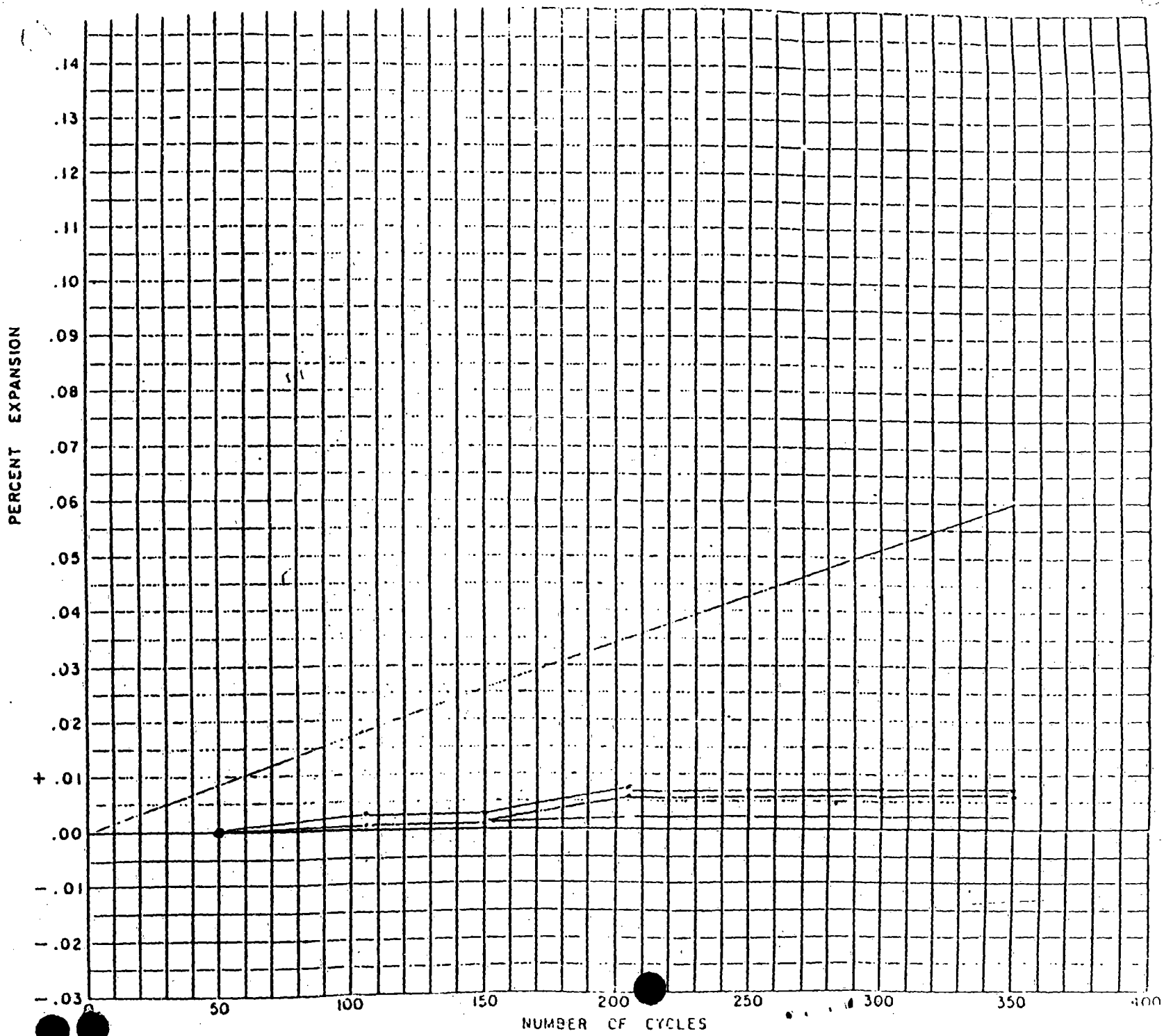
C. WITHIN QUARRY [illegible] DATE FIRST CYCLE 3-16-85

TIC # 88[illegible] B GROUP 102

| DATE | CYCLES | SPECIMEN ID B-1B (Δ) | | | | SPECIMEN ID (●) | | | | SPECIMEN ID (X) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DIAL | ACTUAL | % EXP | SONIC | DIAL | ACTUAL | % EXP | SONIC | DIAL | ACTUAL | % EXP | SONIC |
| 1-16 | INITIAL | 1293 | | 0 | | 1391 | | 0 | | 1377 | | 0 | |
| 23 | 50 | 1293 | | .000 | | 1391 | | .000 | | 1377 | | .000 | |
| 30 | 106 | 1294 | | .001 | | 1385 | | .003 | | 1379 | | .001 | |
| 5 | 150 | 1295 | | .001 | | 1385 | | .003 | | 1375 | | .001 | |
| 10 | 205 | 1300 | | .006 | | 1390 | | .007 | | 1382 | | .003 | |
| 18 | 250 | 1304 | | .006 | | 1393 | | .007 | | 1382 | | .003 | |
| 25 | 300 | 1304 | | .006 | | 1393 | | .007 | | 1382 | | .003 | |
| 2 | 352 | 1304 | | .006 | | 1393 | | .007 | | 1382 | | .003 | |
| | | | | | | AVERAGE | | .005 | | | | | |

DIAL = Direct Reading From Prism (after zeroing on standard)

ACTUAL = Standard Length + DIAL


PERCENT EXPANSION
.14
.13
.12
.11
.10
.09
.08
.07
.06
.05
.04
.03
.02
+ .01
.00
− .01
− .02
− .03
0
50
100
150
200
250
300
350
400
NUMBER OF CYCLES

URCE ID [illegible]00-98 GRADATION C STANDARD BAR LENGTH 15.412

URCE NAME Chemco, Hartford, IL DATE CAST 3-3-88 SLUMP, INCHES 2 1/2

AIR, % 7.0

WITHIN QUARRY Copper Slag DATE FIRST CYCLE 3-16-88 STRENGTH, P.S.I. 4915

TIC # 88225B GROUP 402

| DATE | CYCLES | SPECIMEN ID 8-1C (Δ) | | | | SPECIMEN ID (⊘) | | | | SPECIMEN ID (X) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | DIAL | ACTUAL | % EXP | SONIC | DIAL | ACTUAL | % EXP | SONIC | DIAL | ACTUAL | % EXP | SONIC |
| -16 | INITIAL | 1357 | | 0 | | 1502 | | 0 | | 1404 | | 0 | |
| -23 | 50 | 1354 | | .000 | | 1502 | | .000 | | 1404 | | .000 | |
| -30 | 106 | 1356 | | .001 | | 1504 | | .001 | | 1404 | | .000 | |
| -5 | 150 | 1356 | | .001 | | 1504 | | .001 | | 1404 | | .000 | |
| -12 | 205 | 1361 | | .005 | | 1507 | | .003 | | 1409 | | .003 | |
| -18 | 250 | 1361 | | .005 | | 1508 | | .003 | | 1409 | | .003 | |
| -25 | 300 | 1361 | | .005 | | 1508 | | .003 | | 1409 | | .003 | |
| -2 | 352 | 1364 | | .005 | | 1508 | | .003 | | 1409 | | .003 | |
| | | | | | | AVERAGE | | .004 | | | | | |

DIAL = Direct Reading From Prism (after zeroing on standard)

ACTUAL = Standard Length + DIAL

Current Actual Length = Initial Actual Length

Chemetco
FIRST IN PEOPLE — QUALITY — SERVICE
P.O. BOX 187 • ALTON, ILLINOIS 62002

December 28, 1987

United States Environmental Protection Agency
Region V
RCRA Enforcement Section
230 Dearborn Street
Chicago, Illinois 60604

RECEIVED
DEC 30 '87
U.S. EPA, REGION V
WASTE MANAGEMENT DIV.
OFFICE OF THE DIRECTOR

ATTN: Mr. Kevin Pierard

Dear Kevin,

Enclosed please find a copy of the revised data package from L.C. Metals laboratory. Pursuant to a recent conversation with Mr. David Payne of the USEPA's Cental Regional Lab, I am sending this to you with the recommended corrective action.

Included in the package are:

* calibration curves for lead and cadmium.
* reagent blank analysis for lead and cadmium.
* check solution analysis for lead and cadmium.
* sample analysis for lead and cadmium.
* digestion log (referred to as the "sample prep report")
* extraction worksheet (with pH recorded after 24 hours)
* xerox of the strip chart from the pH controller (the actual data package will have the original)
* data sheet for QC sample and sample results
* sample report
* EP Toxicity worksheet

If you have any questions concerning any of the information in this package, please call. In the meantime, we are waiting to hear from you concerning approval of the slag sampling plan so that we may make whatever revisions are required or begin our slag sampling.

Thank you for your time.

Sincerely,

Michelle Reznack

Michelle Reznack
Environmental Manager
Chemetco, Inc.

SAMPLE REPORT

REPORT TO: _____

_____

_____

SAMPLE ID: Cl reprep

ANALYST: Jane Drumhiller

APPROVED BY: [signature]

DATE SAMPLE RECEIVED: 11-10-87

DATE EXTRACTED: 12-10-87

DATE ANALYZED: 12-15-87

==========

EP TOXICITY (SW846 Method #1310, 2nd Ed., July 1986):

Units are ppm.

Cd .04

Pb 1.57

COMMENTS: _____

_____

SAMPLE DATA SHEET

DATE: 12-15-87 ANALYST: Jan

QA CHECKS (in Absorbance Units)

| element | wavelength | check | Spike 1 | spike 2 | Spike 3 | |
|---|---|---|---|---|---|---|
| Pb | 283 | .027 | .032 (1) | .035 (1.5) | .038 (2) | |
| Cd | 228 | .102 ~~.107~~ | .173 (.6) ~~.102~~ | .217 (1) ~~.113~~ | .282 (1.8) | |
| | | | | | | |
| | | blank reagent | | | | |
| Pb | | -.001 | | | | |
| Cd | | -.004 | | | | |
| | | | | | | |
| | | | | | | |

new calibration curve

SAMPLE DATA

| element | wavelength | C1 reprep | spike 1 | spike 2 | spike 3 | |
|---|---|---|---|---|---|---|
| Pb | 283 | .011 (0) | .018 (1) | .025 (2) | .039 (4) | |
| Cd | 228 | .002 (0) | .069 (.6) | .113 (1) | .213 (2) | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

+ apparent matrix difference from standards in calibration curve flame color is different.

# EP TOXICITY WORKSHEET

Sample ID: C1 reprep

Date: extracted 12-10-87 $9^{30}$

Weight of sample: 99.9 g

Sample Appearance: gravel (black)

Particle Size OK? (yes) no

Extractor: rotary (stirrer)

pH Control: (automatic) manual

rpm for stirrer: 185

ml of acid added: 3

Solution appearance: "clear" - lt brown w/ white flakes on top.

Comments: Initial pH: 4.6

Check pH at end of extraction: pH 7 buffer = pH 7

Analyst: Jane

SAMPLE PREPARATION REPORT

(EP Toxicity Extract Preparation)

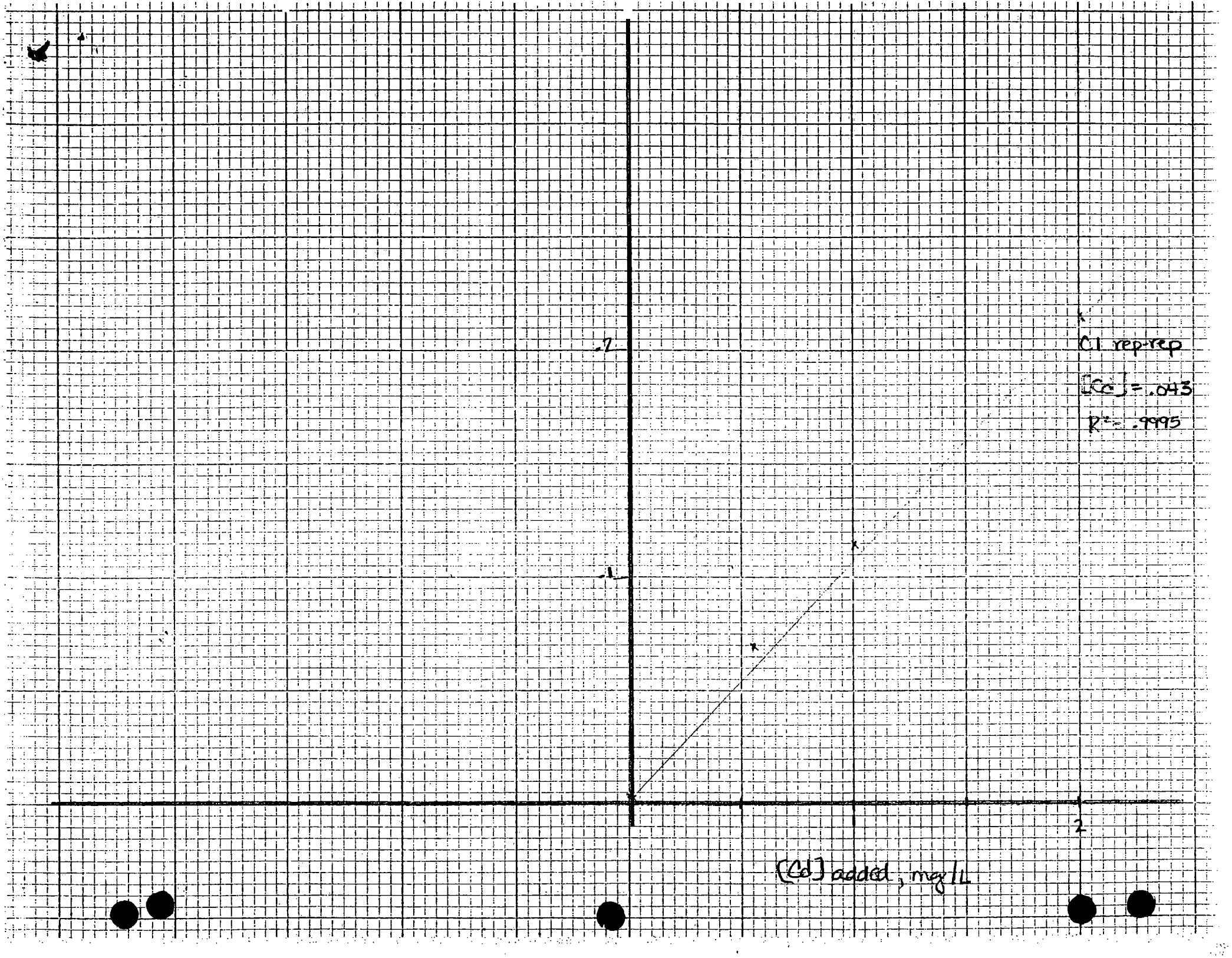
Date: 12-12-87

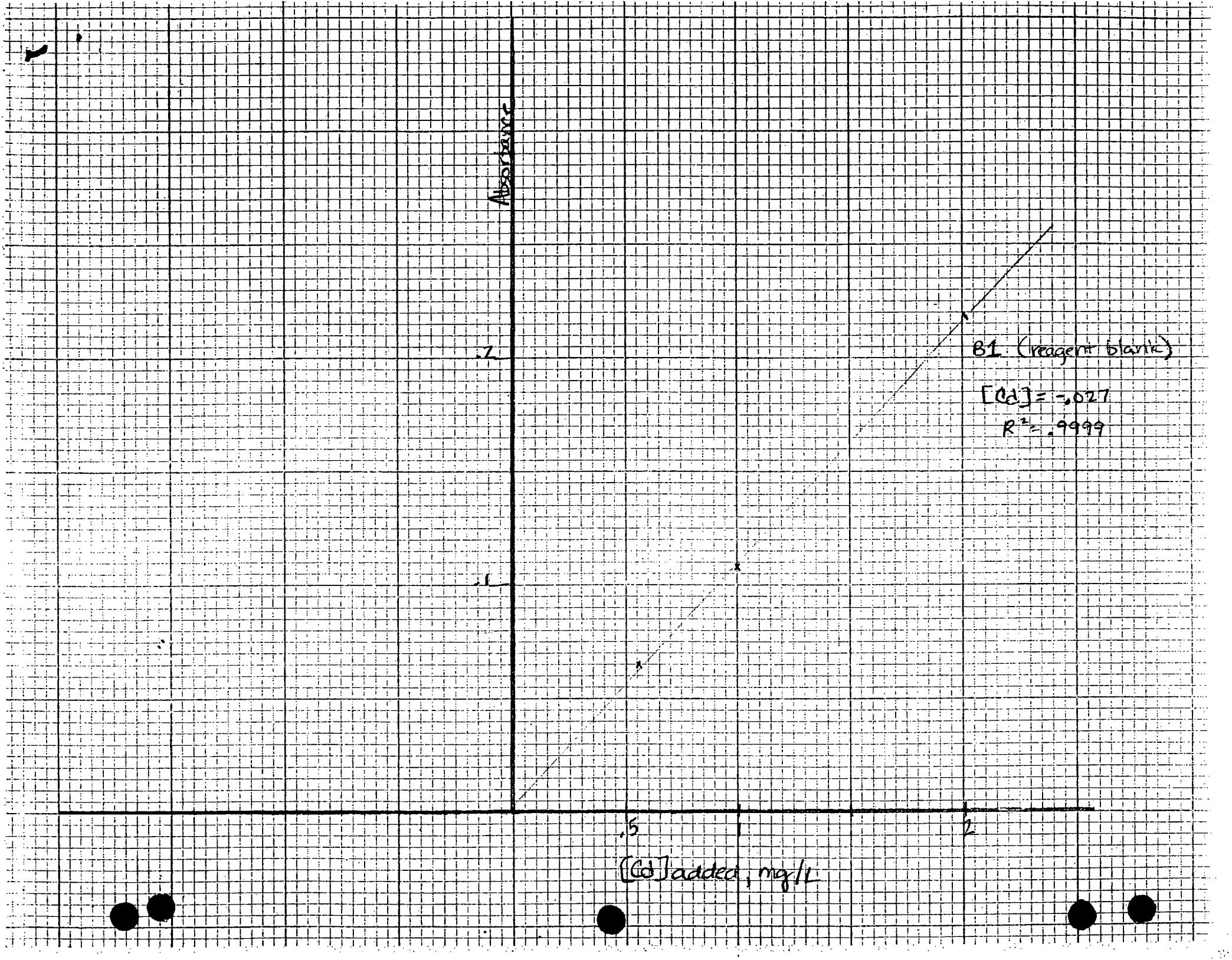
Analyst: Jane

Samples Prepared:

1. B1 reagent blank
2. C14
3. C15
4. C16
5. C1 repeat
6. C2 repeat
7. 
8. 
9. 
10. 

Samples prepared according to SW846 and analyzed via standard addition.


.2
.1
2
C1 rep-rep
[Co] = .043
R² = .9995
[Co] added, mg/L


Absorbance
.2
.1
.5
1
2
[Cd] added, mg/L
B1 (reagent blank)
[Cd] = -.027
R² = .9999

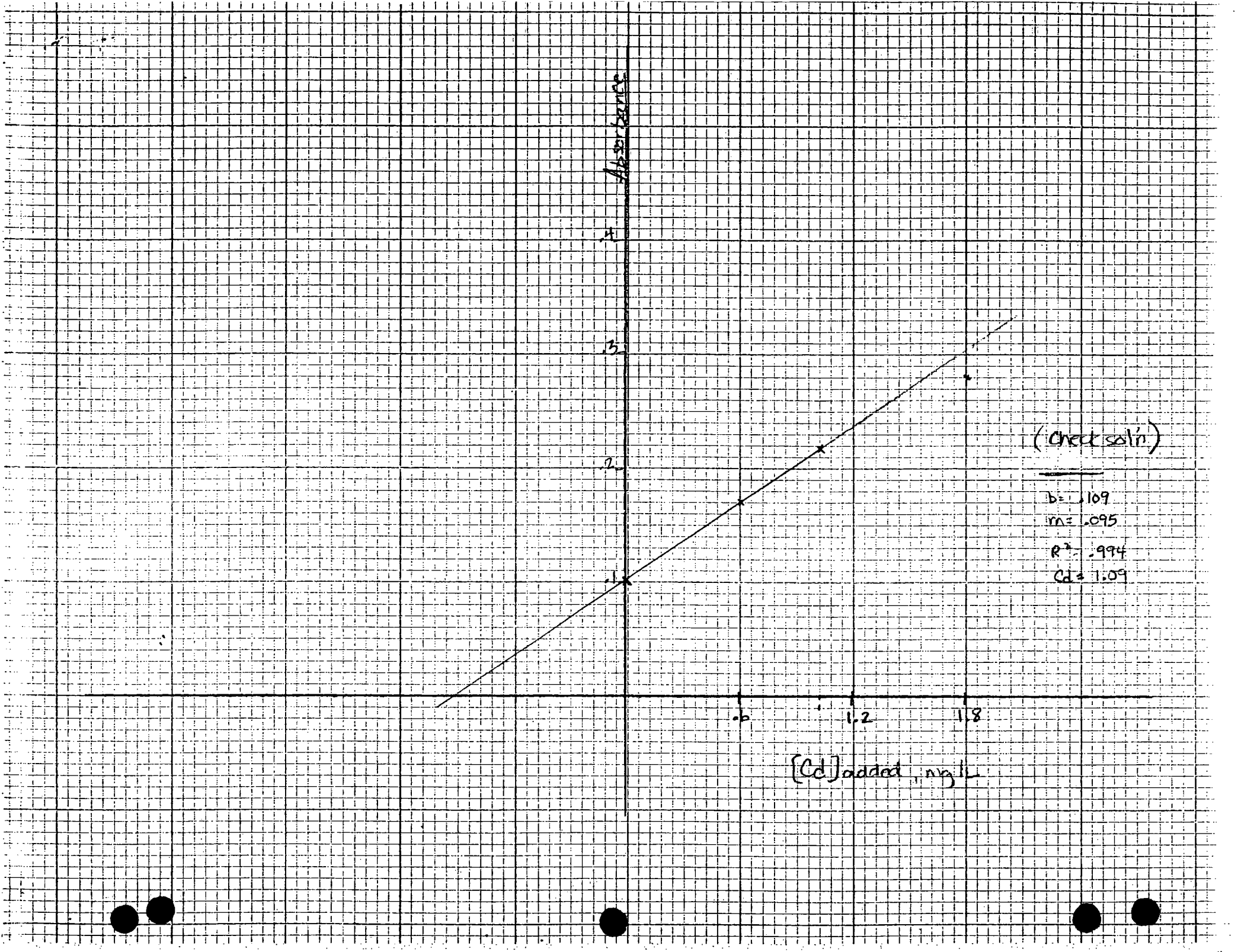
Cd 228

Bi

-0.003
-0.005
-0.003
-0.004AV
0.066
0.065
0.066
0.065AV
0.108
0.107
0.108
0.108AV
0.219
0.219
0.219
0.219AV

0.002
0.002
0.001
0.002AV
0.070
0.068
0.069
0.069AV
0.113
0.113
0.114
0.113AV
0.213
0.213
0.212
0.213AV

Cl upper


Absorbance
.4
.3
.2
.1
.6
1.2
1.8
[Cd]added, mg/L
(check sol'n)
b= .109
m= .095
R² = .994
Cd = 1.09

Cd 228

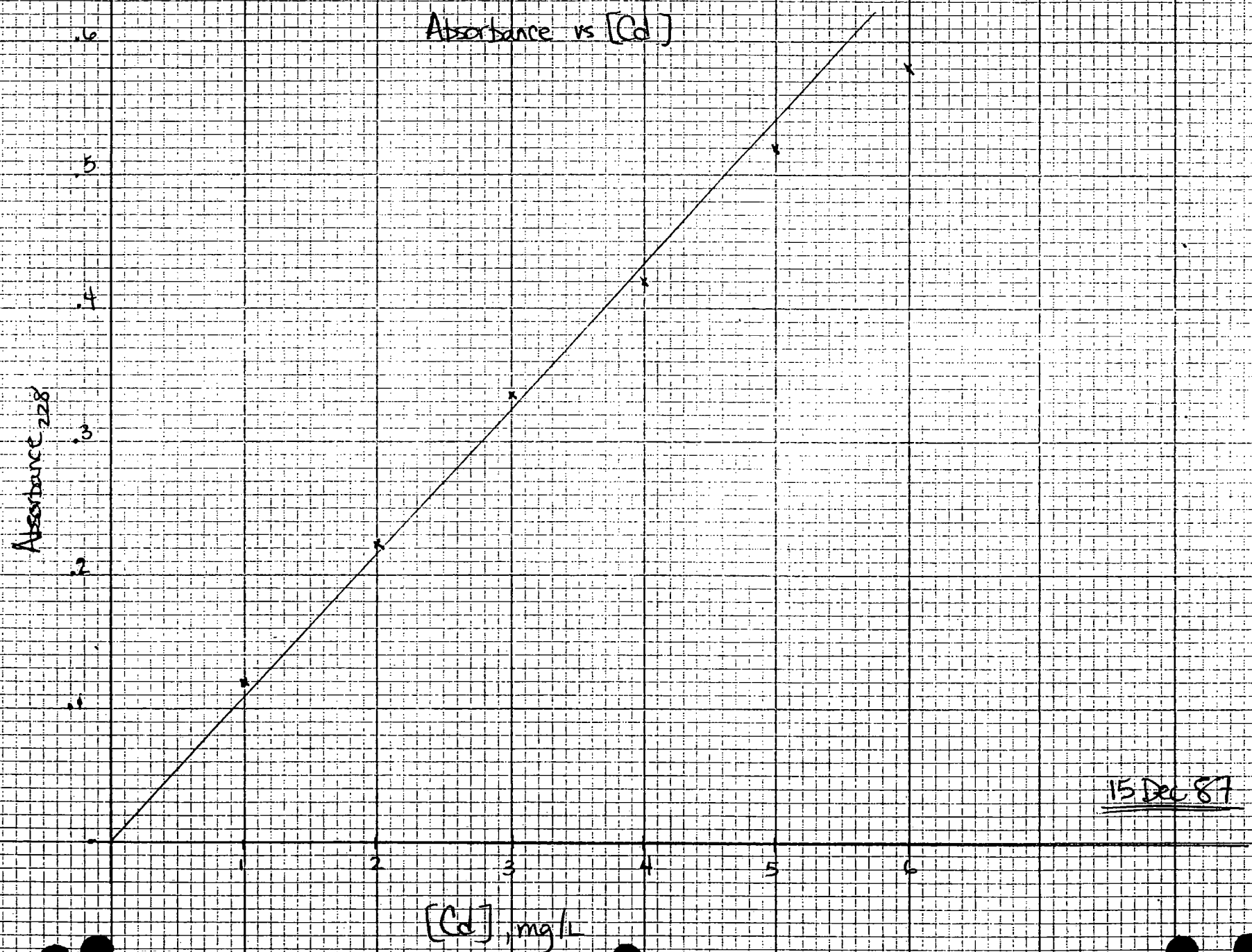
up

0.002
0.003
0.001
0.002AV
0.103
0.102
0.102
[illegible]
0.132
0.171
0.173
0.169AV
0.207
0.215
0.217
0.214AV
0.259
0.278
0.282
0.273AV

Cd 228

up

0.105
0.105
0.105
0.105AV 1.025
0.104
0.105
0.104
0.104AV 1.015
0.105
0.105
0.105
0.105AV 1.025

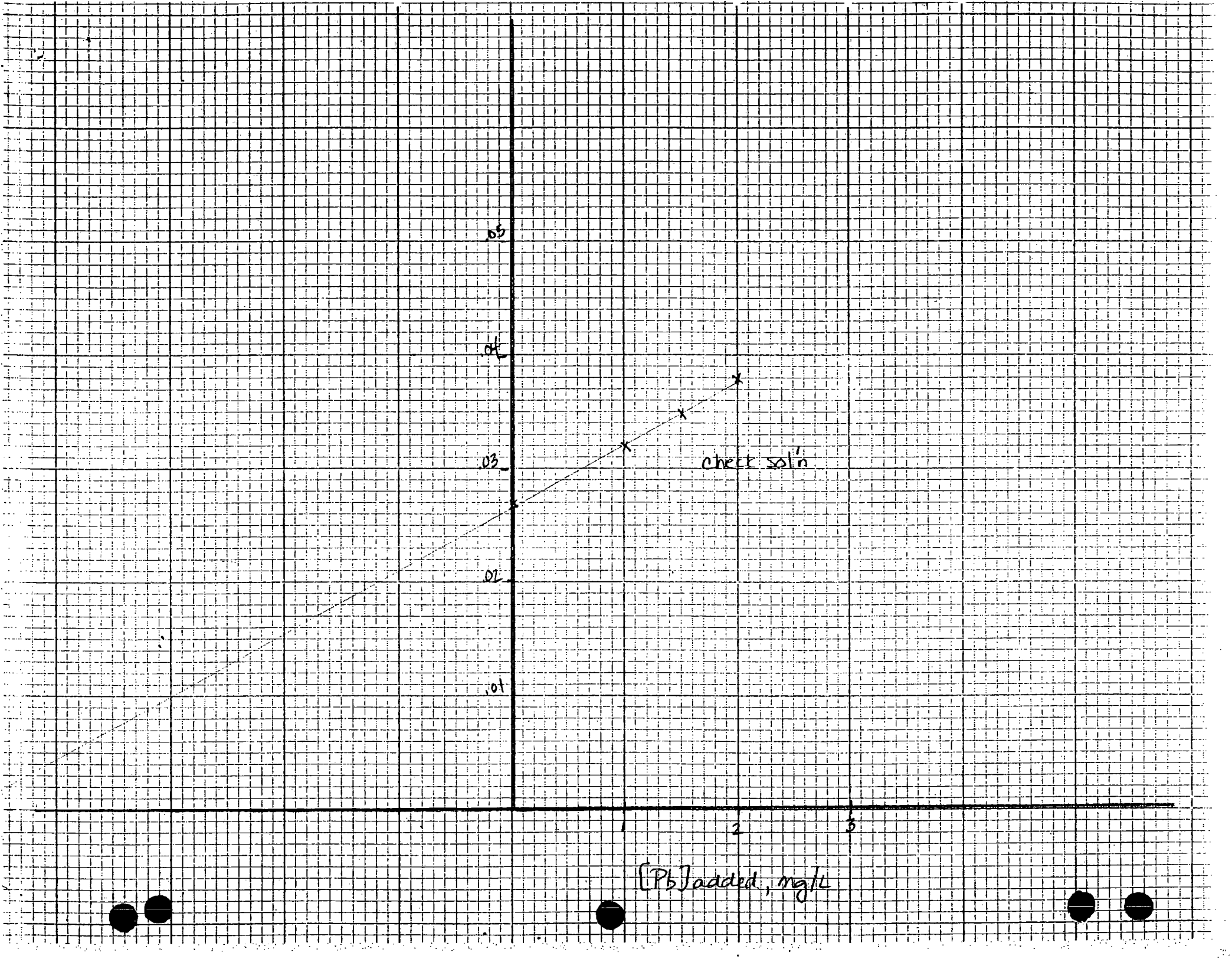



15 Dec 87

$Cd_{228}$

Cal. Curve

0.120
0.121
0.120
0.120AV 1
0.224
0.224
0.223
0.224AV 2
0.338
0.332
0.335
0.335AV 3
0.420
0.424
0.417
0.420AV 4
0.523
0.521
0.519
0.521AV 5
0.582
0.578
0.578
0.579AV 6


.05
.04
.03
.02
.01
check sol'n
1
2
3
[Pb] added, mg/L

$Pb_{283}$

check

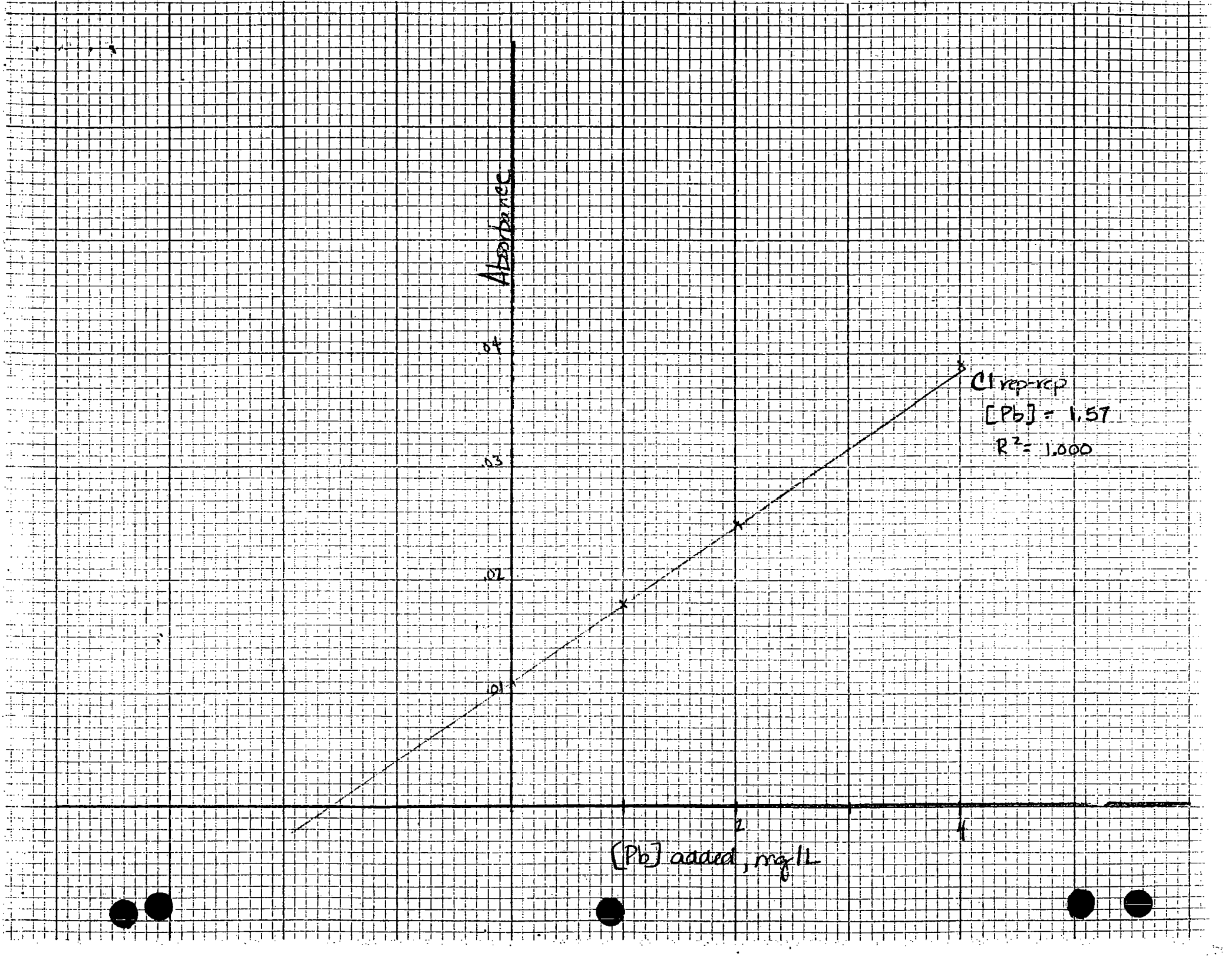
0.001 Z
0.001 Z
0.001 Z
0.000AV
0.026
0.027
0.027
0.027AV check
0.031
0.032
0.032
0.032AV ± (1ppm)
0.035
0.036
0.036
0.035AV ± (1.5ppm)
0.038
0.038
0.038
0.038AV ± (1.5ppm)

b = .0268
m = .00549
$R^2$ = .9927

[Pb] = 4.89

Pb 283

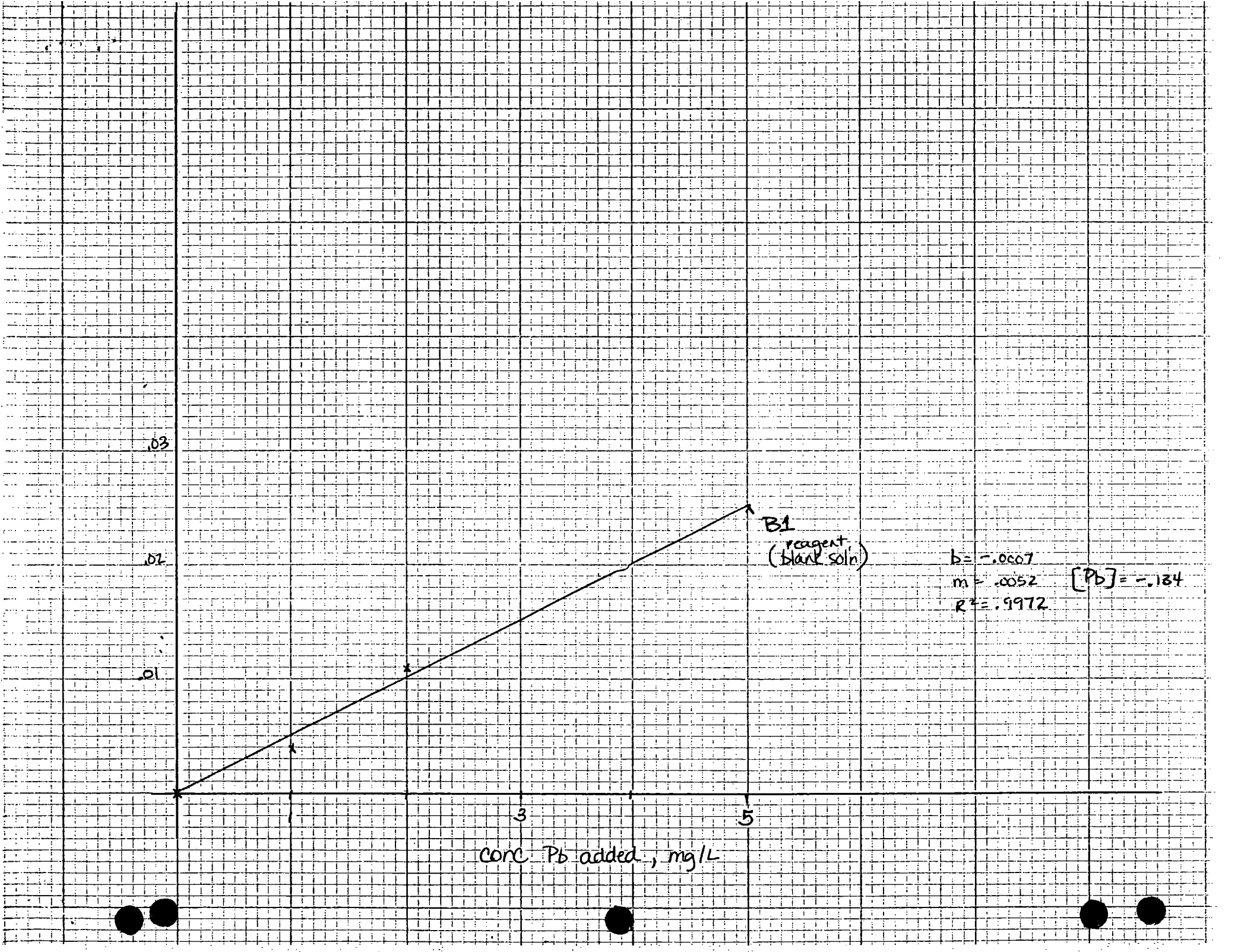
0.025
0.024 4.95
0.025
0.025AV 5.17
0.025
0.025
0.025
0.025AV 5.17
0.025
0.025
0.025
0.025AV 5.17


Absorbance
.04
.03
.02
.01
2
4
[Pb] added, mg/L
C1 rep-rep
[Pb] = 1.57
R² = 1.000

Pb 283

Cl reprep

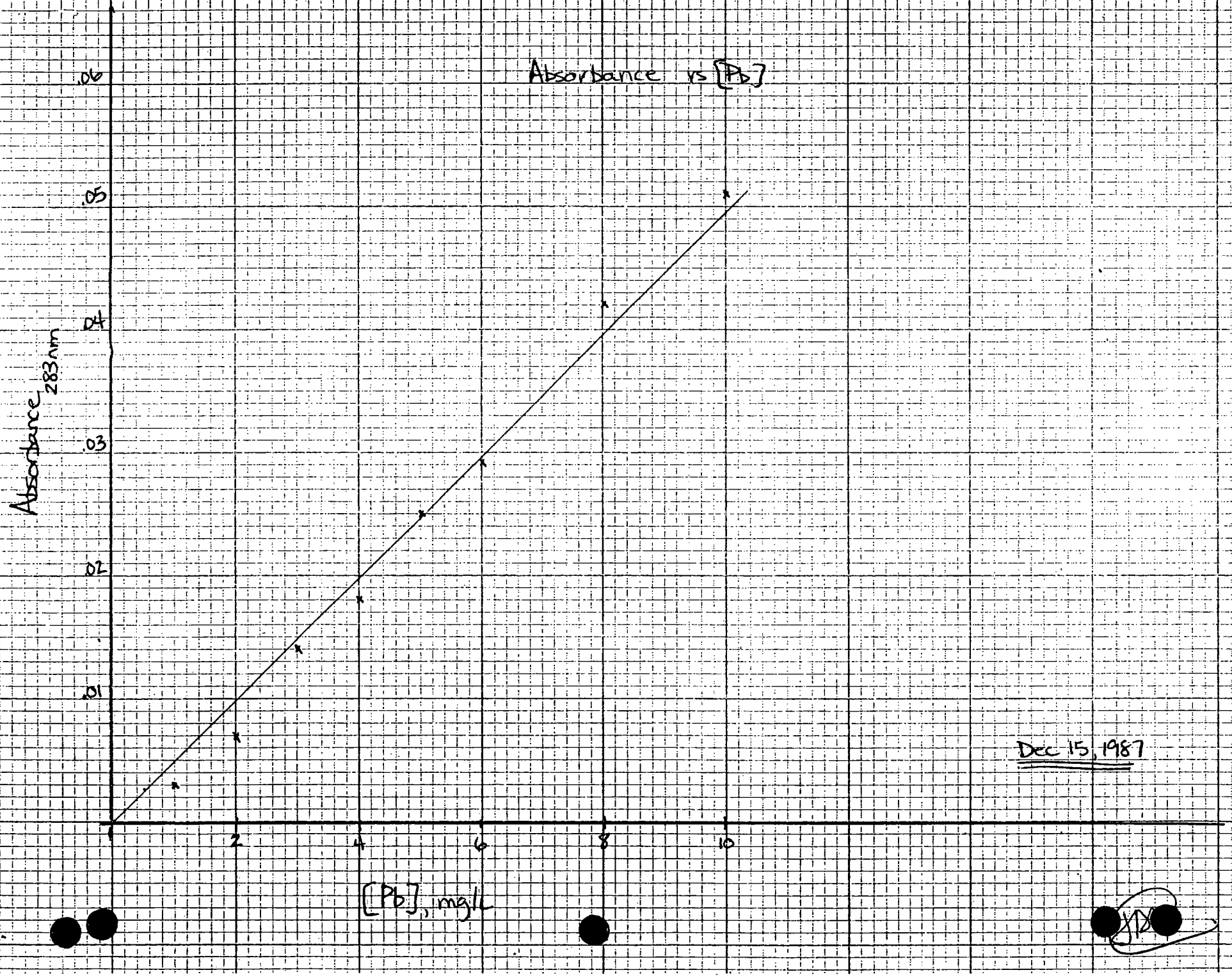
0.011
0.011
0.011
0.011AV 0
0.019
0.018
0.018
0.018AV ‡ 1 ppm
0.024
0.026
0.024
0.025AV ‡ 2 ppm
0.040
0.038
0.040
0.039AV ‡ 4 ppm


.03
.02
.01
1
3
5
conc Pb added, mg/L
B1
(reagent blank soln)
b = -.0007
m = .0052
R² = .9972
[Pb] = -.134

Pb
283

Bi

-0.000
-0.001
-0.001
-0.001AV
0.004
0.005
0.004
0.004AV
0.011
0.011
0.010
0.011AV
0.025
0.025
0.025
0.025AV


Absorbance vs [Pb]
.06
.05
.04
.03
.02
.01
Absorbance 283nm
2
4
6
8
10
[Pb], mg/L

Dec 15, 1987

Pb 283

Calibration Curve

```
*  0.000 Z
  -0.000 Z
  -0.001 Z
  -0.001 Z
   0.000AV
   0.005
   0.003
   0.003
   0.003AV  1 ppm
   0.007
   0.008
   0.007
   0.007AV  2
   0.014
   0.014
   0.014
   0.014AV  3
   0.018
   0.018
   0.018
   0.018AV  4
   0.025
   0.025
   0.025
   0.025AV  5
   0.030
   0.029
   0.029
   0.029AV  6
   0.042
   0.042
   0.042
   0.042AV  8
   0.051
   0.052
   0.051
   0.051AV  10
```

BRYAN, CAVE, McPHEETERS & McROBERTS

A PARTNERSHIP INCLUDING PROFESSIONAL CORPORATIONS

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June 12, 1987

Janice V. Perino, Ph.D., Manager
Office of Chemical Safety
Illinois Environmental Protection Agency
2200 Churchill Road
Springfield, Illinois 62706

RECEIVED
JUN 15 1987
IEPA-DLPC

Re: Chemetco, Inc.

Dear Dr. Perino:

Enclosed is a copy of the analytical results of the Chemetco splits from the samples collected at the Chemetco plant on April 12, 1987. The analyses of these samples were performed by Enseco-Cal Lab in accordance with the procedures referenced in your letter of April 15, 1987, to me. Enseco-Cal Lab is one of the laboratories certified to conduct the analyses for the other dioxin and furan homologues of interest to your office and U.S. EPA Region 5.

Along with the results received from Triangle Labs by Region 5, these results confirm the absence of dioxin from Chemetco's slag and indicate that there is no reason for concern about dioxins at Chemetco. Please feel free to contact me if you have any questions about these results.

Sincerely yours,

Robert F. Van Voorhees

Robert F. Van Voorhees

RFVV/gs
Enclosures
cc: Larry Eastep, IEPA
Donald Bruce, USEPA
Roger Grimes, USEPA
John Suarez, Chemetco
James Lennon, Ert, Inc.

RECEIVED
IEPA
JUL 10 1987
COLLINSVILLE OFFICE

BRYAN, CAVE, McPHEETERS & McROBERTS

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TELEX: 425757 BCMM NYK

June 12, 1987

Mr. Donald J. Bruce
U.S. Environmental Protection Agency
Region 5
230 South Dearborn Street
Chicago, Illinois 60604

Re: Chemetco, Inc.

Dear Mr. Bruce:

We have received your letter of June 2, 1987, and the enclosed analytical results for the five (5) samples collected at the Chemetco plant on April 12, 1987.

I am enclosing for your information the analytical results obtained by Chemetco for the splits of those samples. The analyses performed for Chemetco by Enseco-Cal Lab confirm the absence of any detectable level of any dioxins in the Chemetco slag and indicate more generally that no levels of potential concern were discovered in any of the samples. In particular, the result for the sample taken from the polish pits indicates that the Triangle Lab result must be considered as "the maximum" potential level, as their report emphasizes that it should be viewed. The Cal Lab result suggests that the true level is probably considerably lower and should raise no significant concerns.

Sincerely yours,

Robert F. Van Voorhees

Robert F. Van Voorhees
Counsel for Chemetco, Inc.

RFVV/gs
Enclosure
cc: Janice Perino, IEPA
Roger Grimes, USEPA
John Suarez, Ehemetco, Inc.
James Lennon, Ert, Inc.

Enseco

ENSECO-CAL LAB

POLYCHLORINATED DIOXIN/FURAN ANALYSIS

TICKET NO: 29030

CLIENT ID: 42459 FIELD ID:1 Staging Area  Date Analyzed: 5/8/87

CAL ID: 29030-3  Weight: 1.80G

| FURANS | AMOUNT FOUND (ng/g) | DETECTION LIMIT (ng/g) | |
|---|---|---|---|
| tetra (total) | ND | 0.18 | |
| (2378 *) | ND | 0.19 | |
| penta (total) | ND | 0.38 | |
| (12378) | ND | 0.29 | |
| (23478) | ND | 0.29 | |
| hexa (total) | 0.90 | - | |
| (123478) | ND | 0.86 | |
| (123678) | ND | 0.83 | |
| (123789) | ND | 1.3 | |
| (234678) | ND | 1.1 | |
| hepta (total) | 0.97 | - | |
| (1234678) | 0.97 | - | |
| (1234789) | ND | 0.38 | |
| octa (total) | 2.0 | - | |
| **DIOXINS** | | | |
| tetra (total) | ND | 0.091 | |
| (2378) | ND | 0.16 | |
| penta (total) | ND | 0.42 | |
| (12378) | ND | 0.61 | |
| hexa (total) | ND | 0.40 | |
| (123478) | ND | 0.96 | |
| (123678) | ND | 0.88 | |
| (123789) | ND | 0.99 | |
| hepta (total) | ND | 1.1 | ** |
| (1234678) | ND | 1.1 | ** |
| octa (total) | 3.3 | - | |

% Accuracy 37Cl-TCDD = 80%

% Recovery 13C-2378-TCDD = 65%

% Recovery 13C-2378-TCDF = 48%

TCDD Equivalence = 0.0011

ENSECO-CAL LAB

Enseco

POLYCHLORINATED DIOXIN/FURAN ANALYSIS

TICKET NO: 29170

CLIENT ID: 42458 #2 Bunker

CAL ID: 29170

Date Analyzed: 5/6/87

Weight: 10.17 g

| FURANS | AMOUNT FOUND (ng/g) | DETECTION LIMIT (ng/g) |
|---|---|---|
| tetra (total) | 8.3 | - |
| (2378 *) | 0.78 | - |
| penta (total) | 6.9 | - |
| (12378) | 0.63 | - |
| (23478) | 0.52 | - |
| hexa (total) | 8.6 | - |
| (123478) | 0.81 | - |
| (123678) | 0.51 | - |
| (123789) | 0.36 | - |
| (234678) | 0.96 | - |
| hepta (total) | 5.7 | - |
| (1234678) | 3.0 | - |
| (1234789) | 0.55 | - |
| octa (total) | 4.9 | - |
| **DIOXINS** | | |
| tetra (total) | 0.27 | - |
| (2378) | ND | 0.025 |
| penta (total) | 1.1 | - |
| (12378) | 0.058 | - |
| hexa (total) | 2.5 | - |
| (123478) | ND | 0.064 |
| (123678) | 0.16 | - |
| (123789) | 0.18 | - |
| hepta (total) | 2.4 | - |
| (1234678) | 1.1 | - |
| octa (total) | 1.9 | - |

% Accuracy 37Cl-TCDD = 73%

% Recovery 13C-2378-TCDD = 71%

% Recovery 13C-2378-TCDF = 41%

TCDD equivalence = 0.29

COMMENTS:

ND = Not Detected
* Represents maximum possible concentration because of co-elution of other isomers.
All totals, hepta and octa values from DB-5 column, tetra thru hexa isomer specific values from SP-2331 column.

PREPARED BY: _____ APPROVED BY: BJM DATE: 5/19/92

Enseco

ENSECO-CAL LAB

POLYCHLORINATED DIOXIN/FURAN ANALYSIS

TICKET NO: 29030

CLIENT ID: 42457 FIELD ID:3 Polish Pit

CAL ID: 29030-2

Date Analyzed: 5/5/87

Weight: 1.41G

| FURANS | AMOUNT FOUND (ng/g) | DETECTION LIMIT (ng/g) | |
|---|---|---|---|
| tetra (total) | 19.3 | - | |
| (2378 *) | 1.6 | - | |
| penta (total) | 23.1 | - | |
| (12378) | 2.5 | - | |
| (23478) | 1.6 | - | *** |
| hexa (total) | 28.8 | - | |
| (123478) | ND | 5.1 | *** |
| (123678) | ND | 3.0 | *** |
| (123789) | ND | 1.7 | |
| (234678) | ND | 3.4 | *** |
| hepta (total) | 29.0 | - | |
| (1234678) | 14.8 | - | |
| (1234789) | 3.8 | - | |
| octa (total) | 31.7 | - | |
| **DIOXINS** | | | |
| tetra (total) | 2.2 | - | |
| (2378) | ND | 0.19 | |
| penta (total) | 5.4 | - | |
| (12378) | ND | 0.69 | |
| hexa (total) | 9.6 | - | |
| (123478) | ND | 1.2 | |
| (123678) | ND | 1.1 | |
| (123789) | ND | 1.3 | |
| hepta (total) | 11.3 | - | |
| (1234678) | 5.4 | - | |
| octa (total) | 8.2 | - | |

% Accuracy 37Cl-TCDD = 92%

% Recovery 13C-2378-TCDD = 71%

% Recovery 13C-2378-TCDF = 58%

TCDD equivalence = 0.69

COMMENTS:

ND = Not Detected
* Represents maximum possible concentration because of co-elution of other isomers.
*** These isomers are present (as in the duplicate) but poor chromatography has caused the ratios to be out. These detection limits are MPC'S.
All totals, hepta and octa values from DB-5 column, tetra thru hexa isomer specific values from SP-2331 column.

PREPARED BY: DB APPROVED BY: [illegible] DATE: 5/19/97

Enseco

ENSECO-CAL LAB

POLYCHLORINATED DIOXIN/FURAN ANALYSIS

TICKET NO: 29030

CLIENT ID: 42457 FIELD ID:3 Date Analyzed: 5/8/87

CAL ID: 29030-2DUP Weight: 1.81G

| FURANS | AMOUNT FOUND (ng/g) | DETECTION LIMIT (ng/g) |
|---|---|---|
| tetra (total) | 20.7 | - |
| (2378 *) | 1.5 ** | - |
| penta (total) | 22.5 | - |
| (12378) | 1.8 | - |
| (23478) | 1.2 | - |
| hexa (total) | 30.5 | - |
| (123478) | 3.5 | - |
| (123678) | 2.1 | - |
| (123789) | ND | 1.7 |
| (234678) | 2.7 | - |
| hepta (total) | 30.0 | - |
| (1234678) | 15.7 | - |
| (1234789) | 3.9 | - |
| octa (total) | 32.4 | - |
| **DIOXINS** | | |
| tetra (total) | 2.8 | - |
| (2378) | ND | 0.28 |
| penta (total) | 5.9 | - |
| (12378) | ND | 0.37 |
| hexa (total) | 13.7 | - |
| (123478) | ND | 2.1 |
| (123678) | ND | 1.9 |
| (123789) | ND | 0.71 |
| hepta (total) | 12.1 | - |
| (1234678) | 5.7 | - |
| octa (total) | 8.2 | - |

% Accuracy 37Cl-TCDD = 84%

% Recovery 13C-2378-TCDD = 84%

% Recovery 13C-2378-TCDF = 65%

TCDD Equivalence = 0.66

Enseco



COMMENTS:

ND = Not Detected
* Represents maximum possible concentration because of co-elution of other isomers.
** Co-elution
All totals, hepta and octa values from DB-5 column, tetra thru hexa isomer specific values from SP-2331 column.

PREPARED BY: BB APPROVED BY: ASM DATE: 5/19/87

Enseco

ENSECO-CAL LAB

POLYCHLORINATED DIOXIN/FURAN ANALYSIS

TICKET NO: 29030

CLIENT ID: 42460 FIELD ID:4 Canal  Date Analyzed: 5/8/87

CAL ID: 29030-4  Weight: 1.70G

| FURANS | AMOUNT FOUND (ng/g) | DETECTION LIMIT (ng/g) |
|---|---|---|
| tetra (total) | 1.2 | - |
| (2378 *) | 0.40 | - |
| penta (total) | ND | 0.55 |
| (12378) | ND | 0.40 |
| (23478) | ND | 0.19 |
| hexa (total) | 2.2 | - |
| (123478) | ND | 1.1 |
| (123678) | ND | 1.0 |
| (123789) | ND | 1.2 |
| (234678) | ND | 0.94 |
| hepta (total) | 3.5 | - |
| (1234678) | 1.9 | - |
| (1234789) | 0.32 | - |
| octa (total) | 3.7 | - |
| **DIOXINS** | | |
| tetra (total) | ND | 0.12 |
| (2378) | ND | 0.12 |
| penta (total) | ND | 0.35 |
| (12378) | ND | 0.47 |
| hexa (total) | ND | 0.34 |
| (123478) | ND | 1.1 |
| (123678) | ND | 1.0 |
| (123789) | ND | 0.89 |
| hepta (total) | 1.4 | - |
| (1234678) | 0.70 | - |
| octa (total) | 1.3 | - |

% Accuracy 37Cl-TCDD = 91%

% Recovery 13C-2378-TCDD = 70%

% Recovery 13C-2378-TCDF = 58%

TCDD Equivalence= 0.044

COMMENTS:

ND = Not Detected
* Represents maximum possible concentration because of co-elution of other isomers.
All totals, hepta and octa values from DB-5 column, tetra thru hexa isomer specific values from SP-2331 column.

PREPARED BY: ___ APPROVED BY: ___ DATE: 5/19/87

Enseco

ENSECO-CAL LAB

POLYCHLORINATED DIOXIN/FURAN ANALYSIS

CASE NO. 29030

CLIENT ID: 42456 FIELD:5 5/29 | Date Analyzed: 5/8/87 | Column: DB-5

CAL ID: 29030-1 | Weight: 1.60G

| FURANS | AMOUNT FOUND (ng/g) | DETECTION LIMIT (ng/g) |
|---|---|---|
| tetra (total) | ND | 0.073 |
| penta | ND | 0.46 |
| hexa | ND | 0.16 |
| hepta | ND | 0.36 |
| octa | ND | 0.91 |
| **DIOXINS** | | |
| tetra (total) | ND | 0.099 |
| penta | ND | 0.36 |
| hexa | ND | 0.55 |
| hepta | ND | 0.46 |
| octa | ND | 1.2 |

% Accuracy 37Cl-TCDD = 89%

% Recovery 13C-2378-TCDD = 77%

% Recovery 13C-2378-TCDF = 68%

TCDD Equivalence = NA

ND = Not Detected

PREPARED BY: [illegible]

APPROVED BY: BJM DATE: 5/19/87

Illinois Environmental Protection Agency · 2200 Churchill Road, Springfield, IL 62706

217/785-0830

April 15, 1987

Robert F. Van Voorhees
Bryan, Cave, McPheeters & McRoberts
1015 Fifteenth Street, N.W.
Washington, D.C.

RECEIVED
JUN 15 1987
IEPA-DLPC

Dear Mr. Van Voorhees:

The analysis of dioxins and furans is quite complex. IEPA would like to inform you that a description of the modifications of Envirodyne's analytical procedures for 2,3,7,8-tetrachlorodibenzodioxin (TCDD) to permit them to analyze for other dioxin and furan homologues would not be sufficient to qualify Envirodyne's laboratory to conduct the analyses for the other dioxins and furans. USEPA has an elaborate QA/QC procedure established for any laboratory which would conduct these types of analyses. In addition, each laboratory must pass a performance test with USEPA-provided test materials in order to become certified to conduct these analyses. To date, only a few (3?) laboratories nation-wide are certified to conduct analyses for the other dioxin and furan homologues of interest in this investigation. We would be happy to provide a list of these laboratories if you so desire. One of these laboratories has already been contracted by USEPA to conduct the analysis on our portion of the split samples.

Sincerely,

Janice V. Perino

Janice V. Perino, Ph.D.
Manager
Office of Chemical Safety

JVP/psf

cc: Bruce Carlson, Esq.
Don Bruce, Region V
Roger Grimes, Esq., Region V

Document No. P-E318-003

# Site Investigation Study Work Plan-Wash Water Impoundment Area

Prepared for:

**Chemetco, Inc.**
Hartford, Illinois

October 1986

CHEMETCO INC.
HARTFORD, IL.

# PROPOSED FLOOR-WASH IMPOUNDMENT SITE INVESTIGATION STUDY

## 1. SUMMARY OF THE SITE INVESTIGATION STUDY WORK PLAN

Chemetco, Inc. operates and maintains a secondary copper smelter located on Route 3 near Hartford, Illinois. A facility location map is presented as Figure 1. Among other process and support operations, Chemetco has operated an electrolysis unit from time to time at the Hartford facility to produce cathode copper from the anode copper plates produced in its smelting operation. Electrolysis was carried on within the Tank House. Prior to 1980, Chemetco maintained a storage impoundment to contain floor-wash water from the Tank House. The floor wash contained electrolyte solution spilled from the electrolysis operation.

Chemetco discontinued discharges to the impoundment in 1980, and the floor-wash impoundment subsequently was pumped out and backfilled. Beginning in 1981, Chemetco installed ground water monitoring wells up and down gradient of the former floor-wash impoundment area. After assessment of the ground water monitoring data in 1984, Chemetco installed an interceptor trench down gradient of the impoundment area to collect contaminated ground water. The ground water is pumped back to the plant and recycled. The plant layout showing the location of the floor-wash impoundment area in relation to other facility operations is presented in Figure 2.

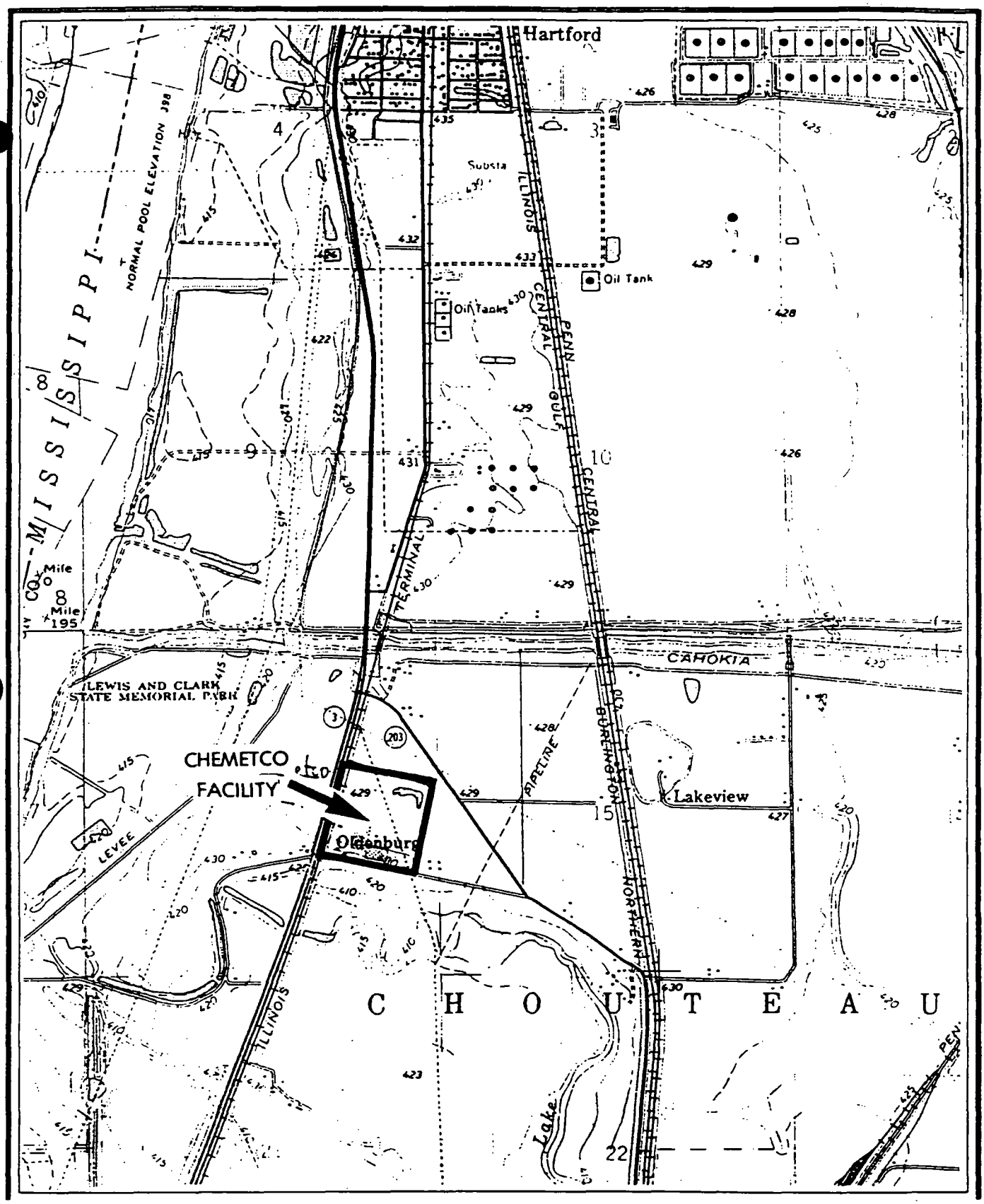


Figure 1 Facility Location Chemetco, Hartford, Illinois

FORM 84110

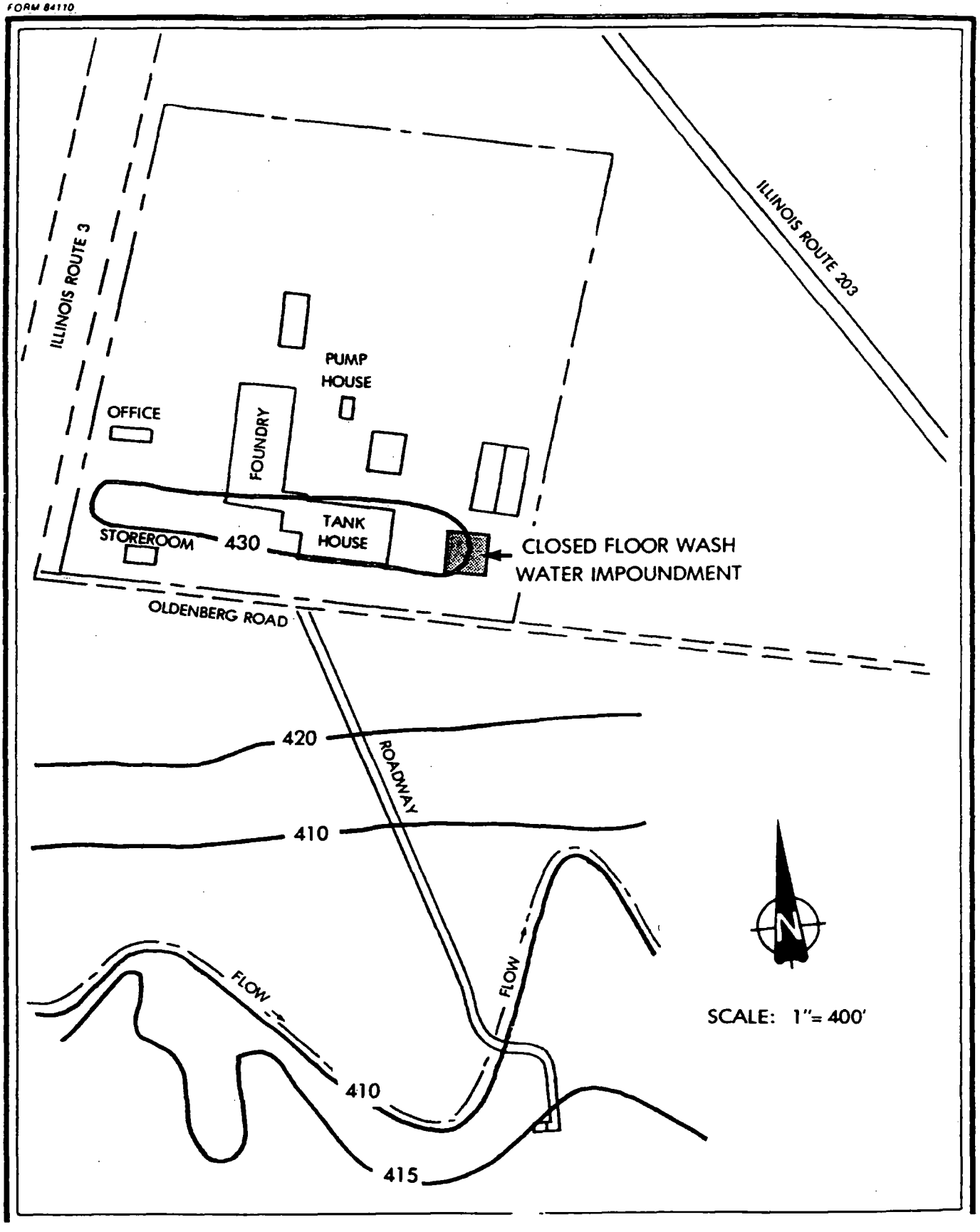


Figure 2 Plant Layout Chemetco, Hartford, Illinois

The U.S. Environmental Protection Agency, Region V (U.S. EPA) and the Illinois Environmental Protection Agency (IEPA) have requested Chemetco to secure the floor-wash impoundment area in a manner that will protect human health and the environment in accordance with applicable requirements of Federal and Illinois hazardous waste management regulations.

Based upon the available closure and corrective action alternatives and in order to develop and implement the most cost-effective solution, Chemetco proposes to complete a site investigation study. This site investigation study will be conducted to identify and evaluate local hydrogeological characteristics and to define the nature and extent of soil, ground water and surface water contamination due to the floor-wash impoundment. The site investigation study will also address and evaluate alternative corrective actions that could be implemented to mitigate potential adverse impacts on human health and the environment from the floor-wash impoundment area.

The primary objectives of the site investigation study are to determine the extent and nature of the problem, to determine what corrective actions would be necessary and appropriate to control hazardous contaminants attributible to the former impoundment, and to recommend corrective action that is consistent with appropriate Federal and Illinois regulations. The appropriate alternative corrective actions will be formulated and evaluated as part of this study after

sufficient data have been generated in the initial phases of the site investigation.

Based upon existing data, potential corrective actions appropriate for the impoundment area may include one, or some combination, of the following:

-- Removing and disposing of waste material or contaminated soil from the impoundment site;

-- Solidifying or stabilizing waste material;

-- Reconstructing or encapsulating waste material at the site;

-- Continuing or expanding ground water monitoring;

-- Limiting access to contaminated areas;

-- Continuing or expanding of the existing ground water collection and treatment system;

-- Constructing ground water barriers; or

-- Constructing a clay or synthetic cap over the impoundment site.

The study also may identify additional alternatives that should be considered.

At the present time, the available information concerning the site is insufficient to identify what specific corrective action should be implemented. The proposed study will allow Chemetco, IEPA and USEPA to evaluate the potential closure and corrective action alternatives and to determine the most appropriate and cost-effective course of action.

The scope of work in this work plan was prepared following a preliminary review of available data. The prescribed work is subject to revision as a more detailed and

thorough evaluation of existing information is completed and as new data are collected during each successive task. Accordingly, this site investigation study has been designed to be executed in three phases so that adjustments in subsequent phases of the work plan can be made as professional judgment and technical requirements indicate a need for modifications following assessment of the completed work in earlier phases. Chemetco will inform IEPA and USEPA of all field investigation work two weeks in advance so that the IEPA and USEPA can participate in these investigations.

The scope of work for the proposed study includes the following tasks which are described in Section 2 of this proposal:

## Site Investigation Activities

### Phase I

Task 1 - Detailed Review and Evaluation of Past and Current Activities and Information —1
Task 2 - Site Mapping —1
Task 3 - Water Well Survey —1
Task 4 - Phase I Review and Preparation of Phase II Work Plan 2

### Phase II

Task 5 - Preparation of Site Investigation Support Plans 2—3
Task 6 - Hydrogeologic and Ground Water Quality Investigation 3 waste char.
Task 7 - Soil Contamination Investigation 3
Task 8 - Surface Water Investigation 3
Task 9 - Phase II Review and Preparation of Phase III Work Plan 3 w.p. for Task 4

### Phase III

Task 10 - Additional or Continuing Studies 4
Task 11 - Risk Assessment 4



8817s

lab Bench scale studies

Task 12 - Identification and Evaluation of Site Closure and Corrective Action Alternatives 6

Task 13 - Site Investigation Study Report 7

The Site Investigation Study for the floor wash water impoundment area on the Chemetco facility is planned as a phased approach. Tasks 1, 2, 3 and 4 are included in Phase I. These activities are designed to allow existing site background information and activities pertinent to the impoundment area to be throughly reviewed and evaluated; and for determinations to be made about potential receptors and the level of contamination of ground water on-site (based on existing data).

After information from these tasks has been evaluated, the scope and level of effort for further investigations will be determined. Review of the cumulative data base following completion of Phase II will further define the scope of subsequent study activities. Finally, the Site Investigation Study Report will summarize the data and present an analysis of the results of tasks 1 through 13. The Report also will identify and present alternatives for corrective action at the site.

Phased approach

NO
go through
CMS after
final RI study
report



8817s

## 2. DETAILED DESCRIPTION OF THE SITE INVESTIGATION STUDY ACTIVITIES

Goals of the SIS proposed for Chemetco's floor-wash impoundment area are to:

a. Identify and determine the extent and nature of contaminants associated with the impoundment area that pose a significant risk to human health and the environment.

b. Determine the level and extent of ground water contamination attributable to the impoundment area and the rate of contaminant migration.

c. Determine present ground water flow conditions and the effect on contaminant migration resulting from area well use, seasonal variation, and other factors.

d. Based upon investigation activities, Chemetco will evaluate and recommend the most feasible alternative(s) for mitigation of existing contamination to protect human health and the environment.

This work plan is intended to be a flexable document with work elements that can be expanded, reduced, or eliminated based upon information gathered during preceding phases and tasks. Any major changes in the scope will be reviewed with IEPA and USEPA.

<u>Phase I: Establishment of Initial Data Base</u>

The scope of Phase I activities is designed to establish an initial data base for assessing the nature and scope of the potential problem relating to the floor-wash impoundment. Existing information and data concerning past and current activities will be identified, evaluated and documented. Maps will be prepared for plotting data locations. An inventory of local wells utilized as potable

water sources will be prepared. Phase I activities will conclude with a review to determine the need for and scope of a hydrogeologic investigation.

Task 1 - Detailed review and evaluation of past and current activities

A thorough review and evaluation of all available documents and information pertinent to the impoundment area will be completed. This will include but may not be limited to information about the following:

- Manufacturing processes and activities associated with generation of the floor-wash water. This will be done to determine the characteristics and constituents of concern placed in the floor-wash impoundment.
- Design, operation and management of the floor-wash impoundment.
- Subsurface geotechnical studies, investigations and activities relating to the impoundment area, including foundation boring studies, the boring study completed by Woodward-Clyde & Associates, installation logs for the water supply wells on Chemetco's property, logs for boring and monitoring wells installed by John Mathes & Associates, analytical results of monthly samples from the existing monitoring wells, the Ground Water Assessment Plan prepared by Environmental Science and Engineering, Inc., and a geophysical study completed by Geo-Survey.

This information will be evaluated, summarized and used as a basis for defining the problem and scoping successive tasks.

Task 2 - Site Mapping

A topographic survey will be undertaken to create a site plan showing elevations and locations of pertinent physical features and to provide elevations for wells in the

hydrogeological investigation. An on-site benchmark will be established as part of the survey. Topographic information will also be used for developing, evaluating, and selecting closure and corrective action alternatives, as well as for the actual design and construction of the appropriate remedies. Offsite areas will be included for mapping to allow evaluation of surface drainage and possible offsite impacts.

A legal description of the properties will be examined and verified in the field to confirm boundaries so that subsequent closure and corrective action activities will not encroach on neighboring property without permission of the owners.

The area for topographic mapping is indicated in Figure 1. After any additional monitoring wells have been installed, their locations and elevations will be surveyed and plotted on the topographic map. Site aerial photographs will be obtained at a scale of 1 inch = 200 feet and 1 inch = 2,000 feet with the site in the center of each photograph.

The topographic survey will determine horizontal distances of appropriate physical features relative to the property boundary and vertical elevations according to the National Geodetic Vertical Datum (NGVD) of 1929.

Task 3 - Water Well Survey

Contaminated water supply wells present a potential hazard to human health by allowing direct contact and ingestion of contaminated ground water. As part of Phase I activities,

Chemetco will prepare an inventory of public, private, residential, commercial, and industrial wells within a one mile radius of the impoundment area. The well inventory will include precise location, elevation, depth, geologic profile, construction, current and past use, historical testing results, and pumping rates as available from existing public and private records.

Task 4 - Phase I Review and Phase II Work Plan

After completing the first three tasks in Phase I, Chemetco will prepare a work plan for the completion of Phase II of the site investigation. The work plan will identify the specific tasks to be completed as a part of the Phase II activities (Tasks 5 through 9 below). The work plan will include the activities identified in the proposed task descriptions below, modified as necessary based upon the results of the Phase I activities. The Phase II work plan will be submitted to IEPA and USEPA for review and discussion.

Phase II Activities: Determining Extent of Contamination

Phase II of the SIS will focus on determining the nature and extent of ground water, soil and surface water contamination in the vicinity of Chemetco's floor-wash impoundment area. Phase II will include the development of detailed sampling and health and safety plans. The sampling plan will be based upon the Phase I findings and the data gaps identified as a result of the Phase I activities. Following

development of the detailed plans, the Phase II activities will commence.

Phase II activities will include the installation of monitoring wells, monitoring ground water elevations, sampling and analyzing ground water quality, completing soil borings, sampling and analyzing soils, identifying and mapping surface water drainage from the site, and (if appropriate) sampling and analyzing surface water. The Phase II activities will close with a review of completed activities. The review will determine the need for and scope of further site investigation activities.

Task 5 - Phase II Site Investigation Support

Data and information gathered during Phase I of the investigation will be used to prepare detailed sampling plans for hydrogeologic, soil and surface water studies.

Task 5A - Sampling Plan. A sampling plan will be prepared to specify the conduct of the Phase II field investigations. The plan will furnish detailed information on the following:

- Number and locations of new monitoring wells
- Installation procedures for these new monitoring wells
- Monitoring-well materials and construction
- Procedures for hydraulic testing of wells
- Water-level measurement procedures and equipment
- Well-water quality sampling, sample handling, sample shipping and custody procedures
- Laboratory analytical procedures
- Soil boring and soil investigation procedures
- Surface water quality sampling and analysis procedures
- Stream sediment sampling and analysis procedures

Copies of the draft sampling plan will be provided to IEPA and USEPA for review.

Task 5B - Health and Safety Plan. The Phase II Health and Safety Plan will be developed based on the results of Phase I study efforts. In addition, Chemetco will review existing records and on-going measurement programs conducted by Chemetco to determine appropriate health and safety procedures for field investigation workers. The Safety Plan will be submitted to IEPA and USEPA for review.

Task 6 - Hydrogeologic and Ground Water Quality Investigation

The objective of this activity is to conduct a hydrogeologic investigation that will provide the following:

a. data needed to determine the nature of ground water contamination and delineate the present horizontal and vertical contaminant concentration gradients;

b. hydrogeologic data needed to guide potential future corrective actions and support evaluation of corrective action alternative(s);

c. a ground water monitoring network to detect current and future movement of any existing ground water-borne contaminants and to assess results of potential future corrective actions; and

d. a ground water monitoring network to determine the relationship between ground water and surface water features such as Long Lake

Task 6A - Install Monitoring Wells. The number and location of additional monitoring wells will be determined as a part of the Phase II Sampling Plan. Well locations and vertical spacings will be located to accomplish the following objectives:

a. identify and quantify "background" conditions upgradient of the Chemetco property;

b. determine the nature and extent of ground water contamination downgradient of the Chemetco facility;

c. characterize the hydrogeologic system and ground water quality sufficiently to predict the movement and fate of ground water contamination; and

d. gather sufficient data to support the determination and design of a corrective action approach.

Technical specifications for drilling, casing and developing new monitoring wells will be included in the Phase II Sampling Plan. Drilling and well design will conform with existing USEPA, Illinois and local regulations. A geologist, hydrogeologist or geotechnical engineer will be with each drill rig to log subsurface borings and ensure that the wells are properly installed.

Boreholes for each well will be drilled in soil using hollow-stem augers whenever possible. Deeper wells may require a wash-rotary or other method of drilling. A preferred method of drilling for each well will be specified in the Hydrogeologic Study Plan, but changes in installation techniques may be necessitated by conditions encountered in the field.

While drilling each well, samples will be collected for possible future grain size analysis, index testing and lithology analysis. Samples will be properly packaged and stored. Samples will be analyzed at a later date as necessary. A standard split-spoon sampler (ASTM D1586) will be used to collect overburden samples at selected regular

Continuous

intervals, as well as at the water table and at changes in lithology. The sampling interval will be specified in the Phase II Sampling Plan. Samples will be described in the field notebook and placed in tightly-closed glass jars with lid and side labels indicating the boring number, sample number and sample depth. The samples will be stored out of sunlight and above freezing and will be made available to the IEPA and USEPA upon request.

Physical Testing of Soils at selected intervals

Monitoring wells will be constructed of minimum 2-inch inside-diameter flush joint threaded galvanized or black steel pipe fitted with an appropriate length of stainless steel screen. Well materials, diameters and construction will be specified in the Phase II Sampling Plan. The length of well screen will be determined in the field, but is generally expected to be 5 or 10 feet. The screened interval will be determined in the field based on the location of the water table, results of field analysis of soil samples and other field data. The screened interval selected for shallow borings generally will be situated in the interval of greatest contamination.

No

No statement w/s at water table

Each well will be surveyed to establish its location, the elevation at the top of the casing, and the ground-surface elevation. Horizontal locations will be tied to the State of Illinois coordinate system. Vertical elevations will be tied to the National Geodetic Vertical Datum.

294 To Touhy W
(1st stoplight)
To River Rd Take R
To Oakton Take L
1-1½ mi on right side
just before RR Tracks
Riggios
753 O Oakton
Desplains
Tween River rd & Mannheim

Aquifer response tests will be performed at selected wells to determine aquifer hydraulic properties. Rising or falling head tests will be conducted at selected wells. In addition, aquifer testing (pump tests) may be deemed appropriate at selected locations. The Phase II Sampling Plan will specify the type and location of selected aquifer tests to be conducted during this Subtask.

Throughout Subtask 6A, drilling equipment and soil sampling equipment will be properly decontaminated to prevent cross-contamination of soil samples, boreholes and monitoring wells. Well screen and riser pipe will be similarly decontaminated prior to installation. The Phase II Sampling Plan will specify decontamination procedures in detail. Decon. info. OK

Task 6B - Water Level Monitoring Program. The objectives of the water level monitoring program are the following:

a. to determine the general configuration of the water table and thus ground water flow patterns in the vicinity of the Chemetco facility;

b. to investigate short-term fluctuations in the water table due to possible pumping of high-volume industrial supply wells if existing;

c. to determine typical seasonal patterns in the configuration of the water table; and

d. to investigate surface water and ground water interaction.

The specific water-level monitoring program to accomplish these objectives will be described in detail in the Phase II Sampling Plan. At present, it is anticipated that a

monitoring program for water levels will include but may not be limited to monthly or quarterly water level measurements during a one-year period at selected wells in all directions about the Chemetco property.

Water-level measurements in ground water wells will conform with standard practice. Water levels will be measured to an accuracy of 0.01 feet. Measuring equipment will be properly decontaminated after measurements. Details of measuring protocol and decontamination procedures will be described in the Phase II Sampling Plan.

Task 6C - Sampling and Analysis of Ground Water. A ground water sampling plan will be proposed in the Phase II Sampling Plan. At least two rounds of sampling will be conducted. Wells to be sampled will include all of the new monitoring wells plus some of the existing wells. Existing wells to be included in the Subtask 6C sampling rounds will be selected based on several criteria, including, but not limited to:

- well construction, integrity and security;
- areal coverage in ground water sampling;
- use of well for water supply; and
- physical accessibility of well and permission from well owner to sample.

Sufficient wells will be included in the sampling round to allow assessment of ground water contamination downgradient of the Clemetco plant fence line. Changes in the sampling program for the second sampling round will be

recommended as more is learned of the nature and extent of contamination in the first sampling round.

Wells will be sampled in accordance with the Phase II Sampling Plan that will provide specific directions for sampling activities. New monitoring wells will be allowed to equilibrate following well installation and development before the wells are sampled. Prior to sampling, water-level measurements will be taken in the new monitoring wells and in existing wells for which water-level measurements are possible.

Prior to sampling, wells will be purged of a sufficient volume of water to ensure that samples are representative of the formation. This will be accomplished by either:

1. measuring conductivity, temperature and pH of the purge water, and purging until these parameters have stabilized; or
2. purging a minimum of five well bore volumes.

Wells will be purged by peristaltic or submersible pump if this is feasible based on the well construction and depth. Otherwise, the wells will be purged by bailing or other acceptable methods. Samples will be collected in appropriate containers using the peristaltic pump and Teflon tubing or bailing techniques. Ground water sampling and shipping procedures will conform with the approved Phase II Sampling Plan. The sampling program will include an appropriate number of duplicate and field blank samples.

The IEPA and USEPA will be informed that a sampling round is planned at least two weeks prior to its occurrence. IEPA and USEPA representatives may observe well sampling. Chemetco will split samples with IEPA or USEPA upon request.

Task 7 - Soil Contamination Investigation

An investigation of soil contamination will be conducted to determine the horizontal and vertical extent of soil contamination so that an appropriate corrective action can be designed.

The extent of the soil investigation will be consistent with the degree to which various areas of the floor-wash impoundment area are believed to act as a source of ground water contamination. The soil sampling plan will employ the results of the Phase I activities to determine where investigation is required, including known areas of waste disposal or spillage. In addition, the sampling plan will specify the number of soil samples, the types of analyses that will be performed on these samples, and the methods to be used for obtaining the samples.

Task 8 - Surface-Water Drainage Study

Water courses, drainage ditches and other surface water drainage ways from the impoundment area have the potential to act as pathways for contaminant migration. Task 8 will use the site topographic survey (Task 2) and a field site reconnaissance to determine surface water drainage ways from

the impoundment area. These will be mapped on the site topographic map. The major watercourses to which the site drainages are tributary will also be identified.

If necessary, the presence of contaminants in the site drainage will be evaluated in sediment and water samples taken from selected site surface water drainages. Water sampling is not likely to be possible in all drainways because most are likely to be dry most of the time. Nevertheless, sediment samples may be obtained from dry drainways. The number and location of all sampling points will be specified in the Phase II Sampling Plan.

Task 9 - Phase II Review and Phase III Work Plan Preparation

The Phase II studies will be designed to determine the nature and extent of soil, ground water and surface water contamination in the vicinity of the floor-wash impoundment area. Data collected during these studies will be compiled and preliminarly analyzed. The purpose of the review of the Phase I and Phase II findings will be to identify and clarify any areas of uncertainty. Following the Phase II review and the determination of the scope of additional study activities, Chemetco will prepare a detailed scope of work for the subsequent site investigation tasks. The scope of work will indicate the tasks determined to be necessary and the specific investigations, field activities and analyses to be completed under those tasks. The Phase III Work Plan will be submitted to IEPA and USEPA for review.

## Phase III Activities: Resolving Open Questions

The scope of Phase III activities will be highly dependent upon the findings during Phases I and II of the site investigation. Other investigations may be needed to further refine the Phase I and II findings. At a minimum, Phase III will include the completion of a site evaluation and analysis and risk assessment and the preparation of a Site Investigation Report. Other investigation tasks and appropriate investigative support may be added as a result of the Phase I and II findings. These are described in general terms in the following task descriptions.

### Task 10 - Additional or Continuing Studies

Further site investigation may be required in one or more technical disciplines. These studies could include:

1. Hydrogeologic Investigation - Installation of selected monitoring wells, additional ground water quality samples, continuing ground water level measurements, or collection of additional information on aquifer hydraulic properties.

2. Soil Contamination Investigation - Selected additional soil borings or test pits.

3. Surface water Drainage - Selected additional surface water or sediment samples, or further evaluation of off-site water quality and sediment contamination.

4. Hydrologic Analysis - Analysis of hydrogeologic water balance.

Appropriate Sampling and Health and Safety Plans will be prepared for the required additional tasks. All studies cited above are included to indicate the types of analyses that may be included under this task. The actual studies to be

completed, if any, will be determined following the Phase II studies and will be specified in the Phase III Work Plan.

Task 11 - Risk Assessment

Data collected during the site investigation phase will be evaluated by a qualified scientist/toxicologist to determine if environmental conditions or materials associated with the floor-wash impoundment area present potential hazards to public health, welfare, or the environment. Existing standards will be reviewed to help formulate conclusions and recommendations regarding the hazard potential of contaminated soil and ground water, and in identifying ground water protection standards. If additional hazards are identified, the risks associated with each hazard will be summarized. The site evaluation and risk assessment findings will be documented in the Site Investigation Report per Task 13.

Task 12 - Identification and Evaluation of Closure or Corrective Action Alternatives

In conjunction with the site investigation studies discussed above and based upon an assessment of site conditions as indicated by these studies, Chemetco will identify and evaluate appropriate closure or corrective action alternatives. These alternatives will address mitigation of both sources of contamination associated with the floor-wash impoundment area and areas affected by the release and migration of contaminants in the ground water which may pose a threat to human health and the environment. The evaluation and

recommendation of the most appropriate and feasible alternative(s) will be presented in the Site Investigation Report (Task 13).

Task 13 - Site Investigation Report

A Site Investigation Report will be prepared to consolidate and summarize the data collected during the site investigation studies. It will include a discussion of the data and the hazard identification, risk potential and proposed ground water protection standards (and/or corrective action criteria) of the contaminants detected. The site investigation report will provide data sufficient to allow evaluation of the need for source control or migration management measures, and for the identification and evaluation of appropriate closure or corrective action alternatives.

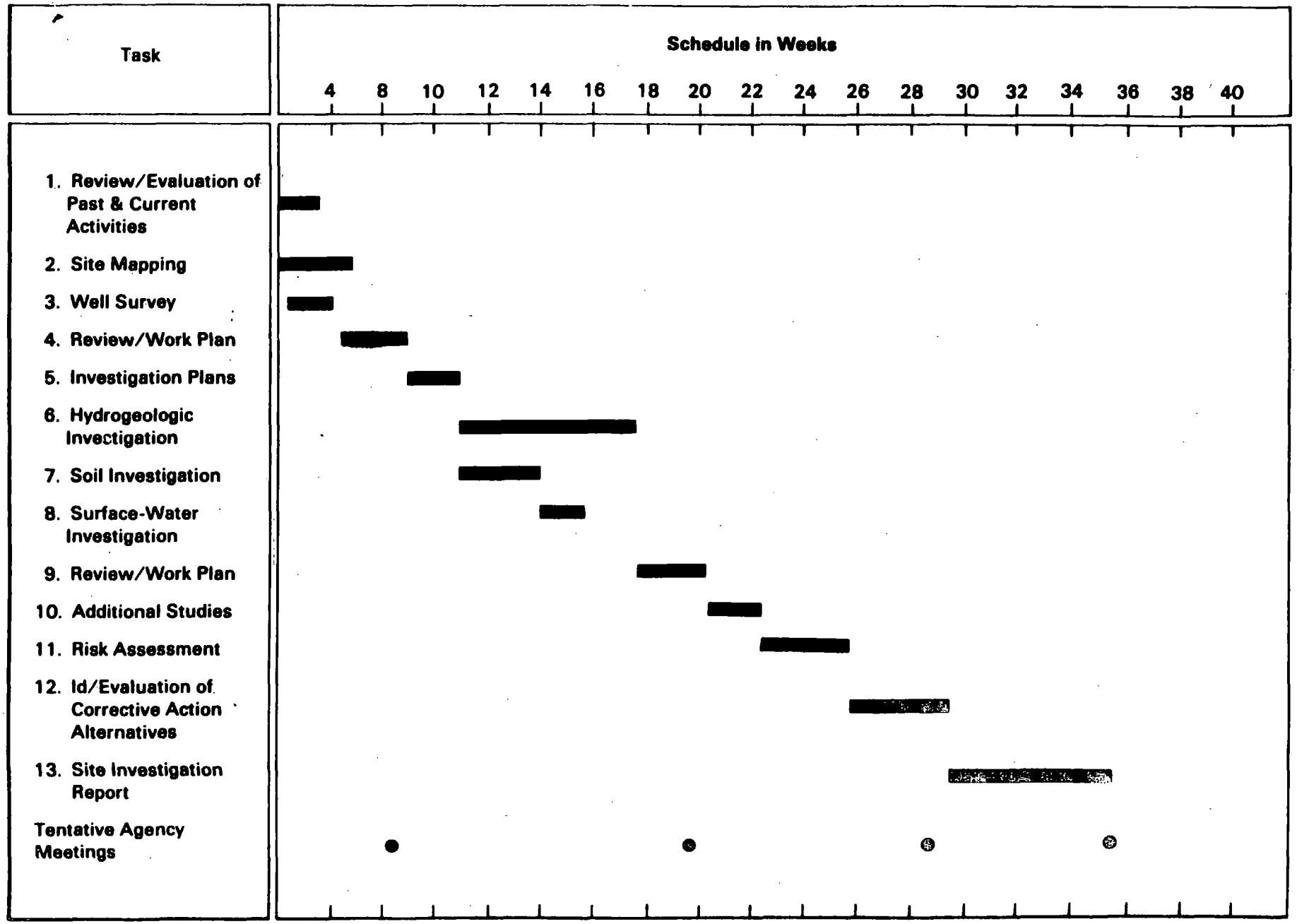


Figure 3 Estimated Schedule

## 3. PROPOSED SCHEDULE

Chemetco will commence the proposed site investigation study described in the foregoing sections within ten working days of receiving written approval of this work plan from both IEPA and USEPA. Figure 3 illustrates the estimated schedule for completion of the proposed work plan following receipt of approval. The schedule is stated in weeks.

Although time requirements for several of the individual tasks can be estimated accurately, most of the task schedules depend upon several variables, including: 1) IEPA and USEPA review and approval of the work plan; 2) completion of preceding tasks; 3) availability and performance of subcontractors; 4) cooperation of federal, state and local agencies; and 5) weather conditions. The estimated schedule includes reasonable allowances for these factors.

# Last Refuge on the River

Photo by: George Waldman

*A remnant wetland on the Detroit River inspires the creation of an international wildlife refuge.*

By Emilia Askari

For years, it was a secret spot known mainly to anglers and hunters. A place where endangered osprey perch on an old oak snag, their talons wound tightly around a flapping fish. A place where migrating ducks feast sumptuously on half-submerged beds of wild celery. A place where prized and once-abundant sturgeon, now rare in the lower Great Lakes, are beginning to spawn again in the slow-moving, shallow waters.

This is Humbug Marsh, the last remaining wetland on the American banks of the Detroit River. All the rest of the 32-mile shoreline between Detroit and Lake Erie is hidden behind rip-rap and concrete seawalls, covered with steel factories, shipping yards, and other powerhouses of Detroit's auto-based economy.

Few of the five million people who live around the river had heard of Humbug Marsh until a couple of years ago, when developers announced plans to convert it into a golf course surrounded by million-dollar homes. That's when Bruce Jones sounded the alarm. A semiretired dentist whose family has lived near the river for three generations, Jones grew up watching birds dive in Humbug Marsh as the sun played peek-a-boo on its waters. He knew what would be lost if a developer were allowed to bulldoze the small fingers of water that wash from the river into 400-plus acres where hummingbirds, hawks, and monarch butterflies rest on their annual migrations from Canada to Mexico and points south. He knew that behind the scraggly roadside trees on the marsh's edge a stand of red oaks two feet thick sink their roots deep into the soil and history of the Great Lakes region. Just beyond, on a small upland rise, a few white oaks more than four feet in diameter tower above the mucky marsh. They are among the last living legacies of the summer of 1701, when the French explorer Antoine de la Mothe Cadillac landed his voyageur canoe on the riverbank that would become Detroit.

To Jones it was obvious: Humbug Marsh had to be saved for future generations of people and wildlife to enjoy. Soon he was writing letters to newspapers, city officials, state regulators, and anyone else who might help. He was organizing rallies. He was passing petitions.

Activist Bruce Jones campaigned to save Humbug Marsh
Photo by: George Waldman

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Humbug Marsh. A slim, white-haired man in jeans and a maroon fleece shirt, he trained his wire-rimmed glasses upriver, naming the companies that built the vari smokestacks lining the shore from a place called the "black lagoon" down to the edge of the marsh: Detroit Edison, Great Lakes Steel, Chrysler, and others. Then motioned toward Humbug, the wet and wooded lot next door. "In there," he said, "you're in a totally different world. Trees close in all around you. You can't believe you're in the Detroit metropolitan area."

Jones, founder of the nearby Grosse Ile Conservancy and a lifelong environment activist, wasn't the only one who jumped to action when plans were announced tc develop Humbug. Members of other groups including Friends of the Detroit River involved, selling "Save Humbug Marsh" T-shirts, passing out leaflets at bait-and-tackle shops, and speaking out by the hundreds at public hearings on the developer's proposed building permits.

Congressman John Dingell, whose family has represented the area since 1932 a who worked on the protection of a small piece of the river in the 1960s, realized tl this was a critical point in time for the river he cares so deeply about. "Humbug Marsh is a wonderful place . . . the last wildland on the Michigan side of the river t appears much as it did when the area was settled two centuries ago." The threat Humbug convinced Dingell that a more comprehensive approach to river protecti was needed, and he began drafting legislation to create an international wildlife refuge along the river.

State officials began to take notice as well. They modified the developer's plans without entirely rejecting the notion of building mansions in the swamp. But the U.S. Army Corps of Engineers refused to allow the developer to build a bridge from a part of the marsh known as Humbug Island to the watery mainland. Lawyers were retained. Before long, the developer had sued the Corps. The banks had sued the developer. The state had sued the developer for breaching the terms of a longstanding easement on part of the marsh by scraping down saplings in preparation for construction.

Congressman John Dingell
Photo by: George Waldman

**Planning a River Renaissance**

Humbug is the crown jewel of the properties that TPL hopes to preserve on and about the Detroit River, according to Steve Muyskens, who leads TPL's efforts in southeast Michigan. In addition to Humbug Marsh and Island, TPL hopes to acqu an adjacent old factory site owned by Chrysler and several nearby properties. "O goal is to see that Humbug Marsh remains an example of natural habitat that peo can visit and see what the Detroit River was like before all the development."

Detroit is a classic example of urban sprawl at its worst. The city lost half its population since the 1950s, dipping below one million for the first time in decades during the 2000 census. Some blame the race riots of the 1960s. Others blame foreign competitors who brought hard times to the U.S. auto industry.

As people left Detroit, the city was burdened with vast tracts of abandoned homes. Many have been torched or torn down. Still, it is not unusual to find blocks with a handful of old homes standing amid lots of weeds and rubble. Meanwhile, the ever-expanding suburbs continue to consume former farmland, requiring the construction of new schools, new roads, and sewer lines.

In the mid-1990s, some in the region began to talk about reversing that trend. If only the Detroit River and its tributaries could be cleaned up, if they could be made beautiful and accessible for recreational uses, perhaps people could be enticed to move back into the city and its grittier, older suburbs. It was an ambitious notion. But many thought it was worth a try.

Humbug Marsh
Photo by: George Waldman

First, the U.S. government began pumping millions of dollars into a pilot effort to clean up the Rouge River, a large tributary of the Detroit River. Then the environmentally minded chairman of Ford Motor Company, William Clay Ford, Jr., announced that he would clean up the company's historic Rouge Plant, making it a model of sustainable development. Before long, civic activists launched a campaign to pick up garbage on Belle Isle, the largest island in the Detroit River and the heart of the city's beleaguered park system.

Then business leaders teamed up with environmental activists and local philanthropists to launch something they called the Southeast Michigan Greenways Initiative. It is a visionary plan to create a network of trails and other greenways throughout Detroit and its suburbs, especially along its rivers. Next General Motors, the largest manufacturing corporation in the world, announced that it was moving its world headquarters to the shining Renaissance Center office complex on the Detroit River.

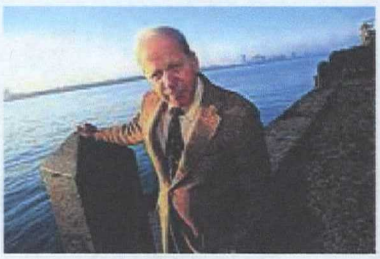
Momentum was definitely building for change.

**An International Effort**

Peter Stroh, scion of the brewing family and ardent advocate for the outdoors, recalls hearing more and more people beginning to talk about the Detroit River in the mid-1990s. "The fact is it was a grimy place and it was getting grimier until we all said, 'Whoa, this can't go on,'" says Stroh, who grew up on the shores of Lake St. Clair, which feeds into the Detroit River. A group of civic leaders asked Stroh to chair the Greater Detroit American Heritage River Initiative. A few years ago, Stroh and friends were successful in gaining federal American Heritage River status--and accompanying federal dollars--for the Detroit River. Last July, the Canadian government made the Detroit a Canadian Heritage River as well.

Planning to save the Detroit River focused not just on putting strips of green under public control, though that was part of the vision. In addition, organizers want to encourage factories and other private landholders to put conservation easements on their property that borders the river.

The effort got a major boost last December when dignitaries from Canada, the United States, and the state of Michigan came together in a nearby boathouse to celebrate the creation of the first international wildlife refuge in North America--along the banks of the Detroit River. The gathering of more than 100 community leaders, national politicians, regulators, and scientists from both countries was a testament to the strong



Civic leader Peter Stroh

appeal of the river as a living refuge from urban industrial life. They shared a vision for restoring the river's shoreline through a patchwork of government ownership and private easements or other conservation commitments. And they identified Humbug Marsh and Island as key pockets of green worth preserving.

Photo by: George Waldman

At the meeting, Simon Llewellyn, director of the environmental and conservation branch of Environment Canada's Ontario region, observed, "As we've lost wetlands over the years to development, the ones that remain become very precious." He looked out the window at the river. "They are wildlife jewels. When you've lost so much, it's very, very important to protect and conserve those that remain."

Congressman John Dingell is the senior member of the U.S. House of Representatives and one of the most influential Democrats in Congress. He represents the factory towns that embrace the lower Detroit River and surround the Humbug Marsh. Dingell's hard work brought swift approval by the House of Representatives of the legislation creating the wildlife refuge. Michigan's Senator Debbie Stabenow, who carried the bill through the Senate, caught an early morning flight from Washington for the dedication.

Dingell received a standing ovation when he stepped to the podium before an enthusiastic hometown crowd. "We have to keep up the quality of life downriver," said Dingell. "We can have thriving industry, recreation, and at the same time preserve wildlife."

Detroiter Jerry Burrell casts for fish at Humbug Marsh
Photo by: George Waldman

The Honorable Herb Gray, deputy prime minister of Canada, also was on hand to fete the new wildlife refuge. Gray, whose job is equivalent to the U.S. vice president's, grew up on the Detroit River. The appropriately gray-suited senior politician still lives within view of the river and delights in watching boats gather in the shadow of the Detroit and Windsor skylines to fish the annual walleye run each spring.

"For some, the Detroit River may be a border between the United States and Canada," Gray says. "For the first settlers in this region, it was not a border. It was a shared mode of transportation. It underscored the importance of cooperation. And for us today it is our shared environment . . . It is a powerful magnet that draws us together socially, physically, and environmentally."

**Feeding the Spirit and the Economy**

The Detroit River sits at the intersection of the Atlantic and Mississippi flyways. Every year an estimated three million ducks, geese, swans, and coots migrate through the region. That includes about 300,000 diving ducks, which contribute to a $22 million waterfowl hunting industry in the region. Birdwatching and photography of birds contribute another $200 million, according to government estimates.

And that is only the start of the economic benefits that flow directly from the wildlife on the river. Each spring, hundreds of thousands of anglers descend on the river and Lake St. Clair as an estimated ten million walleye ascend the river from Lake Erie to spawn. Walleye are among 65 kinds of fish and 29 species of waterfowl that live along the river, in places like Humbug Marsh. Another 150 bird species

Mute swans are among the millions of migrating birds dependent on the Detroit River
Photo by: George Waldman

nest near the river. Without Humbug and a few other small pockets of wetlands on the Canadian side of the river and its islands, the birds might have nowhere to feed. The fish might have nowhere to spawn.

For Bruce Manny, a biologist with the U.S. Geological Survey, the bald eagles swooping overhead are the most awesome aspect of Humbug Marsh. "I've seen as many as three at a time doing aerial acrobatics," he says. "Their very presence shows that the river is cleaner than it once was. They are a living reminder that the fight is worth fighting, and that those who care about improving the environment are winning."

Steve Gronda and Kay McGowan visit their native ground.
Photo by: George Waldman

For Steve Gronda, chief of the Wyandot of Anderdon Nation, it is the red-tailed hawks that make Humbug special. The birds are a symbol of his people, who lived on the river for thousands of years before Europeans arrived. Now, Humbug is the only part of the shoreline that his ancestors might recognize. Gronda still likes to hunt duck and fish there. He strongly supports TPL's efforts to purchase Humbug and another chunk of nearby land on a Detroit River tributary called Marsh Creek. The land, known as Six Points, holds the remains of hundreds of Wyandot going back thousands of years. Though the burial ground is now surrounded by brick apartment complexes, it remains a 15-acre thicket of reeds and water.

On a clear fall day Gronda walked across the old burial ground with Kay McGowan, spokeswoman for the Wyandot tribe, which has approximately 800 members. She mentioned that in the Wyandot tradition, after a person's remains are buried there is a large feast. "The soul is said to go to the western door, to the spirit world, on the wings of the red-tailed hawk," she explained.

Nearby, where the creek crosses a road, a couple from Detroit stops to fish one fall afternoon. Asayann Martin and Jerry Burrell say they drive down there about twice a month, spring through fall, to cast their lines for bass, bluegills, and suckers. "It's peaceful," Martin says. "Not a whole lot of noise. You get your thoughts together." Bruce Jones, Humbug's longstanding champion, stands nearby, listening. "That's why we need to save these places," he whispers. "For people like them."

**Emilia Askari is a prize-winning journalist who has covered environment and public health issues in the Midwest for more than a decade. She lives in the Detroit area and is a former president of the Society of Environmental Journalists.**

PRINT



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# Long Lake Watershed
# Resource Inventory
# and
# Alternative Evaluation

Prepared for the
Long Lake
Planning Committee

by

Madison County Soil and Water Conservation District

Metro East Watershed Planning Team

USDA Natural Resources Conservation Service

IDNR, Office of Water Resources

U.S. Army Corp of Engineers

July 25, 1995

UNITED STATES DEPARTMENT OF AGRICULTURE

NATURAL RESOURCES CONSERVATION SERVICE

7205 Marine Road
Edwardsville, IL 62025
Phone: 618-656-7300 Ext. 3
FAX: 618-656-5187

July 30, 1999

Chris Cahnovsky
Ill. EPA
2009 Mall St.
Collinsville, IL 62234

Dear Mr. Cahnovsky,

Enclosed is the copy of the Long Lake Resource Inventory and Alternative Evaluation you requested. If NRCS can be of further assistance, please call.

Sincerely,

Donna K Beauchamp

Donna K. Beauchamp
Soil Conservationist

Enclosure

RECEIVED
IEPA
AUG 02 1999
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# SECTION I

# INTRODUCTORY

## INTRODUCTION

In July 1990 the Illinois Department of Conservation requested assistance to reduce the siltation and water quality impairments affecting Horseshoe Lake from the Madison County Soil and Water Conservation District. With the assistance of the Soil Conservation Service, a Resource Planning committee was formed on September 25, 1990, for the purpose of promoting economic development in harmony with preserving habitat for endangered and threatened fish and wildlife.

The Horseshoe Lake Resource Planning Committee completed its study in October 1991. The study identified multiple concerns throughout the watershed which included parts of St. Clair County as well. This led to the formation of a joint effort by Madison and St. Clair Counties to address other natural resource problems in the American Bottoms drainage basin. As a result, the counties have been joined by the Illinois Department of Transportation, Division of Water Resources; the U.S. Army Corps of Engineers and the Natural Resources Conservation Service in creating a "Watershed Planning Team" to find solutions to these problems.

The Long Lake watershed is the fifth watershed and the fourth report completed by this team. The study area overlaps the previous Horseshoe Lake area, but it is being studied separately because of unique concerns.

## PLANNING COMMITTEE

In February 1995, the Madison County Soil and Water Conservation District Board Chairman appointed a Planning Committee to develop a Long Lake Watershed Resource Plan. The first meeting of the Planning Committee was conducted on February 23, 1995. At this meeting the Planning Committee received an overview of the watershed, reviewed the history of past activities relating to flooding along Long Lake, discussed the planning procedure, and began to identify resource concerns. The Planning Committee members are as follows:

| Name | Affiliation |
|---|---|
| Ken Davis | Land owner, Nameoki Township- MESD |
| Gary Rapp | Land owner, Nameoki Township |
| Ken Mueller | Land owner, Nameoki Township |
| Ralph Buske | Land owner, Chouteau Township |
| Charlie Luehmann | Land owner, Nameoki Township |
| Don Rea | Madison County Board |
| Kim Affolter | Alderman, City of Granite City |

**Technical Assistance was provided by the following individuals and agencies:**

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Aquatic Systems

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Civil Engineer
*USDA- NRCS

Scott Ballard
Illinois Dept. of Conservation
Natural Heritage Biologist

**USDA-NRCS - United States Department Of Agriculture - Natural Resources Conservation Service (formerly Soil Conservation Service)*

**LONG LAKE RESOURCE CONCERNS: At the first meeting the Resource Planning Committee developed a list of resource concerns, observations, and opportunities utilizing the nominal group process. The list was as follows:**

1. **No direct route is available for water to get into Long Lake.**
2. **The water level of Elm Slough is not well controlled.**
3. **Beaver damage disrupts the flow of water especially in Elm Slough.**
4. **Stop filling of Wetlands (with construction debris or for development).**
5. **Pontoon Beach Ordinance (Land-Fill).**
6. **Should culverts on Route 111 have gates or should they be removed.**
7. **Dredge Horseshoe Lake.**
8. **Plan for Upland detention areas.**
9. **Horseshoe Lake Outlet.**
10. **Culverts too small on Mitchell Ditch.**
11. **Groundwater problem.**
12. **Siltation of Horseshoe Lake.**

## WATERSHED SETTING

The Long Lake drainage area is located in Madison County and takes in much of the upper part of the Metro East Sanitary District. It is comprised of about 19,500 acres of bottomland protected from Mississippi River flooding by a continuous levee system. Groundwater and poor internal drainage cause the majority of current water resource problems in the bottomland area. Water is conveyed to the Mississippi river through a system of leveed canals (Long Lake, Horseshoe Lake, and Cahokia Canal).

The watershed, which is part of the American Bottoms, is characterized by very flat slopes and resulting poor drainage. Elevations in the flood plain range from about 400 to 420 feet above mean sea level, with ridges at approximate elevation 415 and swales at approximate elevation 405 to 410. The elevation of the water surface in Long Lake is approximately 408, while the water surface in Horseshoe Lake is approximately elevation 404.

### Additional Drainage

In addition to the principal systems already defined above, there are numerous small farm ditches, urban ditches, and municipal storm sewers that provide drainage and local runoff, as well as channels for hillside runoff through the bottomland. Outlets for many of these sewers are gravity drains through the spoil bank levees along the major ditches.

## LAND USE

The Long Lake watershed is predominantly agricultural, with large areas of urban development and wetlands Table 1 provides a breakdown of the watershed by major land uses.

**TABLE 1**

Land Uses As Of 1993

| Land Use | Acres | Percent |
|---|---|---|
| Urban Land | 3,960 | 20.3 |
| Agricultural | 10,490 | 53.7 |
| Forest | 60 | 0.1 |
| Water | 2,570 | 13.3 |
| Transportation, Utilities, etc | 610 | 3.1 |
| Wetland | 1,810 | 9.5 |
| Totals | 19,500 | 100.0 |

## CLIMATE

Madison County has the continental climate typical of southern Illinois. The average winter temperature is about 31° F and the average summer temperature is about 77° F. Weather fronts associated with low pressure systems bring frequent changes in temperature, humidity, cloudiness, and wind direction during much of the year. Such changes are considerably less frequent in summer.

Annual precipitation averages about 37 inches. The monthly precipitation averages more than 3.5 inches in May, June, July and August. The monthly average for November through February is between two and three inches. More than half the annual precipitation normally falls during the growing season of April through September. Less than 18 inches of precipitation occurs only about twice in 10 years.

In summer, precipitation occurs mostly as showers or thunderstorms of brief duration. A single thunderstorm often produces more than one inch of rain and occasionally is accompanied by hail and damaging winds. The heaviest one day rainfall during the period of record was 4.68 inches at Alton Dam in July 1952.

The St. Louis urban area affects the climate in this area. This urban effect increases the rainfall, especially during spring and summer thunderstorms in the 25-year to 100-year frequency events. (Huff and Angel, *Frequency Distributions and Hydroclimatic Characteristics of Heavy Rainstorms in Illinois - Illinois State Water Survey Bulletin 70, 1989*)

## SOCIOECONOMIC

The watershed includes parts of three urbanized centers in the county. The communities of Granite City, Pontoon Beach, and Mitchell. Tables 2 through 4 show income, property value, and unemployment data.

**TABLE 2**
Per Capita Income

| | 1989 | 1990 | 1991 |
|---|---|---|---|
| Madison County | $17,101 | $17,805 | $18,143 |
| Illinois | $20,141 | $21,322 | $21,749 |
| United States | $17,696 | $18,635 | $19,091 |

Source: Department of Commerce, Bureau of Economic Analysis.
Survey of Current Business 7/(4) May 1993

**TABLE 3**
Average Property Values

| | |
|---|---|
| *Madison County | $92,921 |
| *State of Illinois | $53,900 |
| Granite City, Pontoon Beach, and Mitchell | $49,405 |

Source: Madison County Realtors Association
*Median property value

**TABLE 4**
Average Annual Unemployment

| | 1990 | 1991 | 1992 | 1993 |
|---|---|---|---|---|
| Madison County | 6.6% | 8.0% | 7.9% | 7.7% |
| Illinois | 6.2% | 7.1% | 7.5% | 7.4% |
| United States | 5.5% | 6.7% | 7.4% | 6.8% |

Source: Local area unemployment statistics, Illinois Department of Employment Security.

# RESOURCE INVENTORIES

## SOIL RESOURCE

The parent material of the soil in the Long Lake Creek watershed is of alluvial origin. The landform divisions of the watershed can be divided into the Aggraded Cut and Fill Region and the Ridge and Swale Region (Yarbrough and Christe) yielding a variety of soils. Both regions consist of alluvial deposits, known as Cahokia Alluvium. These deposits, consisting of silt, clays, and interbedded sand lenses, were transported and deposited in the area during periods of flooding on the Mississippi River and upland tributaries. The Agraded Cut and Fill region is dominated by one soil, Darwin, while the ridge and swale region has more variability in soil type depending on the sand, silt, and clay content of the deposit.

The Darwin soil is extremely high in clay. Water moves into and through the Darwin soil very slowly. Even though the area is very level, runoff rates are rather high because of the high clay content of the soil. Darwin soils also shrink and swell more than most other soils typical to the area. Foundation movement and cracking can be a big problem.

## WATER RESOURCES

Runoff Water - Long Lake Watershed drainage consists almost entirely of manmade channels, storm sewers and pump stations for carrying runoff water, however extensive development in the watershed over the years and a lack of stormwater management in developed areas is seriously impacting these drainage systems. All storm water makes its way to Horseshoe Lake and is drained into the Mississippi River through Cahokia Canal.

Lakes - The watershed contains several sloughs, lakes and wetlands. Horseshoe Lake is on the south end of the study area. Part of Horseshoe Lake is managed as a state park and part of it is used to cool water for Granite City Steel. It is a very important water resource to the watershed as well as the region. Long Lake is a meander lake cutting through the center of the study area. It is used for private recreation, but is very shallow and some areas are wetland habitat. One of the more prominent sloughs in the area is Dobrey Slough. In addition to recreational opportunities the lakes provide habitat for many water dependent plants and animals.

Groundwater - Groundwater concerns focus on high water tables, septic problems, and ground water quality. The watershed has experienced higher ground-water levels in recent years in the alluvial aquifer of the bottomlands causing flooding of basements and related structural damage, sewer breakage, increased infiltration, and consequent increases in wastewater treatment cost.

Water Quality - The impact of poor water quality on existing natural resources in the study area has not been a key focus with past studies. As a result of greater awareness and attention being focused on the quality of water resources, the effects of such quality parameters such as high turbidity and low dissolved oxygen upon the highly-valued fishery resource in the watershed should be evaluated.

Horseshoe Lake has a partial support/moderate impairment rating from the Illinois Environmental Protection Agency in its 1992-1993 Illinois Water Quality Report. The rating says that Horseshoe Lake water quality conditions are impaired to such an extent that it only partially supports all of its intended uses. The causes of the impairment in Horseshoe Lake are high concentrations of metals, slight concentrations of nutrients, high rates of siltation, high organic enrichment, low concentrations of oxygen, high amounts of suspended solids, and high amounts of noxious aquatic plants. The sources of the impairments are high industrial use, high amounts of agricultural pesticide runoff in the watershed, urban runoff, sand dredging, and spills.

## AIR RESOURCE

The quality of air in the watershed is influenced heavily by its proximity to the St. Louis Metropolitan area. A 1992 Illinois Environmental Protection Agency Air Quality report showed air quality in the state to have a higher frequency of "Good", as opposed to "Moderate" or "Unhealthful", for all sectors of the state with the exception of the Metro East area. This area is that part of Illinois east of Mississippi River in Madison and St. Clair Counties; approximately fifteen miles wide. Other sectors of the state tested showed 80% or more of their days in the "good" category. The Metro East area showed only about 70% of its days in the "good" category. (See figure 1)

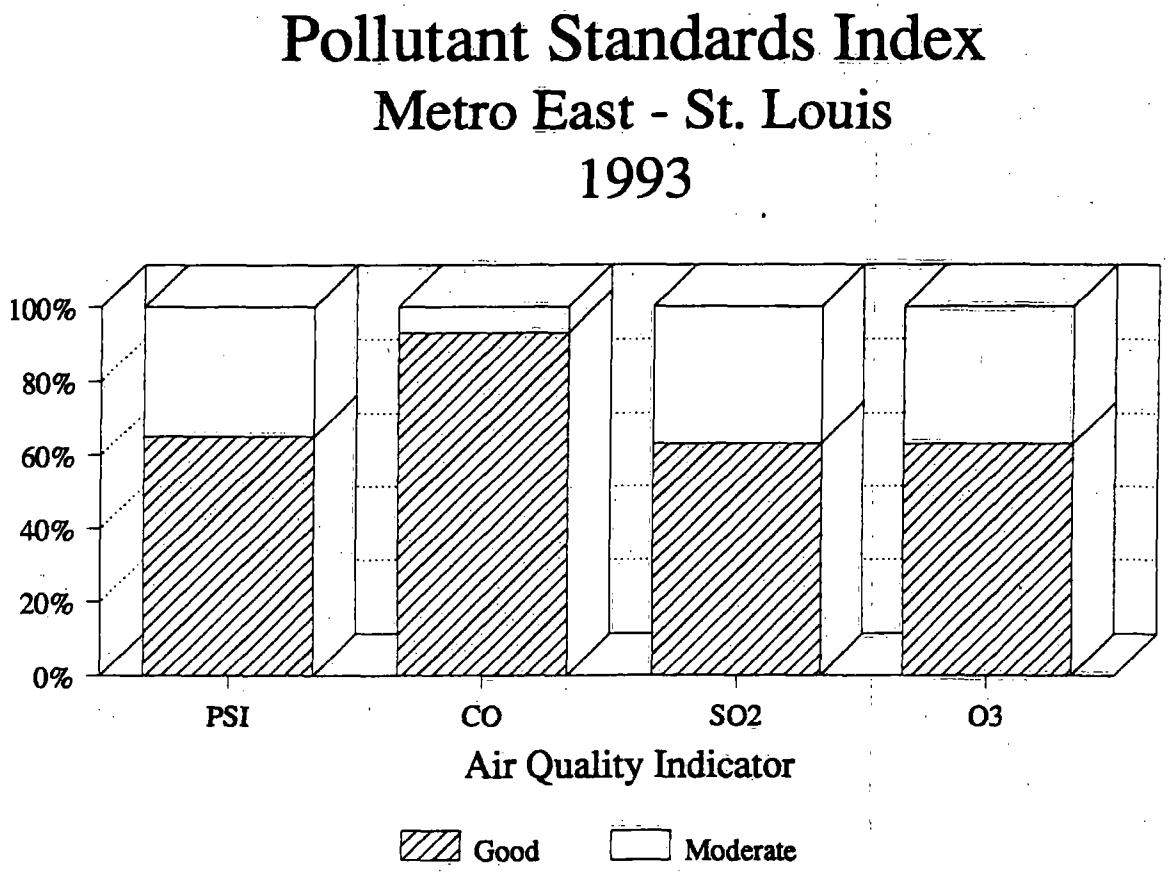



**FIGURE 1**

The report is based on the Pollutant Standards Index (PSI), which is the national standard method for reporting air pollution levels to the general public. The PSI is based on the short-term Federal National Ambient Air Quality Standards (NAAQS), the federal episode criteria, and the federal significant harm levels for five of the "criteria pollutants", namely:

Ozone ($O_3$)
Sulfur dioxide ($SO_2$)
Carbon monoxide (CO)
Particulate matter ($PM_{10}$)
Nitrogen dioxide ($NO_2$)

The PSI descriptor categories and health effects used are shown in Table 5.

**Table 5**
PSI Descriptor Categories and Health Effects

| PSI Range | Descriptor Category |
|---|---|
| 0 - 50 | Good (G) |
| 51 - 100 | Moderate (M) |
| 101 - 199 | Unhealthful (UH) |
| 200 - 299 | Very Unhealthful (VUH) |
| 300 and above | Hazardous (HAZ) |

Source: 1993 Annual Air Quality Report, Illinois Environmental Protection Agency

## PLANT RESOURCE

This watershed historically consisted of tall prairie grasses, and hardwood trees along or near the major streams and drainageways. Small remnants of prairie grasses and hardwood trees still exist but have been relegated to isolated bands or belts along highways, railroad and steep or wet areas along streams. The enhancement or establishment of these major plant groups in riparian zones, as field borders, filter strips on steep eroding land, or as buffer strips between different land uses could enhance the quality and diversity of habitat in the watershed. In addition, they can also solve or retard runoff, add to the beautification of the surroundings, and filter water pollutants.

### Field Crops

Major agricultural crops in the watershed consist of corn, soybeans, wheat, sorghum, and horseradish. Other vegetable crops are also produced in the watershed. Producers have reported annual losses to these crops due to flooding. Table 7 shows ten year production data for major agricultural crops produced in Madison county, the region, and the state. No data is available on horseradish production.

**Table 7**

**Ten Year Averages For Major Crops of Madison County.**

| Commodity | Acreage Planted | Acreage Harvested for Grain | Yield Bu/A | | |
|---|---|---|---|---|---|
| | | | County | Region | State |
| Corn | 74,610 | 72,470 | 116 | 133 | 123 |
| Soybean | 120,140 | 118,250 | 33.4 | 39.0 | 38.2 |
| Wheat | 53,350 | 47,940 | 49 | 51 | 49 |
| Sorghum | 3,545 | 3,255 | 87 | 87 | 80 |

**Source:** *1993 Illinois Agricultural Statistics, Illinois Agricultural Statistics Service.*

### Forest

The forest resources of the area have been largely removed by clearing land for farming or urban uses. Some areas of bottomland hardwoods remain in wetlands, but they are generally made up of less commercially desirable species such as willow, cottonwood and maple. Existing forest resources are only in danger in those areas where wetlands are developed.

## ANIMAL RESOURCE

### Vertebrates

Between 1800 and the present there has been a considerable reduction in the diversity of vertebrate species in the study area primarily because of extensive modification of native habitat by humans. Many species which are present are now much less abundant. As a group, aquatic birds have been most severely effected. A few introduced species and native species which thrive in modified habitats have become more abundant.

### Wildlife Habitat

Before settlement the Long Lake Study Area had a rather large diversity of habitat types. The major habitat features in the bottoms were large lakes, swamps on the borders of the lakes, forest, wet prairie, and forest edge. Today this area is greatly changed by human activities. The large lakes have been partially drained and filled, both by active filling and by receiving sediment from upstream.

The wet prairie has been plowed under or plowed over. There is a substantial amount of suburban lawns and a significant stretch of agricultural land, both of which harbor some terrestrial vertebrates.

### Fisheries

According to an Illinois Department of Conservation Fisheries Biologist, little information exists on Long Lake. According to a 1994 survey, the following species were present in Horseshoe Lake: bigmouth buffalo, black bullhead, black crappie, bluegill, carp, channel catfish, freshwater drum, golden shiner, gizzard shad, largemouth bass, orangespotted sunfish, white bass, yellow bass, bowfin, redear sunfish, white crappie, green sunfish, and yellow bullhead. Presence of large numbers of river species indicate that the fish are sometimes able to swim upstream into Horseshoe Lake.

The bluegill population was rated fair with mostly smaller fish in 1994. The largemouth bass population was rated fair to poor with mostly larger fish caught. Carp were very abundant with all sizes caught. An abundance of 11 to 14 inch bigmouth buffalo appear to have been brought in by the 1993 flood.

## THREATENED AND ENDANGERED SPECIES

The watershed can be divided into terrestrial, fresh water, and wetland areas. Threatened and endangered species information is included for all of these habitats. The federal government, as well as individual states, has identified endangered and threatened species. Endangered species or sub-species are those in danger of extinction throughout all or a significant portion of its range. Threatened species or sub-species are those likely to become endangered within the foreseeable future throughout all or a significant portion of its range. The major cause of species decline today is loss of habitat. Species that are listed for the study area are shown in **Table 8** along with flora and fauna sensitive to development. Since this information changes frequently, an updated list should be obtained annually from the appropriate federal or state agency.

## TABLE 8

### Madison County Threatened and Endangered Species

| Common Name | Scientific Name | Status |
|---|---|---|
| PLANTS | | |
| Large ground plum | *Astragalus crassicarpus* | SE |
| Decurrent false aster | *Boltonia decurrens* | ST, FT |
| Sweet indian plantain | *Cacalia suaveolens* | SWL |
| Hill's thistle | *Cirsium hillii* | ST |
| Whitlow grass | *Draba cuneifolia* | SE |
| Hoary mock orange | *Philadelphus pubescens* | SWL |
| Prairie white-fringed orchid | *Platanthera leucophaea* | SE, FT |
| Sour dock | *Rumex hastatulus* | SE |
| Royal catchfly | *Silene regia* | SE |
| Spring ladies' tresses | *Spiranthes vernalis* | SE |
| Prairie spiderwort | *Tradescantia bracteata* | SE |
| INVERTEBRATES | | |
| Butterfly mussel | *Ellipsaria lineolata* | ST |
| Elephant-ear mussel | *Elliptio crassidens* | ST |
| Ebonyshell mussel | *Fusconaia ebena* | ST |
| Scaleshell mussel | *Leptodea leptodon* | SWL |
| Fat pocketbook mussel | *Potamilus capax* | SE, FE |
| Salamander mussel | *Simpsonaias ambigua* | SE |
| FISHES | | |
| Lake sturgeon | *Acipenser fulvescens* | SE |
| Alligator gar | *Aractosteus spatula* | SWL |
| Gravel chub | *Erimystax x-punctatus* | SWL |
| Silvery minnow | *Hybognathus nuchalis* | SWL |
| Sturgeon chub | *Macrhybopsis gelida* | SE |
| Bigeye shiner | *Notropis boops* | SE |
| Flathead chub | *Platygobio gracilis* | SWL |
| Pallid sturgeon | *Scaphirhynchus albus* | SE, FE |
| AMPHIBIANS AND REPTILES | | |
| Illinois chorus frog | *Pseudacris streckeri* | ST, C2 |
| Timber rattlesnake | *Crotalus horridus* | ST |
| Great Plains rat snake | *Elaphe guttata emoryi* | ST |
| Eastern massasauga | *Sistrurus catenatus* | SE, C2 |
| BIRDS | | |
| Upland sandpiper | *Bartramia longicauda* | SE |
| Red-shouldered hawk | *Buteo lineatus* | SE |
| Great egret | *Casmerodius albus* | ST |
| Little blue heron | *Egretta caerulea* | SE |
| Snowy egret | *Egretta thula* | SE |
| Peregrine falcon | *Falco peregrinus* | SE, FE |
| Common moorhen | *Gallinula chloropus* | ST |
| Black-crowned night heron | *Nycticorax nycticorax* | SE |
| Pied-billed grebe | *Podilymbus podiceps* | ST |
| King rail | *Rallus elegans* | ST |
| Least tern | *Sterna antillarum* | SE, FE |
| Bewick's wren | *Thryomanes bewickii* | SE |
| Yellow-headed blackbird | *Xanthocephalus xanthocephalus* | SE |
| MAMMALS | | |
| Gray bat | *Myotis grisescens* | SE, FE, KS |
| Indiana bat | *Myotis sodalis* | SE, FE, KS |

STATUS LEGEND AND DEFINITIONS:

SE - State endangered; any species which is in danger of extinction as a breeding species in Illinois.
ST - State threatened; any breeding species which is likely to become a state endangered species within the foreseeable future in Illinois.
SWL - State watch list; species for which there are questions about status which can not be answered currently available data.
FE - Federally endangered; any species which is in danger of extinction throught all or a significant portion of its range.
FT - Federally threatened; any species which is likely to become an endangered species within the foreseeble future throughout all or a significant portion of its range.
C2 - Candidate for federal listing.
KS - Karst sensitive.

Note: This list is current only as of the date of it's preparation. It should not be used as an all inclusive list of sensitive species within the county, but only as an informational guide. Additional species may be added at any time without updating this list. Local units of government are required by law to engage in the the Illinois Department of Natural Resources Division of Natural Heritage endangered species consultation proces prior to changes in land use.

This list was prepared on July 19, 1995 by Illinois Dept. of Natural Resources District 10 Natural Heritage Biologist Scott R. Ballard.

### Natural Areas

Natural areas provide critical habitat for native Illinois plants, animals and natural communities. The Illinois Natural Heritage Division of the Department of Conservation inventories sites in the state that possess the biological diversity of Illinois' pre-settlement conditions. These ecosystems are important as living repositories for use in science, medicine, industry and agriculture, as well as for our children to develop their own sense of nature and reverence for the land. We will consult with the Illinois Department of Conservation Natural Heritage Division in regard to alternative solutions that might impact any natural area site in the study area. Local units of government, by law, are required to engage in the Illinois Department of Conservation Division of Natural Heritage endangered species consultation process when proposing development or otherwise altering land use.

## CULTURAL RESOURCES

### Archaeological

This region of the state contains some of the most important areas of prehistoric Indian occupation in Illinois. Humans have occupied the area for thousands of years, and many remnants of these past cultures have survived. The archaeological record in this watershed is incomplete. Many of the cultural resources have been destroyed by construction for urban uses or through agricultural activities; but many remain undiscovered and should be protected. The most important archaeological site located near the watershed is Cahokia Mounds, a World Heritage site.

### Historical Sites

Historical sites are important symbols of an area's cultural heritage. They also provide an important aesthetic value as well. These carefully built, and uniquely crafted structures stand out from the more mass-produced structures of today. Historic sites within this study area are predominantly located near towns being built during a period of more than 70 years ago. They include present and former residences, institutional buildings and a number of churches and seminary sites.

Historic sites as well as archaeological sites possess economic value as generators of tourist dollars. They are an important component of an area's total environmental quality. These are portions of the environment that attract new businesses to an area, pleasing the employers and employees alike. These areas are important contributors to the future growth of the watershed and should be preserved.

## PERMITS

This section is to document possible permits needed and other items which affect the feasibility of any project. Almost any project completed in this plan will require a permit under section 404 of the Clean Water Act. All projects will be designed to minimize impacts to wetlands. Many activities are covered under nationwide permits and may be done under existing authorities. Many activities that are covered under nationwide permits may still need mitigation. An individual permit will be required for most of the activities proposed in the American Bottoms.

Municipal and County floodplain ordinances must be obeyed. A permit may be required from Illinois Department of Transportation, Division of Water Resources. Dam safety permits will be needed for any structure greater than six feet high and storing over 50 acre-feet of water and may be required for some smaller dams also.

All plans must be in compliance with regulations on Historic Properties. Because of the intense historical occupation of the area, efforts must be made to avoid as much historic property as possible. Some sites where disturbance is unavoidable may need to be mitigated.

Every effort must be made to minimize impacts to prime farm land. This is an especially important issue in this area because the best farm land is used to produce horseradish, a high value crop which is unique to the area.

Assessments will need to be made to determine if endangered species are affected. This can be accomplished through the IDOC Division of Natural Heritage endangered species consultation process. Opportunities exist to enhance the endangered species habitat as part of the solution to the flooding problems. Some federally listed species that could be encountered would include the Decurrent False Aster, Prairie white-fringed orchid, Bald Eagle, Peregrine falcon, Least tern, Gray bat, Indiana bat, Pallid sturgeon, and Fat pocketbook mussel.

## GEOLOGICAL CONSIDERATIONS

A geological investigation is required to determine the structural stability and to detect conditions which would adversely affect the safety of dams. Such investigations should be conducted on the soil, bedrock and geological irregularities.

The soil investigation determines several important factors to the construction and stability of the dam. Factors included in this investigation are soil type, shear strength, sliding potential of the dam, overturning potential of the dam and seismic stability of the soil. Each of these are critical in the engineering design of the dam.

The bedrock investigation determines factors such as bedrock type and strength. Special investigations may be necessary when rock types such as limestone, gypsum, salt, basalt, claystone and shales are encountered to determine the extent of cavities, piping or other deficiencies in the rock foundation. Again each of these factors are critical in the engineering design of the dam.

Geological irregularities usually occur within the bedrock. Examples of such irregularities are joints, faults, voids and caverns. Such geological irregularities may also occur within the soil and may even be manmade, of which an example would be underground mining. Each of these factors are very important in the engineering design of the dam. These factors may also indicate that a dam should not be constructed at certain locations due to severe safety reasons.

## DAM CLASSIFICATION

Dams are categorized in one of three classes, according to the degree of threat to life and property in the event of dam failure. The three Illinois Department of Transportation, Division of Water Resources classes of dams are:

Class I: Dams located where failure has a high probability of loss of life or substantial economic loss in excess of that which would naturally occur downstream of the dam if the dam had not failed. This is similar to the U.S.D.A. Natural Resources Conservation Service Class "C" category and the U.S. Army Corps of Engineers "High Hazard Potential" category.

Class II: Dams located where failure has a moderate probability for causing loss of life or may cause substantial economic loss in excess of that which would naturally occur downstream of the dam if the dam had not failed. This is similar to the U.S.D.A. Natural Resources Conservation Service Class "B" category and the U.S. Army Corps of Engineers "Significant Hazard Potential" category.

Class III: Dams located where failure has low probability for causing loss of life, where there are no permanent structures for human habitation or minimal economic loss in excess of that which would naturally occur downstream of the dam if the dam had not failed. This corresponds to the U.S.D.A. Natural Resources Conservation Service Class "A" category and the U.S. Army Corps of Engineers "Low Hazard Potential" category.

A majority of the dams proposed to be constructed for storm water management would be classified as Class I dams. This category requires the most stringent design and construction details due to obvious reasons. Also, an ongoing dam inspection program is required to ensure the dams' integrity is maintained. The Division of Water Resources regulates the construction and maintenance of this classification of dam to ensure the public's safety is preserved.

## SECTION II

## PROBLEMS AND OPPORTUNITIES

### INTRODUCTION

This section describes some of the existing watershed conditions and problems. It provides some observations and recommendations for the study area based on the evaluation of data provided in previous studies. Data collected during preliminary inventories is summarized here as well. The information is synthesized into summary findings and recommended actions. The purpose for this study is to identify possible mechanisms for achieving watershed goals and objectives. The following goals and objectives have been identified by the planning committee and project sponsor for this study:

* ***Increase flow into and through natural storage areas.***
* ***Protect local communities, and property owners from flooding.***
* ***Provide a plan within which units of government can implement projects and guide new development.***
* ***Protect and enhance water quality.***
* ***Enhance recreational opportunity.***
* ***Inform citizens on proper stream, wetland, lake, and construction site protection.***

A variety of resource concerns and needs were identified by the Long Lake Resource Planning Committee. All of the concerns fit under a broad category of water management. The Metro-East Watershed Planning Team identified concerns that may arise as a result of attempting to solve water management problems. The two areas of concern are inventoried and categorized as follows:

*1. Water Management:*

a. Flooding problems interfere with traffic, safety, and aesthetics.

b. Lack of maintenance over the years on existing stormwater facilities (ditches, retention ponds, etc.), because of poor or no access and lack of funds.

c. Better cooperation from all residents of the watershed to help clean up and maintain existing stormwater facilities.

d. Need for upland controls to prevent sedimentation in bottomland drainage facilities.

e. Sediment in Horseshoe Lake interferes with the flow of water from the watershed.

f. People in the area and outside the area are dumping in existing wetlands.

g. Dredging would increase the silt storage capacity of Horseshoe Lake.

h. Urbanization inside and outside the watershed is increasing runoff and reducing storm water storage in the watershed.

i. Wildlife may interfere with manmade attempts to alter natural flow patterns within the American Bottoms.

*2. Environmental:*

a. Any change in existing conditions of the area may impact regulated wetlands.

b. Impacts on Prime and Unique Farm Land must be minimized by project work.

c. Changes from existing conditions may affect threatened and endangered species.

d. Areas should be provided to preserve and enhance existing forested areas, remaining pockets of native vegetation, natural areas, wetlands, and cultural sites.

e. Changes from existing conditions may have a negative impact on regulated floodplains.

f. Stream corridors could provide unique recreational opportunities in the county (trails, water activities, birding, etc.).

## Opportunities and Needs

*1. Information Education:*

***All concerns listed are affected by this area also, but the following are especially impacted:***

a. Residents need to be educated about the necessity of cooperation in the watershed to help clean up and keep clean existing stormwater facilities.

b. Residents, developers, farmers and other land users need to be informed of the effects they are having on bottomland residents and on the county in general with regard to water resource problems in the bottoms. Water resource problems affect the economic well being of the entire Metro-East Area.

c. Residents need to be educated about the effects of dumping in streams, ditches and wetlands upon their quality of life.

d. A regional effort is needed to address sediment and erosion control, and stormwater runoff. The lack of uniformity and variations in enforcement of existing regulations needs to change. Providing information and education to local officials and the public is a first step in solving storm water problems.

*2. Legislation/Funding*

a. Legislation is needed to enable county government to pass storm water ordinances and implement regional storm water management plans.

b. Local funding is needed to address storm water runoff concerns from developed areas.

c. Although the area has been studied, there has been little action, or attention, until now. There has been unnecessary economic loss and damage to property due to lack of funding and no authorization from the state to manage storm water.

d. Currently no equitable means exist to get those who create many of the problems (by conducting unmanaged development in the upland) to help cover the high cost of their downstream impact. The cost of correcting the problem should be shared equally from the bottom to the top of the watershed.

e. A regional effort is needed to address sediment and erosion control, stormwater runoff, the lack of uniformity to enforce existing regulations, and the need for providing information and education to local officials and the public.

f. Better funding is needed to address water resource problems throughout the watershed.

## Some Existing Conditions and Observations

**A. Detailed hydrologic and hydraulic studies are needed to develop improved floodplain mapping and to analyze the impact of possible structural recommendations.**

With the problem of continual flooding as the watershed urbanizes, improved floodplain mapping is one tool needed to prevent future flood damages. Due to changes in land use over the years, future growth considerations, and new definitions and regulations for floodways, existing floodplain maps may be inadequate. Although FEMA floodplain maps are the most accepted tool, in many cases incorporated and unincorporated area maps do not always match each other. Furthermore, these maps were done prior to much of the existing development in the watershed. Changes due to added fill materials or the loss of regional storage areas have not been mapped, making floodplain management and protection difficult. Improving available storage for stormwater runoff in the watershed will require detailed analysis of its hydrology and hydraulics.

**B. A regional plan is needed to provide stormwater facilities to better control runoff quantity and quality from existing developed areas.**

Many of the older developed areas in the watershed were constructed without adequate stormwater management practices in place. Regionalized detention is needed throughout the watershed to help reduce peak runoff and peak stream flows. In many areas, local drainage problems cause basements and yards to be flooded, septic system disruption, and reduced efficiency of sanitary sewer systems. Without well planned conveyance for large runoff events the problem will continue. The problem is further aggravated by inadequate maintenance. Improvements in this area can be planned and coordinated with other infrastructure improvements such as street improvements, utility improvements or new developments. The application of Best Management Practices (BMPs) is needed to enhance pollutant removal from stormwater runoff to improve lake, stream, and wetland quality.

**C. Improved maintenance of stream channel and stormwater outlet systems are needed to provide improvements in water quality in the watershed.**

Existing maintenance of stream channels, ditch channels, and stormwater outlet systems is sporadic with no maintenance occurring for years in some areas. Improved maintenance throughout the watershed will reduce erosion while improving habitat and improving flood conveyance and storage. The maintenance of existing detention basins, storm sewers, and catch basins is critical to their effective performance and the avoidance of short and long-term degradation to water quality. Improvement in maintenance programs will require adequate funding and watershed coordination.

Land use changes to residential, office and light industrial uses is projected for these communities. Comprehensive standards for stormwater runoff, wetland protection, and other BMPs are needed to protect the watershed. Enforcement of existing ordinances on filling, subdivisions, and urban erosion is a starting point for improving water management. Filling in wetlands or waters of the United States can be greatly reduced if the local people cooperate with the Corps of Engineers Regulatory Branch to enforce Section 404 of the Clean Water Act.

The cumulative impact of small developments and infill on water resources can be significant. Changes are needed in the management of private property and residences to reduce runoff and improve water quality. Such changes may include things like diverting downspouts from driveways and storm sewers to lawns, rerouting sump pumps; properly using lawn care products; safely disposing of household chemicals such as paint thinner and used motor oil; and establishing vegetative buffers along streambanks and lake shores. Changes such as these in addition to the establishment of strategically located regional storage/treatment facilities are needed through the watershed.

**D. A sustained public education and incentive program is needed to generate support for the implementation of recommendations to improve the management of water resources and other resources in the watershed.**

Public information and education has always been an essential part of natural resource management and planning. This is becoming even more important in Madison County, because of the dramatic shifts in land uses. As land uses in the Long Lake watershed continue to change, the need to educate the communities within this watershed about the impacts of these changes on the natural resources becomes more critical.

Knowledge is lacking among many people in the watershed about the impact certain activities have on existing water resources. In the process of preparing a site for the development of a subdivision or the construction of a home, the existing drainage systems are often disturbed. Subsurface drainage and surface drainage systems that were critical to the areas are often overlooked during development.

A well designed public information and education program is needed to increase the awareness of the public about local stormwater runoff issues, water quality, and other concerns in the watershed. The Long Lake Watershed receives runoff from nine different municipalities. The coordination of stormwater planning among all of these municipalities is critical to achieve effective stormwater management in the watershed. By informing and educating the local communities, public officials, developers and others about stormwater runoff and other natural resource issues in the Long Lake Watershed, a more collective effort to resolving the needs for all stakeholders within its boundary should start to emerge. Effective public education is critical to the initiation of change on the part of those stakeholders.

# INVENTORIES

## Sediment and Erosion

### *Sheet and Rill Erosion*

Studies indicate that the transportation and deposition of large amounts of sediment from the uplands into the channels in the bottoms is a major problem in the Long Lake study area. Large accumulations of sediment have severely limited the water carrying capacity of the channels. This reduction in the channels' ability to carry their design flow results in more and more frequent overflow of banks and the flooding of adjacent property.

Sediment delivery rates shown in Table 13 are based on the evaluation of past sediment studies conducted by the United States Army Corps of Engineers, The Southwestern Illinois Metropolitan and Regional Planning Commission, and the Natural Resources Conservation Service.

**Table 13**

**Total Annual Sediment Delivered To Horseshoe Lake**

| Watershed | Gross Erosion | Delivery Rate | Delivered |
|---|---|---|---|
| Canteen Creek | 160,210 Tons | .65 | 105,339 Tons |
| Cahokia Canal | 141,731 Tons | .64 | 91,586 Tons |
| Totals | 301,941 Tons | .65 | 196,925 Tons |

***Calculations are based on total sediment delivered to Route 157 under current conditions.***

***Note: All the gross erosion and sediment figures will need to be re-evaluated when the time comes for engineering design of proposed structures. We will need to obtain more accurate sediment values to figure storage.***

# RECREATION

The demand for outdoor recreation is increasing with population pressure, leisure time, income level and urbanization. The opportunity to develop outdoor amenities as part of the Long Lake Watershed planning process should be utilized. The facilitation and planning of outdoor recreational activities in the development of water management plans will improve the quality of life for both the local communities and the Metro-East region. Private use is enjoyed by property owners along Long Lake. Horseshoe Lake provides private and public recreational opportunities in the watershed and the region. The lake is utilized by adjacent homeowners, group campers and the general public. In 1994, the Horseshoe Lake Recreation Area welcomed 63,622 site visits. Boating, hunting, fishing, camping, picnicking, and wildlife appreciation are the main activities offered at Horseshoe Lake. Nearby Cahokia Mounds is also a recreational and educational asset to the region. In 1994, the total annual visits were 412,519. The Interpretive Center's total annual visits were 295,890. The center sponsors public tours, self-guided tape tours, and a lecture series during the winter.

## FLOODING

Flood hazard zones and elevations are documented on FEMA "Flood Insurance Rate Maps." These maps are used by the county to determine flood hazard areas for the purpose of enforcing floodplain ordinances. Redirecting the flow of flood waters or storing flood waters in designated storage areas might reduce the extent of flood damages or reduce peak discharges.

## WETLANDS

Wetlands in the area are identified on National Wetland Inventory (NWI) Maps developed by US Fish and Wildlife Service. On many of the NWI maps, farmed wetlands are not identified. USDA-Natural Resources Conservation Service maintains an inventory of wetlands on cropland in the local field office. Wetlands are a very abundant resource in the watershed. Long Lake, Elm Slough and Horseshoe Lake are major regional wetland resources. Smaller areas such as Dobrey Slough are also very important locally for the storage of storm water. Even though large amounts of wetlands exist, wetland restorations may be a logical choice to increase flood storage.

## GROUND WATER

Several studies of ground water conditions in the area have been completed in detail. A listing of known studies is as follows:

Reconnaissance Report, American Bottoms Groundwater Study, US Army Corps of Engineers, August 1979.

Ground Water Sampling, Testing, Analysis, and Reporting for the American Bottoms Area of Southwestern Illinois, Illinois Water Survey, 1992

Limnological Characteristics of Horseshoe Lake and the Impact of Groundwater Discharges to the Lake, Illinois State Water Survey, 1992.

Removal of Iron and Manganese from Ground Water, Illinois State Water Survey, 1992.

American Bottoms Ground Water Project, Summary of Water Quality and Effluent Issues, Goodwin and Broms, Inc., 1992

American Bottoms, Illinois Feasibility Report, US Army Corps of Engineers, 1992.

Groundwater Levels and Pumpage in the East St. Louis Area, Illinois 1967-1971, Illinois State Water Survey, 1972

Plan for Major Drainage, The American Bottoms and Hillside Drainage Area Planning Basin, Southwestern Illinois Metropolitan and Regional Planning Commission, August 1975.

Although the Corps of Engineers found in 1992 that a pumping system is not feasible at this time, individual wells may still be effective in some areas.

## SECTION III
## ALTERNATIVES

### FORMULATION OF ALTERNATIVES

Early in the planning process, the planning committee identified twelve resource concerns. Concerns related to storm water management and the high ground water table are considered the most critical in the watershed. Several alternatives were discussed by the planning committee and its technical advisors. The following narrative describes each alternative, its components, cost, and effectiveness in dealing with the concerns of the residents of the Long Lake watershed.

**Alternative 1 -- Current conditions or no action.** This alternative proposes no action, meaning no change in the way that development occurs, the method of controlling storm water runoff or dealing with high ground water. Urban and agricultural property damages will continue to occur at the same rate or will increase, depending on the rate of development in the area. Local drainage districts will continue to maintain facilities as they have in the past. The cost to the community will be similar to what it has been in the past, very little ongoing expense, but expensive repairs to areas damaged by uncontrolled or excessive runoff or high ground water.

**Alternative 2 -- Implementation of ordinances and regulations.** This alternative would necessitate the review, modification, development, implementation, and enforcement of county and municipal ordinances. New or revised regulations should include land development, flood plain management, storm water detention, soil erosion and sediment control, streambank and wetland protection, and other standards needed to maintain or improve the quality of existing natural resources in the watershed.

These ordinances would require developers to include storm water management and detention facilities, soil erosion and sediment control as part of the development plan. They would limit development in flood prone areas. Measures would be included to maintain and enhance streambanks and wetlands.

Upgraded regulations should clarify the responsibilities of the individuals and agencies involved in the land development process. A common problem is that the developers and local officials are sometimes uncertain which state and federal agencies have jurisdiction or can provide assistance during the planning and approval process. Including this information would expedite the process and result in better project coordination, planning and development.

New and revised ordinances need to be well written and enforceable. If they are too restrictive or too broad, they cause confusion. Once enacted, they need to be enforced.

The cost of implementing this alternative would be small. Enforcement might require additional time on the part of the inspection organizations. These costs would be balanced out by the reduction of storm water, ground water, wetland, and development related problems and local government expense necessary to correct them.

Developers and landowners would be responsible for meeting the standards established in the ordinances. The cost of meeting these standards would be small compared to the overall cost of land development.

Madison, St. Clair, and Monroe Counties, along with some local communities, are active in the effort to upgrade storm water management ordinances in the Metro East area.

**Alternative 3 -- Detention (REVISED).** The six potential detention areas previously discussed by the Planning Committee were vetoed as an alternative. The consensus was that future regional detention punishes the future developers for the previous developers' errors. The future developers would lose large areas of land to detention sites.

**A. On Site Detention.** The committee favored requiring on site detention as the area develops. An example cited was the I-270/Rte 111 interchange which includes detention for the existing commercial development and proposed detention for future development. The cost of on site detention would be included in the development cost of each site.

**B. Retain Existing Detention.** Retaining Horseshoe Lake, Elm Slough, and Long Lake as detention areas is also favored by the committee. Each of the existing detention areas need some remedial work which is addressed in other alternatives. Additional floodways would facilitate drainage into Horseshoe Lake from areas where drainage has been disrupted by development (Alternative 6). Sediment could be removed from the south end of Horseshoe Lake (Alternative 12). Elm Slough would benefit from the removal of some beaver dams (Alternative 7). Preventing backflow from Mitchell Ditch into Long Lake would reduce localized flooding (Alternative 6D).

**C. Natural Detention Areas.** The Long Lake watershed includes several large natural detention areas. These are the low lying areas, generally adjacent to waterways, in which runoff temporarily ponds as a result of precipitation. Most of these areas could be used for detention as the surrounding area becomes urbanized. The benefits of utilizing these areas include reduced costs due to less grading, fewer flood protection requirements for structures built outside of FEMA Flood Hazard Areas, and lower construction costs for structural flood protection.

In addition to detention these areas can provide a natural backdrop for development, provide recreational and educational opportunities, and they could part of a regional system of greenways.

**Alternative 3 -- Detention (PREVIOUS).** Because the bottomlands are very flat and have limited ability to allow storm water to drain away, they are likely to experience ponding or flooding during periods of heavy or extended precipitation. As the bottomlands have urbanized, adding more impervious surface, the flooding problems have also increased.

Sites proposed for detention could remain in their current use until the area does begin to develop, at that time sufficient detention should be created to serve changing land use. Prior to development, detention areas should be delineated. A Master Plan for community development and zoning indicating regional detention along with development potential can preserve detention sites.

Six areas, indicated on Plate 3, could provide runoff detention. Use of these areas could provide control for the direction of runoff, reduce flooding, improve surface water quality, and expand and enhance existing wetlands. These areas are mostly undeveloped and include wetlands and FEMA Flood Hazard Areas.

The detention rates are estimates based on the runoff from a fully developed drainage area resulting from a 100 year storm. A 100 year storm is defined as a storm that has about a one percent chance of occurring each year.

**A. I-270 and Route 111.** The 850 acre area northwest of the intersection of Interstate 270 and Illinois Route 111 drains into the Mitchell Ditch. This area contains almost all of the development in the Mitchell Ditch drainage area with the remainder in agriculture. A few small wetlands are scattered along the east side of the drainage area. There is development within the FEMA flood hazard area that bisects the drainage area.

The development in this area has severely limited the available detention sites. The potential detention site would contain less than 10 percent of the runoff generated by a 100 year storm. This may be best considered to be a settling basin for runoff before it passes under I-270 and Route 111 and into the Mitchell Ditch.

**Planning Cost Estimate**

| | |
|---|---|
| Land Acquisition | $ 280,000 |
| Construction | 874,000 |
| Wetland Mitigation | 0 |
| Engineering | 175,000 |
| **Subtotal** | **$ 1,329,000** |
| Contingencies | 266,000 |
| **Total** | **$ 1,595,000** |

**B. Mitchell Ditch.** The Mitchell Ditch drainage area consists mostly of agricultural land. The wetlands in this area are mostly limited to the riverine wetlands within the ditch. The FEMA flood hazard area is a strip averaging 1,700 feet wide which straddles the ditch. This undeveloped area presents a good opportunity to maintain the flood hazard area for detention when the surrounding area develops.

The potential detention site is approximately the same area defined as a flood hazard area on the FEMA Flood Insurance Rate Maps. The detention site could contain 70 percent of the runoff from the 1640 acre drainage area or 45 percent of the runoff from the combined Mitchell Ditch, I-270 and Route 111 areas. Utilizing this site for detention would serve two purposes. First, it makes use of an existing natural detention area. Second, using it for detention would prevent development in an existing flood hazard and wetland area, preventing some of the problems related to flood plain development and wetland preservation.

**Planning Cost Estimate**

| | |
|---|---|
| Land Acquisition | $ 1,100,000 |
| Construction | 11,000 |
| Wetland Mitigation | 85,000 |
| Engineering | 19,000 |
| **Subtotal** | **$ 1,215,000** |
| Contingencies | 243,000 |
| **Total** | **$1,458,000** |

**C. Long Lake.** The 1,590 acre area that drains directly into Long Lake is approximately half residential and half undeveloped. Some wetlands exist in this area. There are flood hazard areas throughout the drainage area, including the development adjacent to the lake.

This area already experiences drainage problems. The flood hazard areas are developed. The lake elevation tends to jump after a rain, backing through the storm drain system and into the surrounding residential area. There is limited space available for additional detention due to the development.

The proposed detention would not solve the existing drainage problems, but would provide some relief. The potential detention sites could provide runoff storage for about 20 percent of the runoff from this drainage area.

**Planning Cost Estimate**

| | |
|---|---|
| Land Acquisition | $ 1,555,000 |
| Construction | 19,000 |
| Wetland Mitigation | 85,000 |
| Engineering | 21,000 |
| **Subtotal** | **$ 1,680,000** |
| Contingencies | 336,000 |
| **Total** | **$ 2,016,000** |

**D. Elm Slough.** Elm Slough is the last detention site available for the runoff from Mitchell Ditch and Long Lake before it reaches Horseshoe Lake. Approximately 2,890 acres drain directly into Elm Slough, with 4,970 acres of additional drainage area from the Mitchell Ditch and Long Lake areas. The Elm Slough drainage area includes extensive amounts of wetlands and flood hazard areas. Most of this area is agricultural and a natural site for stormwater detention.

The potential detention site is within the Flood Hazard Area. Approximately 40 percent of the runoff from Elm Slough, Mitchell Ditch, and the I-270 & Route 111 drainage areas could be detained in the Elm Slough detention site. As much as 80 percent of the runoff from a 100 year storm in the Elm Slough area could be detained. (The Elm Slough and Mitchell Ditch areas combined could detain almost 65 percent of the Elm Slough, Mitchell Ditch, and I-270 & Route 111 runoff.)

**Planning Cost Estimate**

| | |
|---|---|
| Land Acquisition | $ 5,850,000 |
| Construction | 464,000 |
| Wetland Mitigation | 425,000 |
| Engineering | 178,000 |
| **Subtotal** | **$ 6,917,000** |
| Contingencies | 1,383,000 |
| **Total** | **$ 8,300,000** |

**E. Speedway.** The Speedway drainage area is a subdrainage area of Long Lake. About one third of the 890 acre area is developed. Large sections of the drainage area are within FEMA flood hazard area boundaries. The wetlands within this drainage area include some surface waters.

The potential detention site could detain up to 70 percent of the runoff from this area.

**Planning Cost Estimate**

| | |
|---|---|
| Land Acquisition | $ 588,000 |
| Construction | 3,611,000 |
| Wetland Mitigation | 85,000 |
| Engineering | 739,000 |
| **Subtotal** | **$ 5,023,000** |
| Contingencies | 1,005,000 |
| **Total** | **$ 6,028,000** |

**F. Dobrey Slough.** The 680 acre Dobrey Slough drainage area is mostly developed with the remaining open space to the north of the existing ditch. The remaining wetlands in this area are within or adjacent to the slough. Large Flood Hazard Areas exist within and upstream (west) of the slough area. The development within this area has eliminated the natural drainage outlet. A pump was installed to move water into the Nameoki Ditch but it is too small to be very effective.

The potential detention site could detain almost 70 percent of the runoff from the Dobrey Slough area or 30 percent of the runoff from both the Dobrey Slough and Speedway areas. The two detention sites could detain about 70 percent of the runoff from the two drainage areas.

**Planning Cost Estimate**

| | |
|---|---|
| Land Acquisition | $ 880,000 |
| Construction | 5,962,000 |
| Wetland Mitigation | 0 |
| Engineering | 1,192,000 |
| **Subtotal** | **$ 8,034,000** |
| Contingencies | 1,607,000 |
| **Total** | **$ 9,641,000** |

**Alternative 4 -- Clean the existing ditches.** The Long Lake watershed includes the Nameoki and Mitchell Ditches. The Nameoki Ditch was constructed and maintained to provide storm water drainage for parts of Granite City. Mitchell Ditch was built to provide internal drainage for agricultural areas in the watershed.

**A. Tree and Shrub Removal.** Since Mitchell Ditch was built, some development has occurred at the north end of the drainage area resulting in additional runoff. Some trees and shrubs have grown on the banks of Mitchell Ditch. This vegetation does not significantly affect the channel flow at present, but a regular maintenance program to remove small trees and shrubs will be required to prevent a loss of ditch capacity.

**B. Maintenance.** A regular maintenance plan might consist of mowing the 4.2 mile ditch and drainage easement twice a year. Mowing will cut down saplings and young shrubs as well as grass. Since erosion and sedimentation are minor in this area, no estimate for sediment removal is included.

**Planning Cost Estimate**

| | |
|---|---|
| Mowing, Total | $ 1,000 |

(Note: An estimate to remove a 30 year growth of trees and shrubs, and sediment from a three mile stretch of Big Canteen Creek was $350,000 in 1994. This included dumping sediment on the existing spoil levees or adjacent farmland instead of hauling it off site.)

**Alternative 5 -- Remove Gates From Culverts.** Many of the existing culverts and gates were installed prior to construction of the Mississippi River levee system. The gates originally prevented back flow and minor flooding caused by high Mississippi River water levels. Since the levees were built, the gates are no longer necessary. Removing the gates will prevent them from being shut or snagging debris and blocking flow through the culverts.

The cost of removing gates would be minimal and could be done by public work maintenance crews.

**Alternative 6 -- Floodways (ditches).**

**A. Dobrey Slough to Horseshoe Lake.** Excess runoff could be routed from Dobrey Slough to Horseshoe Lake through a floodway. A grass lined floodway would extend south from Dobrey Slough approximately one mile, then cross under a set of railroad tracks into an existing stream that flows into Horseshoe Lake (Plate 4).

**Planning Cost Estimate**

| | |
|---|---|
| Land Acquisition | $ 45,000 |
| Construction | 2,154,000 |
| Wetland Mitigation | 68,000 |
| Engineering | 445,000 |
| **Subtotal** | **$2,712,000** |
| Contingencies | 543,000 |
| **Total** | **$3,255,000** |

**B.1. Floodway Along Route 111 From I-270 to Long Lake.** A small floodway could be constructed along the east side of Route 111 from the I-270 interchange to Long Lake (Plate 4). A grass lined channel could provide an additional outlet for runoff from the areas north of the interstate highway.

**Planning Cost Estimate**

| | |
|---|---|
| Land Acquisition | $ 224,000 |
| Construction | 738,000 |
| Wetland Mitigation | 17,000 |
| Engineering | 151,000 |
| **Subtotal** | **$ 1,130,000** |
| Contingencies | 226,000 |
| **Total** | **$1,356,000** |

**B.2. Floodway From I-270 to Long Lake, 1/4 Mile East of Route 111.** A grass lined floodway could be constructed along this route to provide a runoff path for the I-270 area. An easement of sufficient width to allow for channel maintenance should be provided.

**Planning Cost Estimate**

| | |
|---|---|
| Land Acquisition | $ 27,000 |
| Construction | 599,000 |
| Wetland Mitigation | 34,000 |
| Engineering | 127,000 |
| **Subtotal** | **$787,000** |
| Contingencies | 158,000 |
| **Total** | **$945,000** |

**C. Lake Boulevard to Horseshoe Lake.** A floodway could be constructed along the west side of Lake Boulevard, from north of Route 162 to just north of Horseshoe Lake Road, then cross under Lake Boulevard and into the small arm of Horseshoe Lake (Plate 4).

**Planning Cost Estimate**

| | |
|---|---|
| Land Acquisition | $ 321,000 |
| Construction | 657,000 |
| Wetland Mitigation | 34,000 |
| Engineering | 138,000 |
| **Subtotal** | **$1,150,000** |
| Contingencies | 230,000 |
| **Total** | **$1,380,000** |

**D. Outlet From Long Lake.** Rainfall in the Long Lake vicinity often causes a dramatic increase in the lake elevation, flooding the low lying areas. This is mostly due to backflow from the Mitchell Ditch as it works its way to Elm Slough. Recent improvements in the ditch should provide some relief but flooding will remain a problem.

The installation of flap gates on the lake outlet culverts (at the Route 162 crossing) to prevent backflow into Long Lake should alleviate flooding.

**E. Mitchell Ditch Railroad Crossing.** The existing culvert under the railroad tracks north of Route 162 is an inadequate size to pass storm water. Replacing the culvert with a concrete box culvert would eliminate this restriction.

**Planning Cost Estimate**

| | |
|---|---|
| Land Acquisition | $ 0 |
| Construction | 71,000 |
| Wetland Mitigation | 10,000 |
| Engineering | 16,000 |
| **Subtotal** | **$ 97,000** |
| Contingencies | 19,000 |
| **Total** | **$116,000** |

**Alternative 7 -- Animal Control.** The increasing beaver population in the Long Lake area has become a problem. The beaver dams reduce flow of water through the already sluggish stream and ditch system. This reduced flow creates higher water levels upstream, spreading runoff across land that was previously dry. The rising water level in Elm Slough and its effect are an example of the result of beaver damage.

According to IDOC, beavers may be trapped by licensed trappers during the regular season from November to mid-March. However, low pelt prices have resulted in a decrease in trapping. This has allowed the beaver population to increase. Special permits can be issued to nuisance trappers at other times of the year. Nuisance trappers generally charge for their services due to the low pelt value.

**Alternative 8 -- Ground Water Pumping.** Pumping ground water to lower the water table is an alternative presented in a U.S. Army Corps of Engineers Feasibility Report, dated July 1992. According to the Feasibility Report, up to 12 mgd (million gallons per day) could be pumped from the Dobrey Slough area. Discharge from the pumps would exit to existing surface water courses.

The Corps of Engineers report also identified ground water quality as a serious concern. High levels of naturally occurring iron and manganese were present in the ground water samples. Industrial pollutants are also present in the ground water in some areas. Pumping could cause the industrial pollutants to spread throughout the ground water. The cost of treating the pumped water, monitoring the wells and treatment process, and loss of well sites due to industrial pollutants reduced the potential effectiveness of the Corps plan so that the Benefit/Cost ratio would be considerably less than 1.0. For a project to be viable, the B/C ratio must be greater than 1.0, the financial benefit (reduction in ground water related damages) must be greater than the cost of completing the project.

The IDOT Division of Water Resources (DWR) is currently studying the possibility of ground water pumping in this area. Water quality is, again, a concern. DWR is considering pumping on a smaller scale than the Corps had anticipated so migration of industrially contaminated ground water is much less likely. DWR is researching low cost treatment methods for iron and manganese removal. They will also cooperate with local governments in marketing the treated water for industrial or municipal use.

Since DWR is conducting their study, no cost information is currently available.

**Alternative 9 -- Wetland Management.** The Long Lake watershed contains many wetland areas, ranging from half acre pockets isolated in farm fields to the more than 300 acres in the Elm Slough area, northeast of Horseshoe Lake. The streams and ditches within the watershed are considered to be riverine wetlands. Development has occurred in some of the wetlands such as along Dobrey Slough and Long Lake. Other wetland areas are being used as dumping areas for construction debris. In order to preserve these wetlands, they must be protected from encroaching development and pollutants, enhanced to maintain and improve their quality, and expanded to replace wetlands already lost to development and misuse.

The quality of the wetlands is an important feature, with some requiring more care and protection than others. High quality wetlands provide habitat for many species of plants and wildlife. Moderate and low quality wetlands are also unique.

Another important wetland function is storm water storage. Filling wetlands reduces their ability to store storm water.

**A. Development Regulations.** Enforcing development regulations can protect existing wetlands from development and further degradation. The U.S. Army Corps of Engineers has jurisdiction over development in wetlands, including approval and issuance of permits and the ability to enforce them.

Most local governments can take advantage of the Corps' expertise at minimal cost. Requiring delineation of wetlands and Corps approval of plans involving wetlands prior to issuing building or development permits will help protect this valuable resource. Identification of wetlands early in the planning process helps to expedite development by allowing design professionals to work with the site.

Other regulations for land development, flood plain management, storm water detention, soil erosion and sediment control, and streambank protection would all benefit the wetlands by dealing with potential problems at their sources.

**B. Documentation of Wetland Damage.** Documenting repetitive or ongoing damage to wetlands is essential to stopping the damage. Noting times and dates of these occurrences is necessary. Photographs of the damage as it occurs and of landscape changes can be helpful. Gathering this type of information takes time and patience. The more information that is available to the regulatory agencies the more likely corrective measures will be taken. Local citizens must take the lead in this documentation because the Corps of Engineers has limited resources and cannot do day to day monitoring.

**C. Enhancement Practices.** Removing pollutants from wetlands will assist in maintaining and improving the wetland quality. Pollutants include soil sediment, chemicals, construction debris, and trash which enter the wetlands through storm water runoff routes, dumping, or are tossed in by passersby.

Buffer zones around the wetland perimeter will filter pollutants. These zones are vegetated strips which trap sediment and other pollutants before they reach the wetland. Buffer zones may be undisturbed areas or they can be enhanced to improve their filtering abilities. Planting disturbed areas with grasses, shrubs, and trees that absorb the pollutants is effective. Undisturbed areas generally do not require any construction. Buffer zones provide additional wildlife habitat and opportunities for recreation. Most buffer zones can be formally established through easements.

Detention structures and sediment basins upstream of wetlands will allow sediment and pollutants to settle out, in addition to controlling the rate of runoff. Sedimentation due to bottomland runoff is considered to be minimal so it is not a major concern here.

Cleaning debris out of waterways and wetlands also improves water and wetland quality. Stream and wetland awareness programs, Alternative 11, are an economical method, in addition to providing educational opportunities.

**D. Mitigation.** Replacing wetlands lost to development and pollution is costly. Requiring development to occur outside of wetlands and buffer zones is usually less expensive than mitigation. The type, size, and quality of wetland lost should all be considered when planning mitigation. Each type of wetland is unique and should be replaced with a similar wetland. Mitigation ratios are an important consideration in land development. Ratios can vary from one to three acres of mitigated land to one acre of lost wetland.

Mitigation costs can vary greatly with the type size and quality of wetlands under consideration. Land acquisition, earthwork to insure water supply, and landscaping are all variables. The following is a planning cost estimate of a one acre site with a 1:1 mitigation ratio.

**Planning Cost Estimate**

| | |
|---|---|
| Land Acquisition, per acre | $ 2,500 |
| Grading, 1,000 cu. yd. | $ 6,000 |
| Landscaping, hydrophilic plants | $ 8,500 |
| **Total** | **$17,000** |

**Alternative 10 -- Recreational opportunities.** The potential exists within the watershed to expand recreation. A network of trails to accommodate hiking, biking, and some horseback riding could be added along the ditches and waterways. The trails could also be connected to existing parks and other public areas for additional access. Along with transportation, these waterways and surrounding areas could be maintained as greenways. Selected sites can be set aside to accommodate bird watching, nature study, and possibly fishing.

Regional detention areas and floodway right of ways, such as those identified in Alternatives 3 and 6, can serve a dual purpose, stormwater management and recreation. Areas can be maintained as parks and recreation areas with baseball and soccer fields, playgrounds, picnic areas, trails, nature study and fishing areas. When necessary, these areas can be temporarily flooded with minimal damage.

**Planning Cost Estimate**

| | |
|---|---|
| Gravel trail, per mile | $22,500 |
| Paved trail access, per each | $6,500 |

**Alternative 11 -- Information Education.** There is a great need in the Metro East region for environmental and ecological awareness. Several different education programs could be developed to meet the need. Programs should be tailored to different age and interest groups such as school groups, Scouts, community service organizations, and high school environmental and ecology clubs.

Programs could include video and slide presentations or demonstrations sponsored by local conservation groups.

**A. Stream Awareness Day.** Local governments could coordinate with local service organizations and ecology clubs to hold an annual event to educate the public on the importance of the local waterways. Activities could include stream cleanup, water quality testing, and minor streambank restoration by volunteers from the community. The Village of Caseyville sponsored a successful program in the spring of 1994 for Little Canteen Creek. The volunteers included homeowners, local business people, local government officials and public works employees, Scouts, and high school ecology clubs.

**Alternative 12 -- Sediment Removal and Control in Horseshoe Lake.** Sediment that enters Horseshoe Lake is largely a result of upland erosion. Sediment control will not be addressed in this plan because it is addressed in the resource plans for the contributing upland areas. It is noted that sediment does affect the lake's ability to handle the runoff and groundwater from the Long Lake area.

Sediment from Big Canteen Creek and Cahokia Canal has completely filled in the 100 acre area at the mouth of the diversion channel at the south end of Horseshoe Lake. Dredging this area would return it to a more natural state.

**Planning Cost Estimate**

| | |
|---|---|
| Dredging | $ 3,872,000 |
| Wetland Mitigation | 85,000 |
| Engineering | 790,000 |
| **Subtotal** | **$ 4,747,000** |
| Contingencies | 949,000 |
| **Total** | **$ 5,696,000** |

## COMPARATIVE ASSESSMENT AND EVALUATION OF ALTERNATIVES.

An initial assessment (non quantitative) was made comparing the twelve alternatives discussed. This analysis briefly lists some of the pros and cons of each alternative.

**Alternative 1 -- Current conditions or no action.**

ADVANTAGES:

A. No current cost.

DISADVANTAGES:

A. Increasing development will create additional runoff and runoff related problems, such as flooding.

B. Health and safety concerns will multiply and economic development will slow down.

**Alternative 2 -- Implementation of ordinances and regulations.**

ADVANTAGES:

A. Ordinances and regulations provide long term development standards.

B. Everyone involved in land development (landowners, contractors, engineers, planners, surveyors, and local officials) understands and accepts responsibility for their actions.

C. Responsibility for storm water management is placed on those who create additional runoff.

D. The cost to local government for ordinance development, enactment, and enforcement would be minimal.

E. Local governments would have enforcement capability.

F. Ordinances provide a preventive measure instead of corrective.

DISADVANTAGES:

A. Time is necessary to develop and enact new ordinances.

B. Everyone involved in land development will need to adjust to the new standards.

C. Only applies to new development, does not address existing problems.

D. Meeting new standards would increase (slightly) the cost of development.

E. Does not correct existing problems.

**Alternative 3 -- Detention.**

ADVANTAGES:

A. The potential detention sites are mostly undeveloped.

B. Sediment is allowed to settle out before runoff reaches Horseshoe Lake.

C. Some of the sites already detain runoff.

D. The sites include existing wetlands and FEMA Flood Hazard Areas.

DISADVANTAGES:

A. High probability of impacting cultural resources exists.

B. The periodic removal of sediment might be necessary.

C. Sediment and other contaminants may adversely impact existing wetlands.

D. This alternative does not address ground water problems.

E. Detention areas are expensive.

**Alternative 4 -- Clean the existing ditches.**

ADVANTAGES:

A. Cleaning and regular maintenance will maintain ditch capacity.

B. Once the ditches are clean, maintenance mowing can be easy and inexpensive.

C. Erosion and sedimentation in this area are minor concerns.

DISADVANTAGES:

A. Drainage ditches require regular maintenance.

B. Development upstream will contribute additional runoff to the ditch.

C. The ditch may need to be enlarged due to development upstream unless on site detention is included in the development.

D. This alternative does not address ground water problems.

**Alternative 5 -- Remove Gates From Culverts.**

ADVANTAGES:

A. The gates will not be shut either accidentally or otherwise.

B. Water flow will not be hindered by gates.

C. Gateless culverts will require less maintenance.

D. Gate removal can be done at a minimal cost.

DISADVANTAGES:

A. This alternative does not address ground water problems.

**Alternative 6 -- Floodways.**

ADVANTAGES:

A. Increasing the outflow rate from the upstream areas would provide some ponding relief for these areas.

DISADVANTAGES:

A. This alternative may not completely solve the ponding problems.

B. This alternative does not address ground water problems.

C. The floodway along Route 111 will direct additional water into Long Lake.

D. Floodways are expensive.

**Alternative 7 -- Animal Control.**

ADVANTAGES:

A. Fewer beaver dams would reduce disruptions of surface water flow.

B. Removal of the dams would allow the surface water to move downstream, thereby lowering the water level.

C. Wet land that was previously dry would return to its previous use.

DISADVANTAGES:

A. Most animal control is limited to seasonal removal.

B. Animal control would be a constant process.

C. Animal control might be unpopular with animal rights groups.

D. This alternative does not address ground water problems.

**Alternative 8 -- Ground water pumping.**

ADVANTAGES:

A. Ground water pumping will reduce damages due to high ground water tables.

B. Pumped ground water may be used by the local community or sold for industrial or commercial use.

DISADVANTAGES:

A. Contaminated ground water might be pumped into surface waters unless a monitoring and treatment program is established and maintained.

B. Pumping might cause migration of contaminated groundwater into previously uncontaminated areas.

C. The high iron and manganese content in pumped ground water will require treatment before discharge.

D. Pumping could adversely affect wetlands.

E. The lower water table might create additional sewer problems.

F. If pumping is discontinued, the water table will rise, recreating the wet basement and sewer problems.

G. A method of disposing of the treated water would be required.

H. This alternative does not address surface water problems.

I. Pumping will be a constant process with ongoing expenses.

**Alternative 9 -- Wetland management.**

ADVANTAGES:

A. Creates additional wetlands and wildlife habitat.

B. Can be combined with educational and recreational opportunities.

C. Requiring permits from agencies with jurisdiction prior to construction will reduce wetland loss and mitigation costs.

D. Buffer zones improve water quality.

E. Provides a means of reintroducing native vegetation to an area.

F. If the wetlands and buffer areas are properly constructed and protected, maintenance will be minimal.

DISADVANTAGES:

A. Mitigation is expensive.

B. High mitigation ratios can be expensive.

C. This alternative does not address ground water problems.

**Alternative 10 -- Recreational opportunities.**

ADVANTAGES:

A. Provides educational opportunities.

B. Wetlands and wildlife habitat can be incorporated into recreation areas.

C. Can expand and connect existing recreation areas.

D. Existing features can accommodate more than one use, such as levees that can also be used for hiking and biking trails.

E. Regional detention areas can provide recreational and storm water management opportunities.

DISADVANTAGES:

A. Recreational facilities would need to be constructed and maintained.

D. This alternative does not address ground water problems.

**Alternative 11 -- Information Education.**

ADVANTAGES:

A. An informed public is more supportive of programs.

B. Many natural resource and environmental activities are done by volunteers, through community service organizations.

DISADVANTAGES:

A. Some activities can be very labor intensive.

B. Stream Awareness Day requires cooperation of a large group of people within the watershed.

C. Only attracts individuals interested in the stream and other natural resources.

D. This alternative does not address ground water problems.

**Alternative 12 -- Sediment Removal and Control in Horseshoe Lake.**

ADVANTAGES:

A. The Long Lake watershed contributes very little sediment to Horseshoe Lake.

B. Increased runoff storage capacity.

DISADVANTAGES:

A. Erosion in the uplands is the greatest contributor of sediment to Horseshoe Lake. The Long Lake watershed has no direct way of controlling this erosion.

B. This alternative does not address ground water problems.

## SUMMARY OF ALTERNATIVES

Seven committee members voted on the various alternatives after much discussion. Each member received seven votes and was asked to cast no more than three votes for any one alternative.

The popularity of alternatives 2, 6, and 8 indicate the need for a regional approach to storm water management. The votes given to the other alternatives demonstrate the committees interest in individual and local government efforts. It appears that the committee would support all of the components that could be part of the solution, but that no single solution, such as detention or ground water pumping, is the answer. Table 14 shows which of the concerns are addressed by each of the alternatives. Appendix A provides plats showing various watershed maps and alternatives.

| ALTERNATIVE | VOTE |
|---|---|
| Alternative 1 -- No Action | 0 |
| Alternative 2 -- Ordinances and Regulations | 7 |
| Alternative 3 -- Detention (REVISED) | 5 |
| Alternative 3 -- Detention (PREVIOUS) | 0 |
| Alternative 4 -- Clean Existing Ditches | 5 |
| Alternative 5 -- Remove Gates From Culverts at Rte 111 | 0 |
| Alternative 6 -- Floodways (Ditches) | 7 |
| Alternative 7 -- Animal Control | 5 |
| Alternative 8 -- Ground Water Pumping | 8 |
| Alternative 9 -- Wetland Management | 3 |
| Alternative 10 -- Recreational Opportunities | 1 |
| Alternative 11 -- Information Education | 0 |
| Alternative 12 -- Sediment Removal and Control in Horseshoe Lake | 6 |

**Table 14**

**Alternatives Impact on Concerns**

| Alternatives / Concerns | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | X | | | | | | |
| 2 | | X | X | | | | X | | X | | | X |
| 3 | | | | | | | X | | X | | | |
| 4 | | X | | | | | | | X | | X | |
| 5 | | X | | | | | | | | | | |
| 6 | | | | | X | | | | | | | |
| 7 | | | | | | | | | | X | | X |
| 8 | | X | X | | | | | | X | X | X | X |
| 9 | | | | | | | | | | | | X |
| 10 | | | | | | X | | | | | | |
| 11 | | | | X | | X | | X | | | | |
| 12 | | X | X | | | | | | X | X | X | X |
| Total Concerns Impacted | 0 | 5 | 3 | 1 | 1 | 3 | 2 | 1 | 5 | 3 | 3 | 5 |

**Resource Reports Developed and Authors**

| | |
|---|---|
| Description of the Big Canteen Creek Watershed | Albert Jones<br>USDA-NRCS |
| Flood Hazard of the Big Canteen Creek Watershed as related to Soil Map Units | David Rahe<br>Team Leader<br>USDA - NRCS |
| Effects of Urbanization on Local Watersheds. | Deborah Rigo<br>Civil Engineer<br>USDA-NRCS |
| Madison County Sensitive Species | Scott R. Ballard<br>Natural Heritage<br>Biologist<br>IDNR District 10 |
| Big Canteen Creek fish Sampling Report | Randy Sauer<br>Fisheries Biologist<br>IDNR |
| Big Canteen Creek Water Quality Report | Bob Hite<br>IEPA |
| Natural Areas Located in Big Canteen Creek Study Area | Scott R. Ballard<br>Natural Heritage |
| Biologist | IDNR-District 10 |
| Wildlife Resources In The Big Canteen Creek Watershed. | Dave Harper<br>IDOC Wildlife<br>Biologist |
| History of Planning in The Big Canteen Creek Watershed. | Wayne Kinney<br>USDA-NRCS |
| Sediment Yields due to gully and streambank erosion. | Roger Windhorn<br>USDA-NRCS |
| Existing Canteen Creek bankfull discharge estimates. | Karl Visser<br>Tom Book<br>USDA-NRCS |

# Appendix A - Maps

**List of References**

Regional Atlas - Madison, St. Clair and Monroe counties, Illinois. A report prepared by the Southwestern Illinois Metropolitan and Regional Planning Commission

Plan for major drainage - The American Bottoms and Hillside Drainage Area Planning Basin, prepared by Southwestern Illinois Metropolitan and Regional Planning Commission. Collinsille, Illinois. August, 1975.

1992 Illinois Annual Air Quality report. Illinois Environmental Protection Agency

Directory of coal mines in Illinois,Madison County. Illinois Department of Energy and Natural Resources, Illinois State Geological Survey, January 1991

An intensive survey of the American Bottoms Basin 1984. Illinois Environmental Protection Agency, Division of Water Pollution Control

Soil Survey of St. Clair County, Illinois. USDA, Natural Resources Conservation Service, in cooperation with Illinois Agricultural Experiment Station

Illinois Department of Transportation, Devision of Water Resources. Strategic Planning Study, Canteen Creek Watershed: Madison and St. Clair Counties, Illinois. September, 1978.

Water Resources Investigation St. Louis Metropolitan Area, Missouri and Illinois, Reconnaissance Report, Amercian Bottoms Groundwater Study. United States Army Corps Of Engineers, St. Louis District. August, 1979.

Reevaluation Report and Environmental Assesment Cahokia Canal, Harding Ditch Areas. United States Army Corps of Engineers St. Louis District. 1984 Revised 1985.

Conservation and Preservation of Horseshoe Lake: Phase II. Southwestern Illinois Metropolitan and Regional Planning Commission. 1981

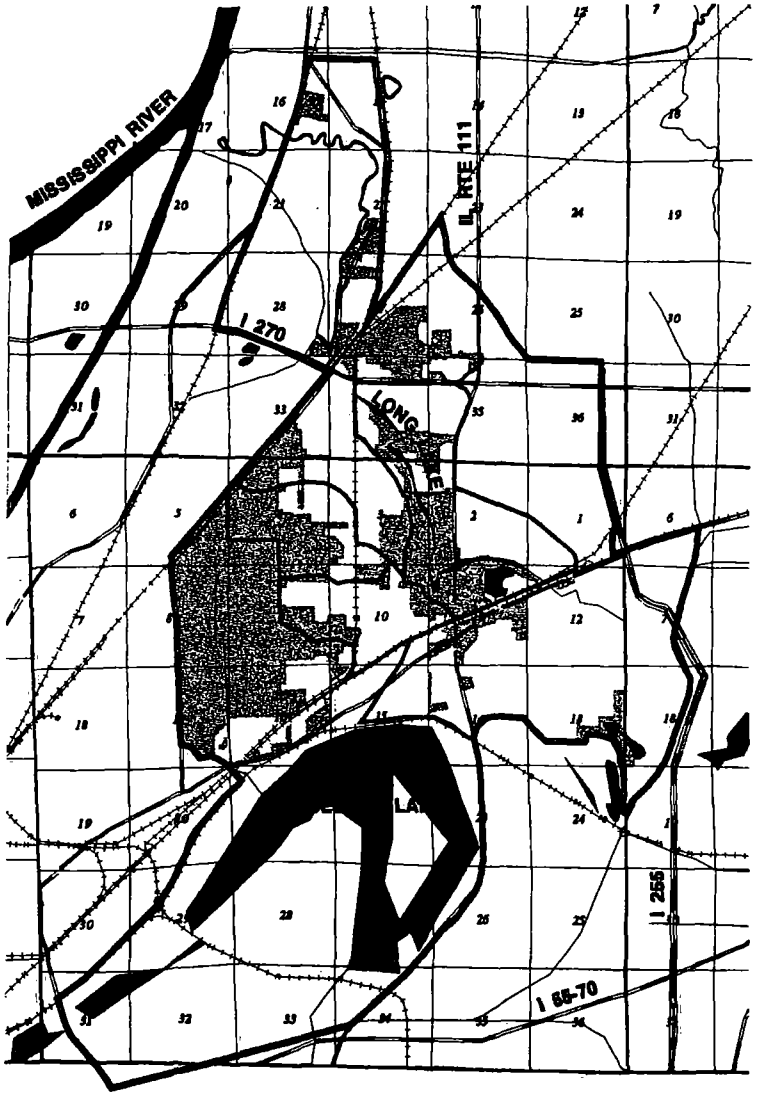
Interstate- 255 Monroe, St. Clair and Madison Counties, Volume I; Final Environmental impact Statment. Illinois Department of Transportation. 1977.

Assessment of the proposedDischarge og Ground Water to Surface Waters of the Amercan Bottoms Area of Southwestern Illinois. Illinois State Water Survey, Hydrology and Chemistry Devision, Department of Energy and Natural Resources. 1992

PLATE 1

# LONG LAKE WATERSHED

## *WATERSHED BOUNDARIES AND EXISTING DEVELOPMENT*




THIS MAP IS FOR PLANNING PURPOSES ONLY. ANY POTENTIAL STRUCTURES AND SITE INDICATED HEREON ARE REPRESENTATIVE OF TYPICAL LOCATIONS AND SHOULD NOT IN ANY WAY BE CONSIDERED TO BE ACTUAL SITES.

### LEGEND

- Watershed Boundaries
- Streams
- Major Highways
- Rail Lines
- Section Lines
- Township Line
- Area of Study
- Urbanized Area
- Existing Lakes and Ponds

N

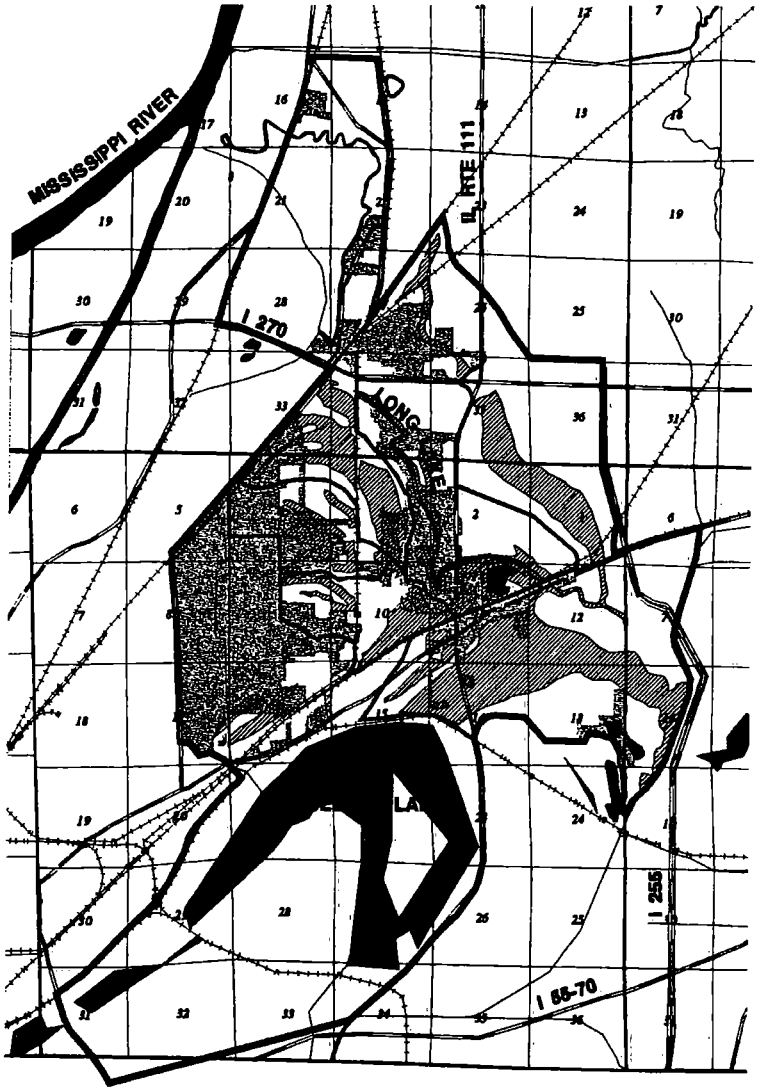
SCALE = 1:84,000

0 1000 7000 14,000

PLATE 2

# LONG LAKE WATERSHED

*APPROXIMATE FEMA FLOOD HAZARD AREAS*




THIS MAP IS FOR PLANNING PURPOSES ONLY. ANY POTENTIAL STRUCTURES AND SITE INDICATED HEREON ARE REPRESENTATIVE OF TYPICAL LOCATIONS AND SHOULD NOT IN ANY WAY BE CONSIDERED TO BE ACTUAL SITES.

## LEGEND

- Watershed Boundaries
- Streams
- Major Highways
- Rail Lines
- Section Lines
- Township Line
- Area of Study
- FEMA Flood Hazard Areas
- Existing Lakes and Ponds
- Urbanized Area

N

SCALE = 1:84,000

0 1000 7000 14,000

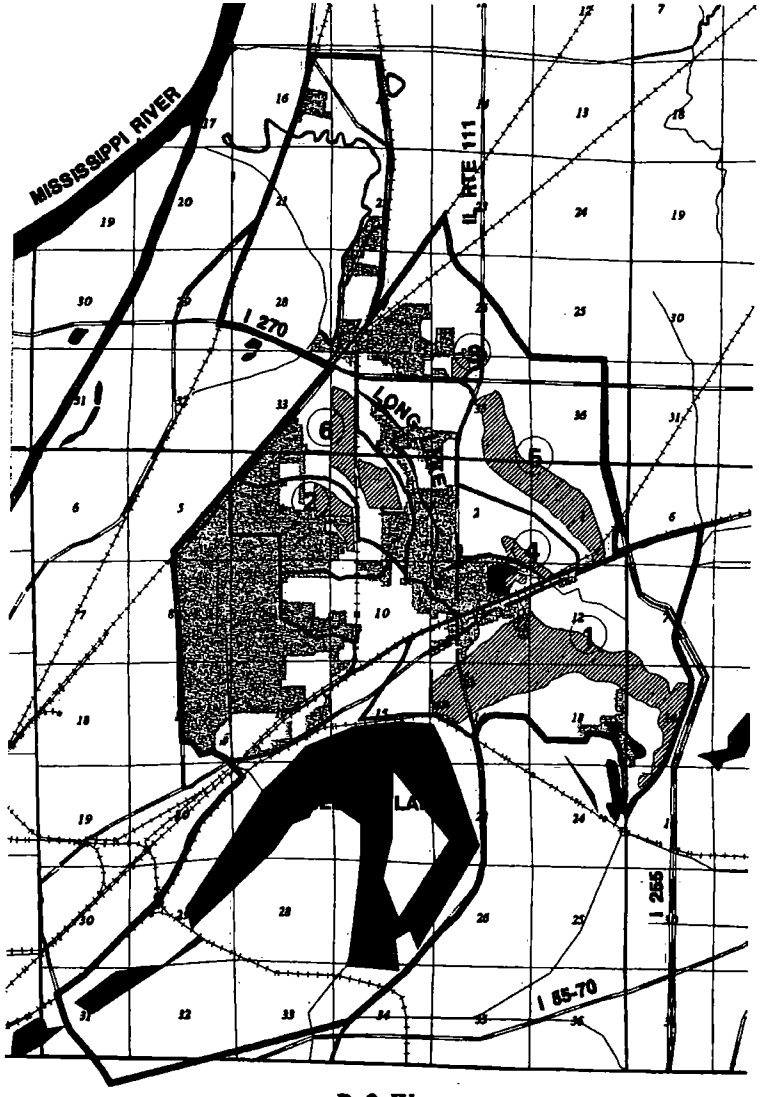
PLATE 3

# LONG LAKE WATERSHED

## *POTENTIAL DETENTION AREAS*

### POTENTIAL DETENTION AREAS

1 ELM SLOUGH
2 DOBREY SLOUGH
3 I-270 & RTE 111
4 LONG LAKE
5 MITCHELL DITCH
6 SPEEDWAY

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### LEGEND

- Watershed Boundaries
- Streams
- Major Highways
- Rail Lines
- Section Lines
- Township Line
- Area of Study
- Urbanized Area
- Existing Lakes and Ponds
- Potential Detention Areas

N

SCALE = 1:84,000

0 1000 7000 14,000

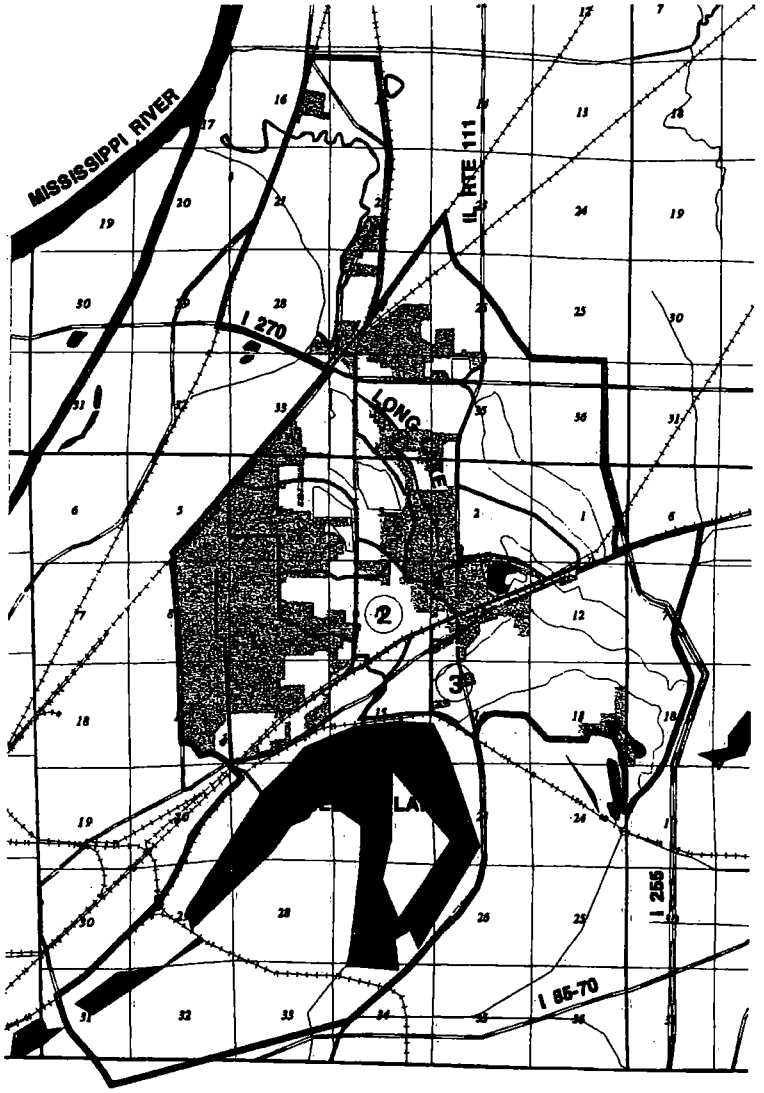
PLATE 4

# LONG LAKE WATERSHED

## POTENTIAL DRAINAGE DITCHES

### POTENTIAL DRAINAGE DITCHES

1 NAMEOKI DITCH (EXISTING)
2 DOBREY SLOUGH DITCH
3 LAKE BLVD. DITCH

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### LEGEND

- Watershed Boundaries
- Streams
- Major Highways
- Rail Lines
- Section Lines
- Township Line
- Area of Study
- Potential Drainage Ditches
- Urbanized Area
- Existing Lakes and Ponds

N

SCALE = 1:84,000

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