PRELIMINARY ASSESSMENT EQUIVALENT REPORT
LAKE CALUMET CLUSTER SITE
CHICAGO, COOK COUNTY, ILLINOIS
TDD: S05-9611-013
PAN: 6B135CSIXX
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Prepared for:

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1. Introduction

The Ecology and Environment, Inc. (E & E), Superfund Technical Assessment and Response Team (START) has been tasked by the United States Environmental Protection Agency (U.S. EPA) to complete a Preliminary Assessment (PA) Equivalent Report for the Lake Calumet Cluster (LCC) site under Technical Direction Document (TDD) S05-9611-013. The PA Equivalent Report is based on information and data from the *Site Assessment Status Report: Results of Phase I Sampling Activities for Lake Calumet Cluster Site*, the *Site Assessment Report: Paxton Landfill Site*, both prepared by E & E; the *Phase I Ecological Reclamation Study: Lake Calumet Cluster Site* (ERS), prepared by Roy F. Weston, Inc. (Weston); and information provided by E & E and U.S. EPA personnel involved in site assessment activities. Additional details on the LCC site, including validated analytical data and photodocumentation, are available in the U.S. EPA Region 5 site file.

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2. Site Description

The site is located in Chicago, Cook County, Illinois (Appendix A). The geographical coordinates for the site are latitude 41°41'15.0"N and longitude 87°34'35.0"W. The LCC site is approximately 200 acres in size and consists of several landfills and waste storage/disposal facilities. The site is bordered by the Interlake/Big Marsh property to the north, Norfolk and Western Railroad right-of-way to the east, Stony Island Avenue to the west, and 122nd Street to the south. Lake Calumet is located west of Stony Island Avenue and the Calumet River is located 0.5 mile to the east of the site. There are several wetlands located on or around the site. Big Marsh is located in the northeastern corner of the site, Dead Stick Pond lies in the southwestern corner of the site, and the Indian Ridge Marsh is located less than 500 feet to the east of the site.

The nearest residence is located approximately 500 feet northeast of the site. The LCC site consists of the following individual sites; Paxton Landfill, Land and Lakes #3, Alburn Incinerator, U.S. Drum II, Paxton Lagoon, MSD #4 Sludge Dump (MSD #4), and the Unnamed Parcel (Appendix B). There are no permitted drinking water wells within the City of Chicago, and nearly all residents within a 4-mile radius of the site are supplied by treated Lake Michigan water. However, seven or eight private wells may exist within a 4-mile radius of the site. These wells are screened within the bedrock at depths of over 200 feet. The closest private well is located more than 2.5 miles away from the site in the Hegewisch neighborhood. The upper aquifer and bedrock aquifer are hydraulically separated by a dense glacial till confining unit (Appendix C). There are approximately 1,141 people living within a 1-mile radius of the site (Appendix D). START documented several employees at the Paxton Landfill and several more at Land and Lakes #3.

Surrounding land is used for a combination of commercial, residential, and industrial purposes, though there are scattered tracts of natural areas. These areas, including Lake Calumet, Big Marsh, Indian Ridge Pond, and Dead Stick Pond are home to a variety of birds, mammals, and vegetation. The peregrine falcon, a federally listed endangered species, has been observed at Big Marsh. Two

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Federal Species of Concern, the black tern and the common tern, have been detected in the vicinity of the LCC site.

The Paxton Landfill is approximately 100 acres in size and composed of several landfills, including: Paxton I Landfill (Paxton I), Paxton II Landfill (Paxton II), and the LHL Landfill. Paxton I operated form 1971 through 1976. The landfill accepted general refuse, industrial wastes, and sludges under special waste permits authorized by the Illinois Environmental Protection Agency (IEPA). Paxton II operated from 1976 through 1992 and accepted hazardous wastes until 1980. Paxton II is approximately 150 feet above grade and 52 acres in size. Operations at LHL Landfill are poorly documented. The landfill was permitted to handle refuse and construction debris, although no records are available to describe the waste types that were disposed of at the site.

Land and Lakes #3 is a permitted, active landfill that has been designed and is operated in compliance with IEPA regulations for sanitary landfills. Land and Lakes #3 is included in the cluster site so that its existing state-approved closure and post closure plans can be modified to be consistent with the end use plan for the area, to the extent practicable and possible.

Alburn operated as a landfill from 1967 through 1977, and is approximately 8 acres. Wastes were disposed in excavated pits and trenches. No details are available on the types and quantities of wastes buried during this period. In 1977, Alburn initiated hazardous waste incineration and hazardous waste storage/transfer operations. In 1979, U.S. EPA issued a Resource Conservation and Recovery Act (RCRA) permit to Alburn for the operation of an incinerator. Alburn incinerated/sorted hazardous wastes and sludges, including paints, thinners, varnishes, chlorinated solvents, styrene, ink, adhesives, waste oils, antifreeze, petroleum, naphtha, coal tar, and waste solvents. Site storage and disposal methods included landfilling, incineration, operation of a surface impoundment, and bulk liquid waste storage. In 1982, Alburn had their permit revoked due to several RCRA violations. Alburn continued to accept bulk waste until January 1983.

Since the 1940s, U.S. Drum II and adjacent areas were used as a dump for municipal and industrial wastes. During the 1970s, the site was used as a hazardous waste transfer and petroleum recovery facility. Operations at the facility were abandoned in 1976. Occasional standing water occurs at several points on the site along the eastern perimeter and in the northwestern section of the site. A ditch appears to drain to a small pond located south of the site, near the intersection of the railroad tracks and 122nd Street. The surface water bodies eventually discharge into the Little Calumet River, located approximately 0.75 mile to the south.

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Paxton Lagoon was an illegal dump site since the 1950s and covers 5.6 acres. The Unnamed Parcel is approximately 38 acres and located south and west of Alburn. MSD #4 is located south of 122nd Street. The contents of approximately 200 drums were released into wetlands located on the MSD #4 site. No further cleanup of the drum release was conducted.

The LCC site lies within the Central Lake Calumet Corridor of a proposed Calumet Ecological Park (Appendix C). On November 12, 1996, President Clinton signed the Omnibus Parks and Public Lands Management Act of 1996 (Public Law 104-333) which included a mandate (Section 816) to the National Park Service to perform a feasibility study for establishing the Calumet Ecological Park. In April 1996, several local community groups approached the U.S. EPA through the Chicago Legal Clinic for two purposes, ranking a single cluster site by the Hazard Ranking System (HRS) for potential listing on the National Priorities List (NPL) and for remediation and long-term responses. U.S. EPA has deferred decisions to undertake formal Superfund action under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) in favor of an alternative approach. U.S. EPA has been working as a facilitator in conjunction with community groups to evaluate the potential health and ecological impact of the LCC site in the Lake Calumet area.

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3. Previous Assessment and Removal Activities

In February 1998 an ERS was completed by Weston. E & E was tasked by the U.S. EPA to perform a site assessment to fill in data gaps; Phase I of sampling activities has been completed, Phase II and III have yet to be completed. Phase II of sampling is scheduled for early May 1999.

From August 24, 1998 through September 3, 1998, U.S. EPA, IEPA, and START performed Phase I of the sampling activities for the LCC site. The sampling included determining the location of site features and potential sampling locations using global positioning systems (GPS), screening metals concentrations in soils using X-ray fluorescence (XRF), and collecting samples of various media sampling. The following media were sampled throughout the site (excluding Alburn): surface soils, subsurface soils, surface water, groundwater, and macroinvertebrates.

START has documented arsenic-contaminated soil distributed throughout the surface of the site. Chromium- and lead-contaminated hot spots occur throughout the surface soil of the site (Appendix E). START also documented that metals contamination appears to be widespread in the subsurface soils and specific organic contamination exists in isolated locations. START documented elevated concentrations of barium, chromium, lead, mercury, naphthalene, polynuclear aromatic hydrocarbons, polychlorinated biphenyls (PCBs), and dieldrin on site. Additional subsurface sampling would be necessary to better understand the extent of subsurface contamination. Analytical results of sediment samples indicate most samples exceeded the Lowest Effect Level (LEL) for six representative contaminants (arsenic, chromium, lead, manganese, benzo(a)anthracene, and chrysene). The LEL indicates the level of contamination tolerated by the majority of sediment dwelling organisms. Analytical results of surface water samples indicate elevated concentrations of barium and manganese in Indian Ridge Pond. Macroinverterbrate analysis indicates that invertebrates which are tolerant to most water conditions are found on site. This suggests least tolerant organisms may not be able to survive in the existing sediment and water conditions at the site. Analytical results of groundwater sampling indicate elevated concentrations of barium, copper, iron, lead, manganese, and zinc.

Alburn Incinerator

On July 5, 1985, two on-site drums exploded from heat expansion and a subsequent chemical reaction. U.S. EPA ordered an immediate removal action of all visible sources of hazardous materials from the site, including bulk storage tanks, drums, 5-gallon pails, and lagoon sludge (Appendix C). In addition, six inches of topsoil, assumed to be the most contaminated, was excavated. A 2-foot clay cap was placed on the site; however, the exact extent and location of the cap has not been surveyed.

U.S. Drum II

A U.S. EPA removal action occurred at the site from December 1984 through July 1985. During construction of a new access road, approximately 1,500 buried drums were discovered. The drums had their ends cut off or punctured to allow the contents to drain into the ground prior to or at the time of burial. More than 3,000 drums, 435 cubic yards of contaminated soil, and 62,000 gallons of standing water were removed (Appendix C). Removal areas were leveled, capped with clay, covered with soil, graded, and seeded.

Paxton Lagoon

A U.S. EPA removal action was completed at the site in 1990. The U.S. EPA removal action was taken to mitigate threats posed by an unlined acidic skimmer lagoon and approximately 60 drums of hazardous materials (Appendix C). A removal action to address other waste lagoons at the site was conducted at the same time by IEPA, which operated a mobile incinerator to dispose of the contents of a PCB-contaminated main lagoon and surrounding soil. After completion of removal activities, a 4.5 foot multilayer soil cover was installed by IEPA over the entire site, consisting of a geomembrane liner, sand, clay, and topsoil. The property was fertilized and seeded. IEPA provides continuing operations and maintenance activities at the site.

Paxton Landfill

START completed a site assessment for the Paxton Landfill site on March 31, 1999. START used historical information from U.S. EPA records compiled for the Paxton site to determine that the site demonstrates potential physical and chemical threats to human health and the environment. Patrick Engineering, Inc. (PEI), contracted by IEPA, has concluded that the potential for slope failure exists at the northwest corner of the Paxton II site. In the event of a slope failure at this location, there would be a significant leachate release from the Paxton II site. The release could migrate across Stony Island Avenue and enter Lake Calumet. Leachate samples collected by PEI at the site have been shown to contain levels of contaminants that exceed Safe Drinking Water Act standards (Appendix F).

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MSD #4

In 1980, 202 drums were discovered at the MSD #4 site. During the removal, contents of some or all of the drums were released by the potentially responsible party (PRP) employees or the removal contractor into wetlands along Crandon Avenue. No further cleanup associated with the drum release was conducted. In 1983, U.S. EPA collected sediment samples from the Lake Calumet area. One sample was taken downstream of the drum release. This sample contained elevated concentrations of inorganic and organic constituents (Appendix C).

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4. Migration and Exposure Pathway Factors and Targets

This section describes the four migration and exposure pathways and targets associated with the Lake Calumet Cluster site. Section 4.1 discusses the groundwater migration pathway; Section 4.2 discusses the surface water migration pathway; Section 4.3 discusses the soil exposure pathway; and Section 4.4 discusses the air migration pathway.

4.1 Groundwater Migration Pathway

Groundwater contamination has been documented on the site. Analytical results of groundwater sampling conducted by U.S. EPA, IEPA, and START from August 24, 1998 through September 3, 1998, indicated elevated concentrations of barium, copper, iron, lead, manganese, and zinc present in the groundwater. Weston also documented groundwater contamination in the ERS. Numerous volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, PCBs, and heavy metals were found in groundwater and leachate at elevated concentrations. The extent of groundwater contamination is unknown. There are no permitted drinking water wells within the City of Chicago. Nearly all residents within a 4-mile radius of the site are supplied by treated Lake Michigan water. However, seven or eight private wells may exist within a 4-mile radius of the site. These wells are screened within the bedrock at depths of more than 200 feet (Appendix C). The upper aquifer and bedrock aquifer are hydraulically separated by a dense glacial till confining unit. The closest private well is located more than 2.5 miles away from the site in the Hegewisch neighborhood. Paxton I, and the LHL Landfills do not have a leachate collection system.

Paxton II has an engineered subsurface clay wall that surrounds most of the site. The wall was installed to prevent off-site migration of leachate from Paxton II. Leachate generated at Paxton II is collected and recirculated into the landfills. Approximately 5,000 gallons of leachate is recycled per day. The leachate collection system is not permitted.

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4.2 Surface Water Migration Pathway

Lake Calumet is located less than 0.5 mile west of the site and the Calumet River lies approximately 0.5 mile to the east of the site. Surface water contamination has been documented on site. Analytical results of surface water samples indicate high concentrations of barium and manganese in Indian Ridge Pond (Appendix E). Weston also documented surface water contamination in the ERS. The City of Chicago maintains drinking water intakes in Lake Michigan, which is approximately 3 miles upstream of the site. START documented fishing activities along the northeastern shore of Lake Calumet (Appendix G). Analytical results of sediment samples collected from Indian Ridge Pond indicate most samples exceeded the LEL for six representative contaminants (arsenic, chromium, lead, manganese, benzo(a)anthracene, and chrysene). In the event of a slope failure at Paxton II, there would be a significant leachate release. The release could migrate across Stony Island Avenue and enter Lake Calumet. It should be noted that in addition to documented chemical contamination, physical hazards which can negatively impact human health or the environment exist at the LCC site.

4.3 Soil Exposure Pathway

Soil contamination has been documented on site. START has documented arsenic-contaminated soil distributed throughout the surface of the site. There are approximately 1,141 people living within a 1-mile radius of the site (Appendix D). The nearest residence is located approximately 500 feet northeast of the site. The site is surrounded by a fence which restricts access. There are several employees at the Paxton Landfill and Land and Lakes #3 sites. The Alburn Incinerator has a 2-foot clay cap over the site; however, the exact extent and location of the cap has not been surveyed. Paxton I and the LHL Landfills were covered with 20 to 30 feet of soil. Removal areas at the U.S. Drum II site have been leveled, capped with clay, covered with soil, graded, and seeded. A 4.5 foot multilayer soil cover was installed by IEPA over the Paxton Lagoons site after removal activities were completed.

4.4 Air Migration Pathway

Currently, Paxton I, Paxton II, and LHL Landfills do not have a gas venting system. START performed air monitoring with a photoionization detector (PID). Air monitoring taken of surface soil samples revealed maximum organic vapors of 3 parts per million (ppm) and 150 ppm (Appendix G).

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5. Summary

The LCC site is located in a combination of commercial, industrial, and residential areas of Chicago, Cook County, Illinois. The LCC site is approximately 200 acres in size and consists of a group of several landfills and waste storage/disposal facilities. Wastes have been buried in unlined pits and have been exposed to groundwater, soil, and surface water. The site contains a substantial amount of contamination on and around the site. START has documented arsenic-contaminated soil distributed throughout the surface of the site. START also documented elevated concentrations of barium, chromium, lead, mercury, naphthalene, polynuclear aromatic hydrocarbons, PCBs, and dieldrin on site. The site is located on or near a substantial amount of water resources; Lake Calumet is adjacent to the site, the Calumet River is located 0.5 mile to the east of the site, and several wetlands exist on or adjacent to the site. START has documented contamination at a nearby wetland. Analytical results of surface water samples indicate elevated concentrations of barium and manganese in Indian Ridge Pond. START has completed Phase I of sampling efforts for a site assessment of the LCC site; Phase II and III have yet to be completed. Phase II of sampling activities are scheduled for early May 1999. These additional sampling efforts may detect additional areas of contamination on the LCC site. The amount of contamination present and the site's proximity to water resources poses a significant risk to human health and the environment.

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Appendix A

Site Location Map

Source: Ecology & Environment, Inc., March 31, 1999, *Site Assessment Report Paxton Landfill Site,* Chicago, Cook County, Illinois.

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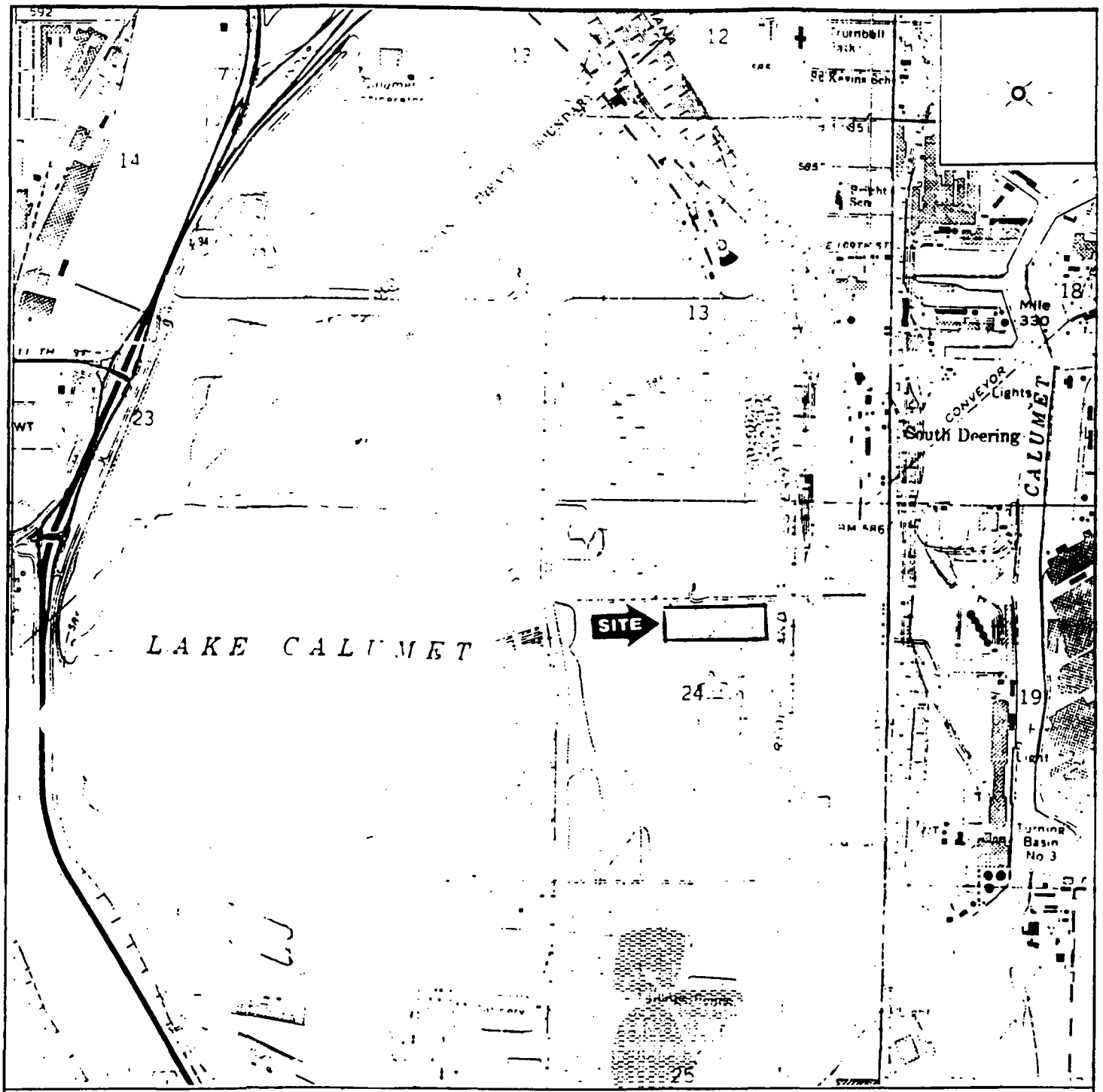

Quadrangle Location

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Superfund Technical Assessment and Response Team

Region 5

33 North Dearborn Street, Suite 900, Chicago, Illinois 60602

TITLE: Site Location Map	FIGURE: 2-1
SITE: Paxton Landfill	SCALE: 1:24,000
CITY: Chicago STATE: Illinois	TDD: S05-9901-004
SOURCE: USGS Topographic Map 7.5 Minute Series - Lake Calumet ILL.-IND. Quadrangle	DATE: 1965 REVISED: 1973

Appendix B

Site Features Map

Source: Ecology & Environment, Inc., March 31, 1999, *Site Assessment Report Paxton Landfill Site,* Chicago, Cook County, Illinois.

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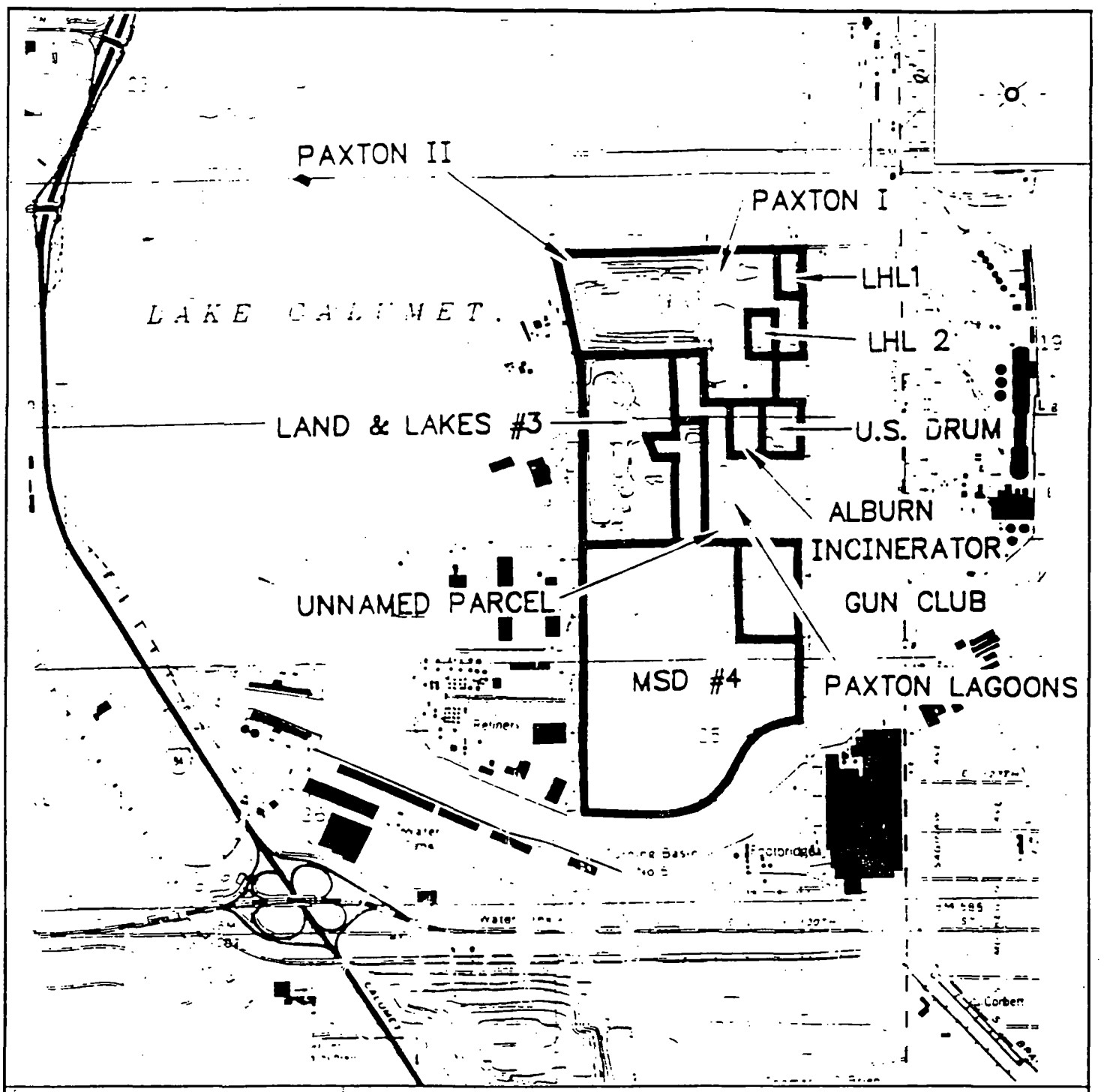

Legend

Site boundary

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Superfund Technical Assessment and Response Team

Region 5

33 North Dearborn Street Suite 900 Chicago, Illinois 60602

TITLE: Area Features Map	FIGURE: 2-2
SITE: Paxton Landfill	SCALE: 1:24,000
CITY: Chicago STATE: Illinois	TDD: S05-9901-004
SOURCE: Phase I Ecological Reclamation Study, Lake Calumet Cluster Site, Roy F. Weston, Inc	DATE: 1999
	REVISED:

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Appendix C

Phase I Ecological Reclamation Study: Lake Calumet Cluster Site

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FINAL
PHASE I ECOLOGICAL RECLAMATION STUDY
LAKE CALUMET CLUSTER SITE
CHICAGO, ILLINOIS

REGION

V

Remedial Planning Activities At Selected Uncontrolled Disposal Sites

U.S. EPA Contract No. 68-W8-0089

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FINAL
PHASE I ECOLOGICAL RECLAMATION STUDY
LAKE CALUMET CLUSTER SITE
CHICAGO, ILLINOIS

February 1998

Prepared for:

U.S. Environmental Protection Agency
Emergency and Remedial Response Branch
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FINAL PHASE I ECOLOGICAL RECLAMATION STUDY
LAKE CALUMET CLUSTER SITE
CHICAGO, ILLINOIS

U.S. EPA CONTRACT NO. 68-W8-0089

Work Assignment No. 91-5EF3
Document Control No. 4500-91-APCW

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Preface

In April 1996, several local community groups approached the U.S. EPA through the Chicago Legal Clinic, requesting that eight disposal sites in the Indian Ridge Marsh area be clustered together for two purposes: ranking as a single cluster site by the Hazardous Ranking System (HRS) for potential listing on the National Priorities List, and for remediation and long-term responses. The community groups concerns about these sites include the potential impact on human health from prior disposal of hazardous materials at the sites, as well as the potential impact of contamination on the sensitive ecological resources in the area.

The U.S. EPA has deferred decisions to undertake formal Superfund action under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) in favor of an alternative approach. The U.S. EPA has been working as a facilitator in conjunction with the community groups to initiate a Phase I Environmental Reclamation Study (ERS) as the first step in the evaluation of potential health and ecological impact in the Lake Calumet area. The ERS is the first step in the planning process that will further promote the coalition of local interests and will pursue the voluntary implementation of a ecological reclamation plan for the area. It is envisioned that over the long term, other adjacent properties may voluntarily join this cluster site initiative, improving the ecological resources in the Lake Calumet Area.

This Phase I ERS report focused on whether ecological reclamation of these individual disposal sites would be possible as a single cluster site. It was conducted by compiling and summarizing existing information regarding the existing conditions of the individual sites. No sampling was conducted for the Phase I ERS.

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EXECUTIVE SUMMARY

This Phase I Ecological Reclamation Study (ERS) Report presents the findings of the ecological reclamation study for the Lake Calumet Cluster Site (Cluster Site). This Phase I ERS report is considered as the first (or screening) phase in a phased approach to ecological reclamation at the Cluster Site. Phase I evaluates the feasibility of conducting ecological reclamation of this site, using readily available information (i.e., Expanded Site Investigation [ESI] reports) and limited site visits. No sampling was conducted as part of Phase I. Based on the results of this Phase I report, a decision can be made on whether to proceed with evaluating the ecological reclamation of the site. Phase II will address data gaps and present the details of an ecological reclamation design. Future phases will involve the implementation of the Final Ecological Reclamation Plan.

This ERS was conducted by Roy F. Weston, Inc. (WESTON ®) for the United States Environmental Protection Agency (U.S. EPA). Subcontractors with special expertise in terrestrial and aquatic reclamation ecology also assisted in the development of this report, including Buchanan Consulting, Inc. of Highland Park, Illinois, Conservation Design Forum, Inc. of Naperville, Illinois, and Ward Environmental Services, Inc. of Chicago Illinois.

Objectives and Scope

The objective of this study was to determine the feasibility of developing an ecological reclamation plan for the Lake Calumet Cluster Site. The proposed end use of the site is ecological open space/wildlife habitat/nature observation. The goal of the Ecological Reclamation Plan is to essentially develop a new landscape working with the physical conditions and constraints that the existing landscape provides. It is also a goal of the reclamation plan to manage the Cluster Site as a component of the local ecosystem, not as individual sites. In general, where the site is upland and dry, development of native upland

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vegetation is proposed; where the hydrology is wet, wetlands or expansion/linkage of the surface water resources is proposed; and in transitional area, mesic vegetation is proposed so that the landscape as a whole follows a continuum of dry to wet, and provides a link to adjoining natural areas. The final reclamation plan must be tempered and moderated by the recognition that if contamination exists to such a degree that some type of remediation is necessary, the physical conditions of those portions of the site might be altered and the ultimate landscape cover will accordingly be adjusted. The selected reclamation plan will also eliminate, reduce, or control risks to human health and the environment.

The primary focus of the reclamation plan was on five contiguous sites (i.e.,Paxton Landfill, Land and Lakes #3 (currently known as Harbor View Landfill), Paxton Lagoons, Alburn Incinerator, and U.S. Drum II) along the north side of 122nd Street. One site south of 122nd Street (the Gun Club) was also considered in this study. Land and Lakes#3, a solid waste management site regulated by the State of Illinois pursuant to 35 IAC Parts 807 and 811 and operating under IEPA operating permit #1995-060-LFM, is considered in this study because its physical location (i.e., directly adjacent to the other sites) lends it to being integrated into a reclamation plan for the Cluster Site as a whole. Land and Lakes #3 is the only operating property included in the Cluster Site. Nonetheless, Land and Lakes Company has agreed to participate in this study so that its existing State-approved closure plans for the landfill can be modified to be consistent with the end-use plan for the area, to the extent practicable and possible. It is a long-term goal of this project that adjacent businesses and property owners may voluntarily join in expanding the Ecological Reclamation Plan to include their properties.

Community groups are concerned about the possibility of contamination at these sites and the potential impact of these sites on human health, as well as their potential impact on the sensitive ecological resources in the area. Local interests, most notably the Southeast Environmental Task Force, the Calumet Ecological Park Association, and the Southeast

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Chicago Development Commission are promoting an innovative site grouping approach to remedial and planning activities for this cluster of sites. The goals of these community groups include (Harley, 1997):

- Removal of environmental health threats arising from this cluster of waste disposal sites by employing appropriately scaled, integrated remedial activities;
- Provision for an uplands "hub" for otherwise isolated wetlands which surround the cluster of sites, thus creating a unique educational, recreational, and ecological resource within the community; and
- Enhancement of the infrastructure which serves the nearby Calumet Industrial Corridor, particularly through improved drainage and flood control.

Through the Chicago Legal Clinic, the community groups approached the U.S. EPA in April 1996 for their commitment to this locally conceived and directed effort for environmental cleanup and reclamation of this cluster of waste disposal sites. In a 23 April 1996 letter to U.S. EPA (Harley and Larkin, 1996), the Chicago Legal Clinic requested that eight disposal sites in the Indian Ridge Marsh area be clustered for two purposes: 1) group as a single site for ranking purposes by the Hazardous Ranking System (HRS) and potential listing on the National Priorities List (NPL); and 2) consideration for remediation emergencies or long-term responses. The U.S. EPA is deferring decisions on whether it would be appropriate to consider such a collective Cluster Site for HRS scoring and/or whether it should undertake formal Superfund action under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) in favor of this alternative planning process. This ERS is the first step in the planning process which will further promote the coalition of local interests and which will pursue the voluntary implementation of the Ecological Reclamation Plan for the area. As an alternative approach for determining the potential NPL status for these sites, the U.S. EPA proposed an Ecological Reclamation Study to evaluate and remediate potential contamination at the Cluster Site, given the ecological sensitivity of the area.

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As part of this ecological reclamation study, the history of the sites was investigated, the geology, hydrogeology, land use, and ecology of the sites were characterized, the extent of contamination was delineated, contaminant fate processes were described, and reclamation alternatives were developed. The following paragraphs summarize the findings on these topics.

Site Background and Setting

The Cluster Site, as defined for this Phase I ERS, consists of the following individual sites: Paxton Landfill, Land and Lakes #3, Alburn Incinerator, U.S. Drum II, Paxton Lagoons, and MSD #4 Sludge Dump (MSD #4). Only the Gun Club portion, not the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC) Stony Island Avenue Biosolids Processing facility portion of MSD #4 site is considered in this study. The MWRDGC Biosolids facility is not considered in this study because the past drum release occurred on the Gun Club portion of the MSD #4 site. Land and Lakes #3 was chosen because it is adjacent to the sites currently defined for the Phase I ERS. The sites in question have a long history of waste disposal, both permitted and unpermitted. In addition, some of the sites and surrounding areas have been filled with a variety of materials, including municipal solid waste, steel/iron slag and road construction debris.

Paxton Landfill is composed of several inactive landfills. Paxton I, LHL #1, and LHL #2 landfills are at-grade landfills that accepted hazardous and non-hazardous special wastes. Paxton II landfill accepted special wastes and non-hazardous special wastes. The elevation of Paxton II is approximately 150 feet above grade.

Land and Lakes #3 is a permitted, active landfill which has been designed and is operated in compliance with Illinois Environmental Protection Agency (IEPA) regulations for sanitary landfills (Sheliga, 1996). At Land and Lakes #3, modeling results indicate that the leachate

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collection system produces an inward hydraulic gradient, resulting in groundwater remaining within the site boundaries (Cowhey, J. 1997).

The 8-acre Alburn Incinerator site is a former hazardous waste incineration and hazardous water storage/transfer operation. The site has also been used as a landfill. A U.S. EPA emergency removal action to remove all visible sources of hazardous materials from the site occurred in 1985. A 2-foot thick clay cap was placed on the site; however, the exact extent and location of the cap has not been surveyed. The 5.6 acre U.S. Drum II site is a former dump for municipal and industrial wastes and a former waste drum temporary storage and transfer facility. A U.S. EPA removal action occurred on the property in December 1984 through July 1985. Over 3,000 drums, 435 cubic yards of contaminated soil, and 62,000 gallons of standing water were removed. Removal areas were leveled, capped with clay, covered with soil, graded, and seeded. The extent of groundwater contamination is unknown for Alburn Incinerator, U.S. Drum II, and the Unnamed Parcel.

Paxton Lagoons is a 13-acre illegal dump site. A U.S. EPA removal action was completed at the site in 1990. The removal action was taken to mitigate threats posed by unlined acidic skimmer lagoons and approximately 60 drums of hazardous materials. The IEPA conducted a removal action at the same time and used a mobile incinerator to dispose of the contents of a polychlorinated biphenyl (PCB)- contaminated main lagoon, surrounding soils, and buried drums. At the MSD #4 Sludge Dump site, 202 drums of hazardous materials were discovered along Crandon Avenue. During removal, contents of some or all of the drums were released by the potentially responsible party (PRP) employees or removal contractor into wetlands along Crandon Avenue. No further cleanup associated with the drum release was conducted.

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Site Characterization

In the immediate vicinity of the Lake Calumet Cluster Site, the shallow stratigraphy of the lake plain consists of well-bedded silt and clay lacustrine deposits belonging to the Carmi Member of the Equality Formation. However, much of the Chicago Lake Plain is covered by fill that can consist of a variety of materials including soil, steel slag, debris, and household and industrial refuse. Because much of the Lake Calumet Cluster Site has been previously developed with waste disposal facilities, much of the site is covered by fill. This consists primarily of clay soil type backfill over much of the site and buried refuse along the northern and western portions of the Cluster Site. Where refuse is not present, the clay fill is approximately 10 feet thick. Municipal solid waste (MSW), MSW ash, and steel slag are the most common fill types in the Lake Calumet region. Actual visual observation of the Cluster Site and adjoining areas indicate that slag has been used for roadbeds throughout the cluster sites, a large stockpile of slag is placed on the southern edge of the U.S. Drum site, and extensive slag flats border the Paxton I Landfill site to the north. In addition, the level areas of cap material on the Paxton I site and filled areas to the east and west of Paxton Avenue in the vicinity north of the main entrance from 122nd Street appear to be a mix of clay, construction debris (bricks, paving stones, rubble), and slag. The composition and fertility of these materials apparently vary considerably as evidenced by the uneven growth of vegetation, ranging from none to dense in close proximity.

The Carmi Member lacustrine deposit is underlain by less permeable silty clay glacial till deposits. This glacial till is described as a gray silty clay that is slightly plastic and contains occasional rounded pebbles. The glacial till deposits are underlain by the extremely dense hard gray silty clay or clayey silt Valparaiso Till. This dense till (hardpan) deposits extends to a depth of approximately 100 feet below the ground surface where it overlies Silurian age dolomite bedrock.

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Two notable aquifers occur in the vicinity of the sites. Of primary interest to this investigation is the uppermost groundwater-bearing zone which occurs within the fill materials and the Carmi Member lacustrine sediments. The second, deeper aquifer occurs within the Silurian-Devonian carbonate bedrock. The two aquifers are hydraulically separated by the dense glacial till confining unit. The uppermost groundwater-bearing zone occurs between the ground surface and 20 feet below the ground surface in the silty sand lacustrine deposit. Nearly all residents within a 4-mile radius of the site are supplied by treated Lake Michigan water. No known wells using the uppermost groundwater-bearing zone as a source of water are within 4 miles of the site (U.S. Drum II ESI Report). In addition, the uppermost zone lacks production capabilities (Land and Lakes #3 ESI Report). The Silurian dolomite is productive, but it has only industrial and minimal drinking water use near the site. The City of Chicago has enacted an ordinance prohibiting the installation of new drinking water wells in the city (Chapter 11-8-385 of the Municipal Code of Chicago).

The climate in this area is classified as temperate continental. The lake effect typically increases cloudiness and precipitation, while reducing temperature extremes throughout the year.

The site is bordered to the north primarily by industrial and undeveloped properties. The 276-acre Interlake Landfill property is directly north of Paxton Landfill. This property is also known as Big Marsh. The Norfolk and Western Railroad borders the east property line, and east of the railroad is Indian Ridge Marsh and Torrence Avenue. Acme Steel is located northeast of the Cluster Site on the west side of Torrence Avenue. Directly south of the MSD #4 site is the junction of the Calumet River and Lake Calumet. To the west of the site is Stony Island Avenue, with industries on the west side along Lake Calumet (which is nearly a square mile of surface water), including Clean Harbors (which was formerly owned by Chem Clear). The former CWM Incinerator was bought by Clean

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Harbors to expand its site. The Harborside Golf Complex, owned by the Port Authority, is northwest of the site and is on top of an old Port Authority (City of Chicago) landfill. The former City of Chicago Calumet Incinerator is directly north of the golf course on 103rd Street. Immediately west of Lake Calumet and the Bishop Ford Freeway is heavy industry and the Pullman Historic District. Lake Michigan is approximately 3 miles east of the site.

The nearest residential area is located about one mile southeast of the site and is in the community of Hegewisch, although the Cluster Site is located within the Chicago community of South Deering. While the community is large in size, it is small in population (17,775) because most of the area is consumed by Lake Calumet, the Calumet River, industry, and marshlands (The Chicago Fact Book Consortium, 1990. *Local Community Fact Book Chicago Metropolitan Area, 1990.* Department of Sociology (M/C 312), The University of Illinois at Chicago, 1007 West Harrison Street, Chicago, IL as cited in Lake Calumet Study Committee Report, April 1997). The community is economically depressed and ethnically diverse.

Before this area was settled, most of the areas comprising the Cluster Site were either part of Lake Calumet or a marsh complex that extended eastward. The results of years of filling has resulted in an area that is largely upland surrounded by biologically important marsh complexes. The fill is largely vegetated by weedy annuals and short-term perennials. Where the ground tends to be wet, the vegetation is almost 100% common reed grass. There are numerous small, man-made ponds on the Cluster Site which provide some low to moderate quality habitat for aquatic resources. Higher quality aquatic resources are located near the site, including Lake Calumet, Big Marsh, Indian Ridge Marsh, and Dead Stick Pond. The site ponds and the adjacent water bodies provide food and a stopover for a variety of migratory waterfowl.

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Animals observed during the site visits by WESTON were mostly birds. A muskrat carcass was seen on the Alburn site and mice and voles were seen throughout the sites. Signs of raccoons and eastern cottontails were also observed. Wild dogs are known to roam the sites. Evidence of fox predation on a ring-necked pheasant was seen at Paxton Lagoons. Bird species observed during site visits included ring-billed gulls, little green heron, great blue heron, black-crowned night heron, blue-winged teal, killdeer, Canada goose, mallards, American kestrel, bank swallows, and barn swallows. Two hundred and five species of birds have been observed in the area, with up to seventy-one species breeding within the Lake Calumet search area (TAMS, 1991). The peregrine falcon, a federally endangered species, has been observed in Big Marsh. A large colony of the state-endangered black-crowned night herons, probably the largest in the Midwest, nests in Big Marsh (TAMS, 1991).

Nature and Extent of Contamination

In evaluating contamination at these sites, data obtained from Expanded Site Investigations (ESIs) at the individual sites was compared to available human health risk-based concentrations and ecological screening values. For human exposure scenarios, the primary soil and sediment contaminants are several carcinogenic polynuclear aromatic hydrocarbons (PAHs), PCBs, arsenic, beryllium, chromium, and manganese. It should be noted that these constituents were also measured in off-site, upgradient/sidegradient samples, suggesting that vehicular traffic, industrial land use, and slag disposal may also be contributing to contamination in the area of the Cluster Site. Based on the available soil and sediment data, the Alburn Incinerator site is the most contaminated parcel. This site is capped, though the location and extent of the cap has not been surveyed.

Groundwater contamination is also present at the Paxton landfills, and may eventually discharge to on-site and off-site surface water features.

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At the Land and Lakes #3 site, a leachate collection system has been installed, which produces an inward hydraulic gradient, restricting off-site migration of groundwater (Cowhey, J., 1997). In addition, groundwater is not used and is not expected to be used as a potable water supply. No volatile organic compounds (VOCs) or semi-volatile organic compounds (SVOCs) were detected at elevated levels in surface water, suggesting that contamination has not reached these water bodies or that transport processes have resulted in significant dilution.

More contaminants are of concern as potential threats to ecological resources. While elevated VOCs were measured in sediments, these constituents are not expected to have long-term impacts because of their volatilization potential. Contaminants that sorb to sediments (e.g.,PAHs, PCBs, pesticides, and metals) were found at elevated concentrations throughout the ponds and drainage ditches on and adjacent to the Cluster Site. However, many of these contaminants were also measured in off-site upgradient/sidegradient samples. While the lowest screening criteria were exceeded in sediments collected from U.S. Drum II, Paxton II pond, LHL #1 pond, and LHL #2 pond, no exceedances of severe levels were noted in these surface water features. The highest PCB concentration was found in a ditch along the south side of 122nd Street. The most contamination was found at the Alburn Incinerator site. Heavy metals were found in Dead Stick Pond and ditches entering the pond. In Lake Calumet, PAHs and metals in sediments are of potential concern. However, the contribution of the Cluster Site to this contamination in comparison to other nearby sites has not been determined.

Groundwater and leachate are not expected to discharge to surface water without dilution. However, the assumption of no dilution was made in this conservative evaluation of potential impacts to aquatic organisms in on-site and downgradient surface water features. In surface water, elevated metal concentrations were of concern, though similar concentrations were found in off-site, upgradient/sidegradient samples. For groundwater,

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VOCs, PCBs, and metals are of potential concern. For leachate, VOCs and metals are of potential concern. Higher concentrations were measured in groundwater and leachate than in surface water, suggesting that fate processes will cause a decrease in contaminant concentrations that are discharged to surface water.

Fate and Transport

Chemicals in surface and subsurface soil can potentially leach into groundwater. Samples collected during the ESIs show that contaminants have been detected in monitoring wells on the Paxton Landfill and Land and Lakes #3 properties. This shows that surface and subsurface soil contamination can affect the groundwater migration pathway. However, at the Land and Lakes #3 site, a leachate collection system has been installed, which produces an inward hydraulic gradient, restricting off-site migration of groundwater (Cowhey, J., 1997). Capping of the landfills and the other sites will restrict precipitation from infiltrating the soil and wastes that remain on the site. Establishment of vegetation will also aid in capturing precipitation, limiting additional groundwater contamination.

Chemicals in surface soil could potentially enter the atmosphere via dust entrainment or vaporization. While most of the source areas are covered with vegetation or capped, others are not. Establishment of vegetation throughout the sites will restrict dust formation, thus greatly reducing this migration pathway.

Sheet erosion of contaminants could occur where contamination is at the surface, where the site has not been capped, and/or where surface water management systems have not been constructed. Some of the sites have been capped. Paxton Lagoons has been capped, portions of U.S. Drum II and Alburn Incinerator have been capped, and closed portions of Land and Lakes #3 have been capped, while the active portion will be capped as part of closure activities. U.S. Drum II, Paxton Lagoons, and the Alburn Incinerator have been

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seeded. The western 18 acres of Land and Lakes #3 has been certified closed and seeded. In addition, the entire south and southeastern portions of the Land and Lakes #3 site have been covered and seeded (Cowhey, M., 1997). Vegetation will also restrict runoff of contaminants. Since there is some potential for soil contaminants to migrate to surface water, this may be a primary migration pathway at the Cluster Site.

Groundwater is potentially the primary contaminant transport pathway associated with the Cluster Site. A groundwater bearing zone occurs from between the ground surface and 20 feet below ground surface (bgs) within the fill material and the Carmi Member lacustrine sediments that underlie the area. However, exposure to groundwater does not represent a significant exposure pathway for human receptors because drinking water in this area is supplied from Lake Michigan and installation of new wells is prohibited by a city ordinance. The potential for horizontal migration of the contaminant plume poses a future threat to surface water and wetland habitat in close proximity to the site. Chemicals that sorb to organic materials in an aquifer (e.g., organic carbon) are retarded in their movement to groundwater. The sorbed chemical travels at a linear velocity that is lower than groundwater flow velocity due to retardation. By establishing a vegetative cover on the sites, infiltration can be reduced, which in turn will reduce groundwater flow.

In addition to horizontal migration, the contaminants of potential concern (COPCs) can migrate vertically. However, vertical migration will be at a much slower rate. Contaminants have been detected in the shallow groundwater-bearing unit. Based on the geology and hydrogeology of the area, vertical migration of contaminants is expected to be restricted by a dense glacial till confining unit overlying the Silurian-age bedrock aquifer.

Elevated concentrations of VOCs were measured in shallow wells on Paxton Landfill during the ESIs. In addition, elevated concentrations of VOCs have been measured in the open leachate sumps on the Paxton Landfill. Thus, migration of VOCs to the atmosphere is a

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limited migration pathway at the Cluster Site. Contaminants in the shallow groundwater could also migrate to the surface waters on the property, drainage ditches that run through and adjacent to the sites, or to off-site surface water bodies including the Calumet River, Lake Calumet, and Dead Stick Pond. Surface water on the sites includes a variety of small ponds and a network of drainage ditches that eventually discharge off site. The PAHs and metals detected in sediments would be expected to move slowly from the surface water system and would likely remain bound to soil and sediments directly adjacent to the water. By developing a leachate collection system for the Paxton landfills and by establishing a vegetative cover that limits infiltration, these migration pathways can be reduced.

Elevated concentrations of VOCS were also measured in shallow wells at Land and Lakes #3 during the ESI. However, at the land and Lakes #3 site, the shallow perched zone was excavated and the contaminated materials in the shallow zone were placed in a lined, permitted landfill cell (Cowhey J., 1997). In addition, a leachate collection system was installed at Land and Lakes #3 that induces an inward hydraulic gradient, stopping the impact on this migration pathway.

Ecological Reclamation Alternatives

Both terrestrial and aquatic reclamation alternatives were developed for the Cluster Site. Reclamation alternatives assume that remediation, where needed, will take place before implementation and where remediation is not needed, reclamation may be initiated immediately. A spectrum of dry prairie to wetlands consisting of species native to the Lake Calumet region is the proposed reclamation alternative for the terrestrial landscape. It is envisioned that reclamation will be an ongoing long-term process at the site. A short-term goal will be to improve soil conditions through addition of biosolids and/or tilling in existing vegetation to allow for establishment of native grasses and forbs, whose diversity will be increased over the long term as the quality of the site improves. Elements of the terrestrial

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reclamation plan are experimental and should be first attempted on a test plot basis. A commitment to long-term management, focused primarily on burning, is necessary for the success of the terrestrial reclamation. Native vegetation in this biome has evolved with fire; therefore, fire has become a necessary component of a successful system. Without it, old field vegetation will develop. By establishing a vigorous vegetative cover on the site, exposure to residual contamination can be restricted. Vegetation will limit dust formation and will slow infiltration into soil. In addition, the native prairie species will build up the soil cover on the site, will capture precipitation, and will help alleviate flooding in the area. End uses of the site may include wildlife habitat, nature observation, and open spaces.

Several small ponds are scattered through the Cluster Site. Some degree of enhancement is the recommended reclamation alternative for most of the ponds. By enhancing the ponds, more intolerant aquatic species (i.e., sensitive) can become established, and over the long-term, stable, higher quality aquatic communities can be attained. It is not anticipated that any of the ponds will support a sport fishery. Because of the poor quality of the aquatic habitat and the potential for more extensive contamination, it is recommended that the pond at the Alburn Incinerator be filled to either increase the terrestrial habitat on this property, or to create a parking lot or other non-ecological facility. The larger ponds can be used for various purposes, such as education, ecological experiments, and nature observation. All of the ponds will add to the aesthetic value of the area.

Overall, ecological reclamation of the Cluster Site will take into account the anticipated needs of the local community and the larger Chicago regional community, including:

- Passive recreation —natural trails, scenic observation points.
- Wildlife habitat —increased diversity of habitats attracting and supporting wildlife.

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- Economic —increased desirability for businesses and people to locate in the area.
- Health —effective remediation of environmental contamination.

Conclusions and Recommendations

Based on the information gathered as part of this Phase I ERS, ecological reclamation may be a viable option for the Cluster Site. Proceeding with Phase II of this study, which will focus on the ecological reclamation design, should be considered. As part of Phase II activities, there are several topics that require further examination, including data gaps, funding sources, and public input. Costs were not explored in the Phase I evaluation because it is anticipated that the project will be gradual, and maybe experimental, with work implemented over a number of years. Preliminary costs should also be estimated during Phase II.

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SECTION 1
INTRODUCTION

The United States Environmental Protection Agency (U.S. EPA) issued a Work Assignment Form (WAF) to Roy F. Weston, Inc. (WESTON®) on 15 April 1997 for conducting an Ecological Reclamation Study (ERS) of the Lake Calumet Cluster Site in Chicago, Illinois (Work Assignment No. 91-5EF3). The scope of the work assignment was to combine the most recent investigative information for the sites. This information would be evaluated to determine present site conditions and whether it is feasible to ecologically reclaim these sites. This report presents the results of the Phase I ERS.

The Lake Calumet Cluster Site, as defined for this Phase I ERS, includes the following individual sites: Paxton Landfill, Land and Lakes #3 (currently known as Harbor View Landfill), Alburn Incinerator, U.S. Drum II, Paxton Lagoons, and MSD #4 Sludge Dump (see Figure 2-1). The MSD #4 Sludge Dump site is divided into two parcels. The northeastern parcel is operated as a gun club; the remainder of the area is owned by the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC) and is operated by the MWRDGC as the Stony Island Avenue Biosolids Processing (Stony) facility. Land and Lakes #3 is the only operating facility included in the Cluster Site. None the less, Land and Lakes Company has agreed to participate in this study so that its existing State-approved closure and post-closure plans for the landfill can be modified to be consistent with the end-use plan for the area, to the extent practicable and possible.

Initially, the primary focus of the reclamation plan is on the contiguous sites north of 122nd Street (i.e., Paxton Landfill, Land and Lakes #3, Paxton Lagoons, Alburn Incinerator, and U.S. Drum II). Reclamation alternatives were not developed for the Stony facility, but are presented for the Gun Club because of a past release of hazardous materials on this

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property and the high quality ecological resources on the property. These sites were brought to the U.S. EPA's attention by a group of interested citizens. Because the sites are adjacent to each other, U.S. EPA agreed to create the cluster. Over the long term, it is the goal of this project that other property owners and nearby facilities in the Lake Calumet Region (e.g. Indian Ridge Marsh, Interlake/Big Marsh, SCA Incinerator, etc.) may voluntarily join in the ecological reclamation plan.

WESTON and its subcontractors have conducted three site visits and attended five community meetings to exchange information concerning the ecological reclamation of the Cluster Site. WESTON has also prepared this Phase I ERS report as part of this assignment. This Phase I ERS report is considered as the first phase (or screening phase) in a phased approach to ecological reclamation of the Cluster Site. Phase I evaluates the feasibility of conducting ecological reclamation of these sites using readily available information and limited site visits. No sampling was performed during this Phase I study, and the environmental data evaluated in this report was obtained from expanded site investigations (ESIs) for the individual sites. Based on the results of this Phase I report, a decision can be made on whether to proceed with implementation of ecological reclamation of the sites. Phase II will address data gaps (including additional field investigations) and will present the details of the ecological reclamation design. Future phases will involve the implementation of the Final Ecological Reclamation Plan, including debris removal, earthwork, and planting activities, etc.

1.1 ECOLOGICAL RECLAMATION STUDY INITIATIVE

In 1992, the Lake Calumet Study Committee proposed the concept of a Calumet Ecological Park. The Calumet Ecological Park would be an urban ecological park in the Lake Calumet area situated between the Illinois and Michigan Canal National Heritage Corridor and the

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Indiana Dunes National Lakeshore. The Calumet Ecological Park Association was created in 1993 to involve citizens and organizations in an effort to create such an entity (Lake Calumet Study Committee, April 1997). The Honorable Jerry Weller (R, 11th, IL) introduced the concept of an ecological park to the U.S. House of Representatives on 8 May 1996. On 12 November 1996, President Clinton signed the Omnibus Parks and Public Lands Management Act of 1996 (Public Law 104-333), which included a mandate (Section 816) to the National Park Service to perform a feasibility study for establishing the Calumet Ecological Park (Lake Calumet Study Committee, April 1997).

Founded in August 1980, the Lake Calumet Study Committee, under the direction of Dr. James E. Landing, has espoused the concept of a Lake Calumet Ecological Park for a number of years, presenting a conceptual plan to the Illinois Department of Natural Resources on the Illinois portion of the proposed park in 1986 (J.E. Landing, *Conceptual Plan for the Lake Calumet Ecological Park, Chicago, IL.* , Lake Calumet Study Committee, submitted to the Non-Game Division, Illinois Department of Conservation, August 1986). The Lake Calumet Study Committee has also prepared other documents on the proposed park, including: "Community Histories Involved in the Calumet Ecological Park" (April 1997), "The Lake Calumet Ecological Park" (Fourth Revision, March 1997), "Calumet Ecological Park, Brief Descriptions of the Individual Corridors" (April 1997), and "Possible Water Access Areas in the Immediate Lake Calumet Area" (May 1997).

The Lake Calumet Cluster Site is situated within the Central Lake Calumet Corridor of the proposed park (Lake Calumet Study Committee, March 1997). The contamination associated with these sites has been of concern for a long time. Historic uses of the sites include sanitary waste disposal, hazardous waste treatment and disposal, hazardous waste incineration, and unregulated waste disposal. Land use in the immediate vicinity of the sites is primarily industrial, though there are scattered tracts of natural areas which include

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prairies, marshes, and lakes. Big Marsh and Indian Ridge Marsh are directly adjacent to the Cluster Site. These marshes provide habitat for the Midwest's largest rookery of the state endangered black-crowned night heron (*Nycticorax nycticorax*).

Local interests, most notably the Southeast Environmental Task Force, the Calumet Ecological Park Association (CEPA) and the Southeast Chicago Development Commission (SCDCOM), are promoting an innovative site grouping approach to remedial and planning activities for this cluster of sites. CEPA is dedicated to establishing an urban ecological park reaching from the Indiana Dunes National Lakeshore on the east to the present boundary of the Illinois and Michigan Canal National Heritage Corridor on the west. The park would consist of a large number of nonadjacent open land sites following the waterways and lakeshore of the area, and would also highlight the historical and cultural facets of the adjacent communities. CEPA has 28 member organizations and approximately 150 individual members. Member organizations include the Southeast Environmental Task Force, the Grand Calumet Task Force, Calumet Prairie Restoration, the Sierra Club-Illinois Chapter, Lake Michigan Federation, Friends of the Park, Chicago Audubon Society, the Northeastern Illinois Planning Commission, plus many others. The mission of the SCDCOM is "to revitalize the business and residential community, improve the quality of life for all, and preserve and expand economic opportunities for the residents of the southeast side of Chicago by providing leadership and actively supporting efforts to effectively and efficiently use human, physical and financial resources for this purpose" (SCDCOM Mission Statement).

The three primary goals of the community groups involved in reclaiming these sites were presented in "A Summary of Efforts to Create an Upland Addition to the Calumet Wetlands by Reclaiming a Cluster of Waste Disposal Sites on Chicago's Southeast Side" (30 April

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1997 Meeting Notice Prepared by Keith Harley, Chicago Legal Clinic, April 1997), and are as follows:

- To remove environmental and health threats arising from this cluster of waste disposal sites by employing appropriately scaled, integrated remedial activities;
- To provide an uplands "hub" for otherwise isolated wetlands which surround the cluster of sites, thus creating a unique educational, recreational and ecological resource within the community; and,
- To enhance the infrastructure which serves the nearby Calumet Industrial Corridor, particularly through improved drainage and flood control.

These groups have enlisted the services of Mr. Keith Harley of the Chicago Legal Clinic and Dr. Kim Gray of Northwestern University's School of Engineering in evaluating the Lake Calumet Cluster Site. Mr. Harley has served as the liaison between CEPA and federal and state agencies involved in environmental investigations and cleanups at the site. The Chicago Legal Clinic has also served as host for meetings between community groups and state and federal agencies concerning the site.

At the request of the Chicago Legal Clinic, Dr. Gray and her students have studied ways to reclaim these sites through wetland creation and landfill gas reuse (Cummings, Bob and Nikki Kryda. *Final Progress Report: Assessing Wetlands Creation and Landfill Gas Reuse Projects at Site Adjacent to Indian Ridge and Big Marshes*. 13 June 1997). In this study, the extent of contamination was evaluated for the sites by comparing available site data from ESI reports with draft Illinois Environmental Protection Agency (IEPA) Tier I residential soil cleanup objectives and Class I groundwater cleanup objectives [IEPA Tiered Approach to Corrective Action Objectives (TACO), 5 November 1995]. Their comparison found that Tier I levels were exceeded for several contaminants. They also concluded that there are numerous pathways for contaminants to be transported off site by surface water. Creation

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of wetlands was proposed as a means to contain and treat this surface water, and information on the construction of wetland systems was discussed. The possibilities of wetland mitigation banking and landfill gas reuse were evaluated as means of funding the cleanup of these parcels.

Since the writing of the Cummings and Kyrda report, the IEPA TACO regulations have been finalized. In June 1997, the IEPA codified TACO (35 IL Administrative Code Part 742: Tiered Approach to Corrective Action Objectives, 5 June 1997). The corrective action objectives presented in the Cummings and Kyrda report document are draft, not final, values. To evaluate the potential for inorganic contaminants to migrate to groundwater, the Cummings and Chartae report used Toxicity Characteristic Leaching Procedure (TCLP)-based remediation objectives. However, total metal concentrations, which were measured at the sites, do not directly correlate with TCLP concentrations. Thus, these changes in regulation and differences in interpretation result in conclusions that differ from those that are presented in this ERS report. The nature and extent of contamination on the Cluster Site is discussed in Section 4 (Nature and Extent of Contamination) of the ERS report.

In addition, residential remediation objectives were used in the Cummings and Chartae evaluation. While a residential land use is considered to be the most restricted land use and under residential land use, human activities are associated with the greatest potential for exposure (U.S. EPA, 1995), this is not a reasonable assumption to make about future land use at the Cluster Site. U.S. EPA guidance (U.S. EPA, 1995) for determining future land use at Superfund sites states that remedial action objectives developed for a site should reflect the reasonably anticipated future land use. It is more realistic to consider commercial/industrial or passive recreational use of the properties. It should also be noted that groundwater ingestion is not considered to be a complete exposure pathway in this area, since residents are supplied with Lake Michigan water, the City of Chicago has enacted an

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ordinance prohibiting installation of new wells, and the shallow groundwater bearing zone is not pumpable nor does in provide a sustainable water supply. Proposed future use of the property is discussed in both Section 4 (Nature and Extent of Contamination) and in Section 6 (Reclamation Alternatives) of the ERS report.

Migration of contaminants to off-site areas is a concern for any contaminated site. Based on the available site information, the primary means of migration from these sites is groundwater discharge to surface water and surface soil erosion. The pathways of contaminant migration are discussed in Section 5 of the ERS report. The means to contain contaminants and reduce exposure of human and ecological receptors are discussed in Section 6 (Reclamation Alternatives) of the ERS report.

Through the Chicago Legal Clinic, the community groups approached the U.S. EPA in April 1996 for their commitment to this locally conceived and directed effort for environmental cleanup and reclamation of this cluster of waste disposal sites. In a 23 April 1996 letter to U.S. EPA (Harley and Larkin, 1996), the Chicago Legal Clinic requested that eight disposal sites in the Indian Ridge Marsh area be clustered for two purposes: 1) group as a single site for ranking purposes by the Hazardous Ranking System (HRS) and potential listing on the National Priorities List (NPL); and 2) consideration for remediation emergencies or long-term responses. As an alternative approach for determining the potential NPL status for these sites, the U.S. EPA proposed an Ecological Reclamation Study to evaluate and remediate potential contamination at the Cluster Site, given the ecological sensitivity of the area.

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1.2 OBJECTIVES AND SCOPE OF ECOLOGICAL RECLAMATION STUDY

Community concerns about the Cluster Site include the potential risk to humans from hazardous materials disposed of at the sites, as well as the impact of contamination on ecological resources in the area. The U.S. EPA is deferring decisions on undertaking formal superfund actions under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) in favor of an alternative planning process. This ERS is the first step in the planning process which will further promote the coalition of local interest and will pursue the voluntary implementation of the ecological reclamation plan for the area. The purpose of the ERS is to evaluate the feasibility of an Ecological Reclamation Plan for developing an ecological open space/wildlife habitat/nature observation end use of the properties that will also eliminate, reduce, or control risks to human health and the environment at the Lake Calumet Cluster Site. The goal of the Ecological Reclamation Plan is to essentially develop a new landscape working within the physical conditions and constraints that the existing landscape provides. It is also a goal of the reclamation plan to manage the Cluster Site as a component of the local ecosystem, not as individual sites. Wildlife habitat, open space, and nature observation are the proposed end use for the site, with possible inclusion of the properties into the proposed Calumet Ecological Park. Over the long term, this site may be joined with adjacent sites (e.g., Big Marsh, Indian Ridge Marsh), providing a broad diversity of ecological resources in the Lake Calumet region.

Alleviation of flooding in the area, especially along 122nd Street, is also a concern to local industry. The reclamation study also evaluates alternatives that will aid in the reduction of surface water runoff from the sites.

Presuming that this Phase I evaluation is acceptable (i.e., ecological reclamation is a viable option for these sites), the report also addresses the following issues:

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- Recommendations for future use of the Cluster Site.
- Data gaps and recommended action items that need to be addressed prior to implementation of the Ecological Reclamation Plan.
- Funding mechanisms that can be used to finance the implementation of the Ecological Reclamation Plan.
- Community involvement in development and implementation of the Ecological Reclamation Plan to ensure that the outcome of the project meets the needs of the local interests (local government, business organizations, and individuals) and the Chicagoland area.

1.3 REPORT ORGANIZATION

The reclamation study report is organized into the following sections:

Section 1, Introduction: Provides a brief overview of ecological reclamation study initiative and the objective and scope of the ERS.

Section 2, Site Background and Setting: Provides site descriptions and site histories.

Section 3, Site Characteristics: Describes geology, hydrogeology, meteorology, demographics and land use, and ecology on and adjacent to the sites.

Section 4, Nature and Extent of Contamination: Presents an analysis of the ESI data and summarizes the extent of contamination by different environmental media. Only ESI data is evaluated because this data was collected after removal activities and represents current site conditions.

Section 5, Contaminant Fate and Transport: Describes contaminant migration pathways, environmental fate of contaminants, and rate of contaminant migration.

Section 6, Ecological Reclamation Alternatives: Describes reclamation concepts and evaluates feasibility of the concepts.

Section 7, Conclusions and Recommendations: Summarizes the findings and conclusions of the ERS and discusses recommendations and data gaps.

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Section 8, References: Lists all the reference sources used in the ERS report.

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SECTION 2
SITE BACKGROUND AND SETTING

The Lake Calumet Cluster Site consists of the following individual sites: Paxton Landfill, Land and Lakes #3, Alburn Incinerator, U.S. Drum II, Paxton Lagoons, and MSD #4 Sludge Dump. The location of these sites is presented in Figure 2-1. Each individual site is briefly described in the following subsections. The property north of 122nd Street that is not within the boundaries of these sites is called the Unnamed Parcel for purposes of this report.

The information summarized in the following subsections was primarily obtained from the Final ESI Reports for these sites (with the exception of Paxton Lagoons). The Final ESI Reports are comprehensive reports that provide the most recent information on these sites. Additional information on Land and Lakes #3 was provided by Land and Lakes Company (Cowhey, M., 1997; Cowhey, J., 1997). The sites have all been placed on the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) as a result of facility inspections initiated by U.S. EPA. ESI investigations were conducted at these sites from July 1993 through December 1993.

The purpose of an ESI is stated in a U.S. EPA directive (U.S. EPA, 1992. *Guidance for Performing Site Inspections Under CERCLA.* Office of Emergency and Remedial Response. Washington, D.C. EPA/540-R-92-021) outlining site inspections under CERCLA, which states:

> The objective of the ESI is to provide documentation for the HRS package to support NPL rulemaking. Remaining HRS information requirements are addressed and site hypotheses not completely supported during previous investigations are evaluated. ESI sampling is designed to satisfy HRS data requirements by documenting observed releases, observed contamination, and

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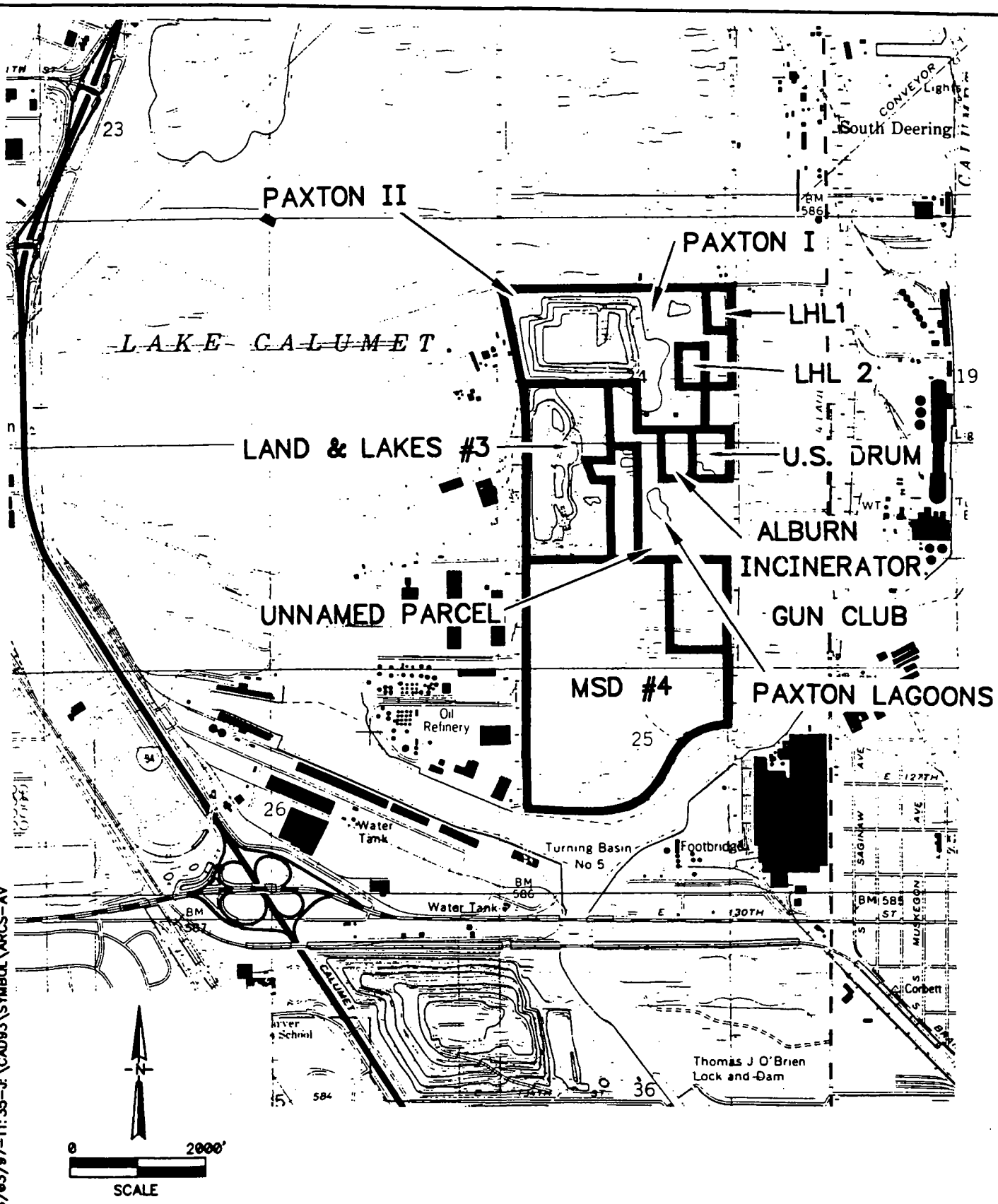

SOURCE: USGS 7.5 TOPOGRAPHIC MAP LAKE CALUMET QUAD, 1991
SITE BOUNDARIES ARE APPROXIMATE

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FIGURE 2-1

ALTERNATIVE REMEDIAL CONTRACTING STRATEGY U.S. EPA CONTRACT No. 68-W8-0089 WORK ASSIGNMENT No. 91-5EF3 DOCUMENT CONTROL No. 4500- 91-AOXI	SITE LOCATION MAP LAKE CALUMET CLUSTER SITE Chicago, Illinois

levels of actual contamination at targets. In addition, investigators collect remaining non-sampling information. Sampling during the ESI includes background and quality assurance/quality control samples to fully document releases and to attribute them to the site. Following the ESI, U.S. EPA site assessment managers assign the site a priority for HRS package preparation and proposal to the NPL.

After completion of site assessments, U.S. EPA makes a determination whether to propose a site for the NPL or for no further response action. These determinations have been deferred for the Cluster Site while the ERS is conducted.

2.1 PAXTON LANDFILL

The following information on the Paxton Corporation (Paxton Landfill) site was adapted from the ESI report (Black & Veatch Waste Science, Inc., 14 July 1995).

The Paxton Corporation (Paxton Landfill) site is located at the intersection of Paxton Avenue and 119th Street. Stony Island Avenue borders the site to the west; a Norfolk and Western Railroad right-of-way borders it to the east. The Interlake/Big Marsh property is located along the northern site border. The Land and Lakes #3 landfill is southwest of the site. The Alburn Incinerator site, open fields, and the U.S. Drum II site are southeast of the site.

Paxton Landfill is composed of several landfills that are combined under one ILD number: Paxton I Landfill (Paxton I), Paxton II Landfill (Paxton II), and the LHL Landfill (Figure 2-2). Paxton I covers approximately 47.5 acres. Paxton II covers approximately 52 acres and is composed of three parcels: Parcels I, II, and III. Of the 10 acres comprising Parcel II, five have been sold; the remainder are unused. The use of the five sold acres is unknown. The total waste disposal area at Paxton II is about 42 acres. LHL Landfill is subdivided into two

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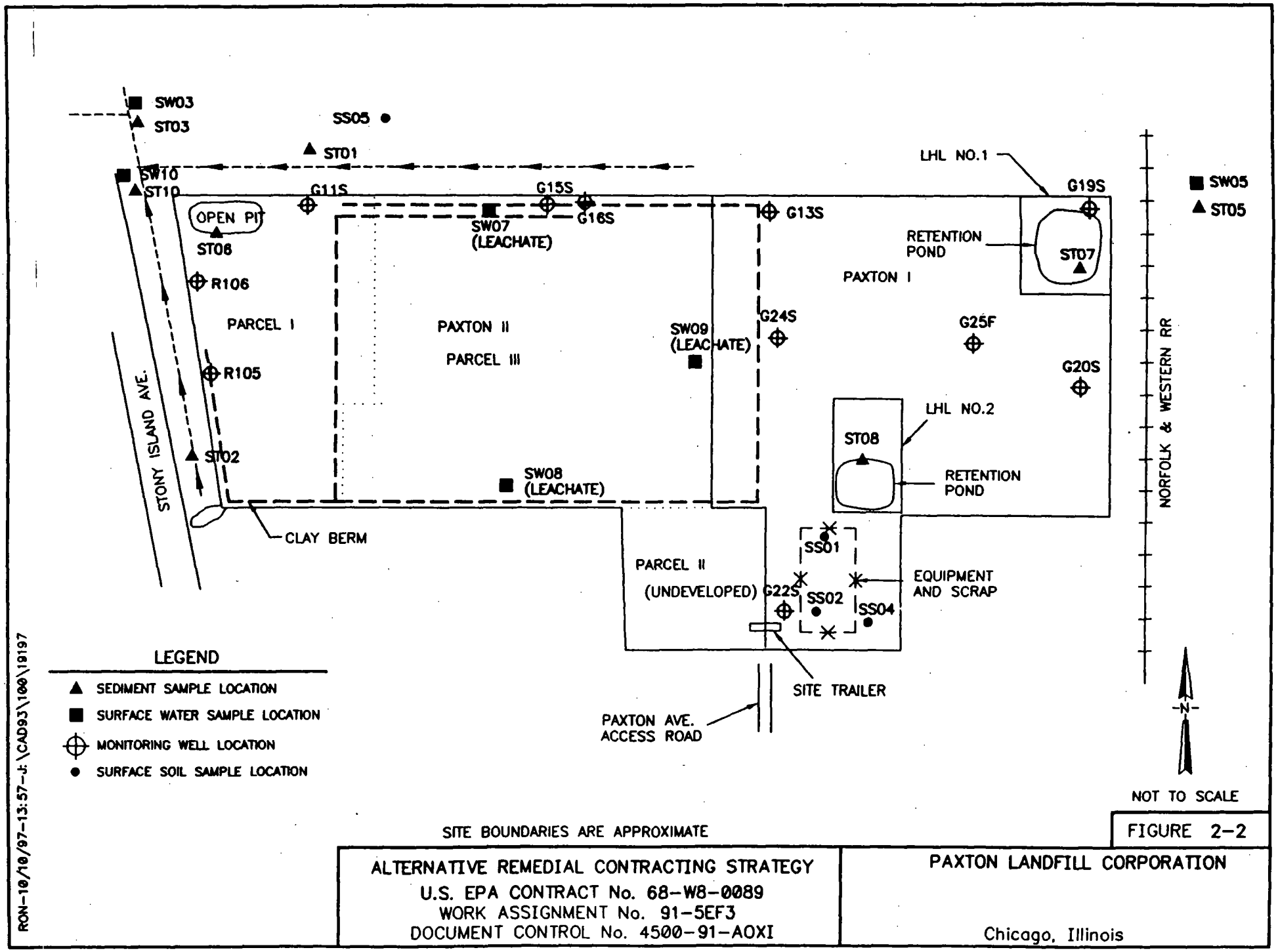

SITE BOUNDARIES ARE APPROXIMATE

FIGURE 2-2

ALTERNATIVE REMEDIAL CONTRACTING STRATEGY
U.S. EPA CONTRACT No. 68-W8-0089
WORK ASSIGNMENT No. 91-5EF3
DOCUMENT CONTROL No. 4500-91-AOXI

PAXTON LANDFILL CORPORATION

Chicago, Illinois

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parcels: LHL #1 and LHL #2. LHL #1 is an inactive 10 acre landfill located one block northeast of LHL #2. LHL #2 is an inactive 7.5 acre landfill surrounded by Paxton I. A flat area on the south side of Paxton I is used to store equipment, miscellaneous scrap, and empty drums.

2.1.1 Paxton I

Paxton I operated from 1971 though 1976. Waste disposal at Paxton I took place using the trench method. Liners were formed by going down to the hardest clay layers, about 40 feet deep, and damming up the perimeter to form clay walls to keep the water out. The landfill accepted general refuse, industrial wastes, and sludges under special waste permits authorized by the IEPA. Special wastes, listed as hazardous and non-hazardous, were accepted at Paxton I. IEPA inspections conducted at Paxton I from 1974 to 1976 noted inadequate daily cover, on-site ponding, and wastes being pushed into standing water at the bottom of trenches. Leachate collection systems and gas venting systems are non-existent for Paxton I.

Paxton I was covered with up to 20 to 30 feet of soil; the elevation of the top of Paxton I is at grade. A retention pond at the southwestern portion of Paxton I receives site surface water runoff. A second pond is in the northeastern corner of Paxton I. These ponds do not have inlet or outlet ditches.

2.1.2 Paxton II

Paxton II opened in 1976 and operated continuously until 1992. Paxton II accepted special wastes until 1980; afterwards, special wastes listed as non-hazardous were disposed of only in Parcels I and II of Paxton II. An engineered subsurface clay cutoff wall surrounds most

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of Paxton II, which was installed to prevent off-site migration of leachate from Paxton II. Most of the cutoff wall was constructed by trenching to a depth of 30 to 40 feet. The wall was keyed at least 2 feet into the underlying glacial till, and has a minimum width of 10 feet. After groundwater monitoring wells started to show signs of being affected by leachate, a second cutoff wall was installed inside a section of the northern perimeter of the first cutoff wall. A branch of the cutoff wall extends around the western and southern walls of Parcel I. This branch is at least 20 feet thick and approximately 30 feet deep and extends into the underlying till. This portion of the cutoff wall also serves as the western sidewall of the trenches in this area.

A gas venting system is not present on Paxton II. Leachate generated at Paxton II is collected and recirculated into the landfills. Leachate flows into several leachate collection sumps, most of which are placed around the northern and southern landfill borders. One sump is on the eastern side of the landfill; no sumps are located on the western side. Leachate is pumped from the sumps to a tanker truck almost daily, and is transported to the top of the landfill and discharged into two concrete pits. The liquid then infiltrates back through the landfill. Approximately 5000 gallons of leachate is recycled per day. The leachate collection system is not permitted.

Paxton II is covered with approximately one foot of material. The material used as cover is spoil from sewer and construction projects. The elevation of Paxton II is approximately 150 feet above grade and represents a distinctive promontory. An open pit is located in the northwest corner of Paxton II. This pit, permitted as a portion of a proposed leachate collection trench, is used to collect stormwater from the northwestern slope of the landfill. The pit does not have an inlet or outlet ditch. A ditch along the northern edge of the site collects runoff from the northern face of the landfill and directs the runoff to a ditch that flows north, along the western edge of the site. Runoff from the western face of the landfill

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enters the ditch. The ditch flows north of the site, turns west, and empties into Lake Calumet.

The City of Chicago closed Paxton II on 22 April 1992 because of city lawsuits concerning zoning issues. Since 1985, the City has from time to time enacted a moratorium on new or expanded landfills (Cowhey, M., 1997). Activities at Paxton II include maintaining an intermediate cover and recirculating leachate. Final closure of Paxton II is currently under litigation with the IEPA.

At the present time, the IEPA has tasked Patrick Engineering, Inc. to evaluate corrective measures for the Paxton II Landfill site. These include, but are not limited to, methane gas recovery, erosion control, leachate management, and cap improvements (Jansen, 1997).

2.1.3 LHL Landfills

Site operations and descriptions for the LHL Landfills are poorly documented. LHL #1 is described as an inactive 10 acre landfill; LHL #2 is an inactive 7.5 acre landfill surrounded by Paxton I. LHL #2 operated from 1976 until 1978. The landfill was permitted to handle refuse and construction debris, although no records that describe the waste types that were disposed of at the site were available for the ESI. Leachate collection systems and gas venting systems are non-existent for the LHL Landfills.

The records for the LHL Landfills and Paxton I Landfill suggest that similar to Paxton I, the LHL Landfills are covered by 20 to 30 feet of soil, bringing the surface up to match the surrounding grade. The LHL Landfills ceased operations in the 1970s. No operations are currently conducted at the LHL landfills.

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2.2 LAND AND LAKES #3

The following information on the Land and Lakes #3 site was adapted from the ESI report (25 March 1996). Additional information was provided by Land and Lakes Company (Cowhey, M., 1997; Cowhey, J., 1997).

Land and Lakes #3 (presently known as Harbor View Landfill) is a permitted, active landfill which has been designed and is operated in compliance with IEPA regulations for sanitary landfills (Sheliga, 1996). Land and Lakes #3 is considered in this reclamation study primarily because its physical location lends it to being integrated into a reclamation plan for the Cluster Site as a whole. The 79-acre site is bounded by 122nd Street on the south, Stony Island Avenue on the west, Paxton Landfill and Paxton Lagoon on the north and northeast. Although Land and Lakes #3 is regulated by the State of Illinois pursuant to 35 IAC Parts 807 and 811 and operates under IEPA operating permit #1995-060-LFM, Land and Lakes Company has agreed to participate in this study so that its existing state-approved closure and post-closure plans for the landfill can be modified to be consistent with the end use plan for the area, to the extent practicable and possible. A site features map (Circa 1993) is presented as Figure 2-3.

Landfilling operations began at the site in 1978. Oily wastes, solid wastes, liquid food waste, waste pigments, and industrial wastewater treatment sludge were accepted. The facility has a permit to accept municipal waste and non-hazardous special waste. In 1986, the U.S. EPA alleged that hazardous wastes were accepted at the landfill. Land and Lakes Company disputed this allegation, and in 1987 the U.S. EPA dismissed its complaint (Cowhey, M., 1997). Land and Lakes currently accepts only municipal refuse and IEPA-classified special wastes.

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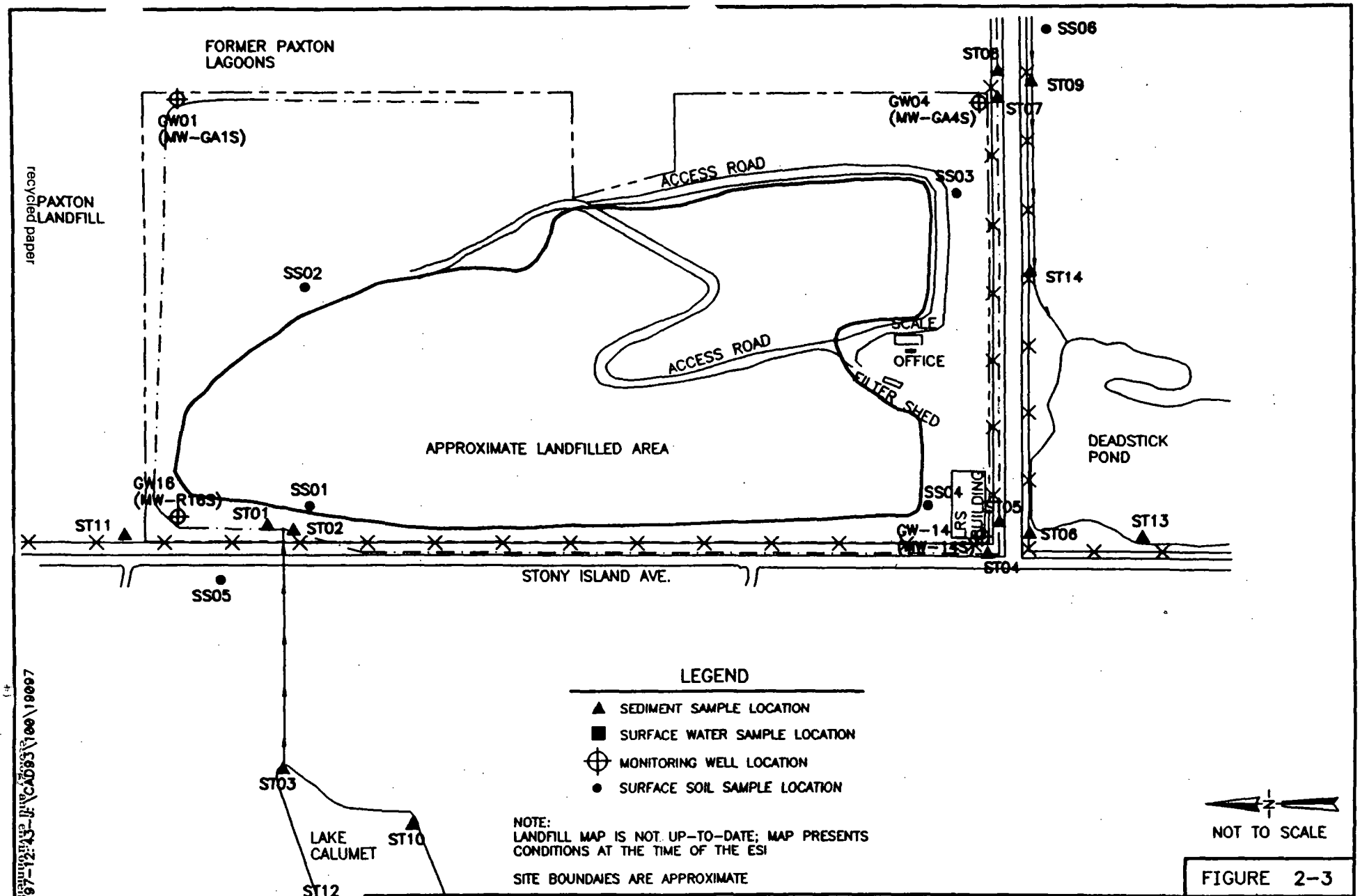

FIGURE 2-3

ALTERNATIVE REMEDIAL CONTRACTING STRATEGY
U.S. EPA CONTRACT No. 68-W8-0089
WORK ASSIGNMENT No. 91-5EF3
DOCUMENT CONTROL No. 4500-91-AOXI

LAND AND LAKES #3 LANDFILL
CIRCA 1993
Chicago, Illinois

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The area fill method, with 11 discrete cells, has been used in landfilling wastes. The natural clay layer beneath the landfill has been reworked during landfilling to prevent releases to the environment. The depth of the waste disposal is approximately 50 feet below grade; the maximum height of the landfill is approximately 70 feet above grade. Land and Lakes installed a slurry wall and berm along the eastern and northern site perimeter to prevent leachate from Paxton Landfill and Paxton Lagoons from entering the site. The entire Land and Lakes #3 facility is equipped with a leachate collection system which drains and collects leachate and transports it to a leachate management system. The facility also has a landfill gas monitoring, processing, and disposal system (Sheliga, 1996).

Land and Lakes closed an 18-acre portion of the landfill located along the western edge of the site in 1991. Closure included application of 2 feet of compacted clay and 6 inches of topsoil over the area with vegetation established on the topsoil. In addition, the entire south and southeastern portions of Land and Lakes #3 have been covered and seeded. An IEPA-approved closure and post-closure plan detailing post-closure monitoring for 30 years after landfill closure has been developed for the entire facility (Sheliga, 1996). Under IEPA permit requirements, a final cover system must be placed on the remaining landfill area after the landfill has reached capacity (IEPA, 1996).

Information provided by Land and Lakes Company (Cowhey, J., 1997) indicates the following measures have been taken to isolate Land and Lakes #3 from neighboring properties:

- Construction of Compacted Clay and Single Composite Lining Systems in all of the Cells. Each cell has a minimum of 20 ft (6 m) of very low permeability clay beneath the waste, and a minimum of 10 ft (3 m) of very low permeability compacted clay on the side slopes. Cell 6 of Phase II was installed with a single composite lining system over a minimum of 20 ft (6 m) of very low permeability clay.

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- Construction of a Slurry Wall. A slurry wall was constructed along the north and east sides of the landfill. The purpose of the slurry wall was to prevent leachate and contaminated groundwater from the adjacent sites from entering Land and Lakes #3.

- Excavation of the Shallow Perched Saturated Zone. The entire shallow perched saturated zone has been excavated at Land and Lakes #3. Contaminated groundwater and leachate from the shallow perched saturated zone was pumped to either the Liquid Recovery Systems, Inc. facility or the MWRDGC sewer for treatment and disposal. Waste materials encountered in the excavation were tested to determine if they were hazardous, and the non-hazardous wastes were placed in a lined, permitted landfill. The hazardous wastes were overpacked in drums and hauled to a hazardous waste landfill for disposal.

- Construction of a Final Cover System. A final cover system meeting the requirements of Part 807 of 35 Illinois Administrative Code (IAC) was installed and certified closed by the IEPA over a 22 acre (8.9 hectare) area in 1990. A final cover system meeting the requirements of Part 811 of 35 IAC was installed over the south and southeast slopes of the landfill in 1995. The final cover system for the remainder of the landfill will be installed as the landfill reaches final grades.

- Placement of Intermediate Cover. All areas which have not received final cover, or which are not actively receiving waste, have been covered with intermediate cover. This intermediate cover consists of a minimum of 1.0 ft (0.3 m) of compacted, low permeability clay.

- Construction of a Leachate Collection and Management System. A leachate collection system has been installed in the landfill. This leachate collection system consists of a leachate French drain, leachate collection manholes, leachate recovery manholes, and a leachate collection system and sump. Numerical modeling was performed in the 1995-060-LFM permit application, which demonstrated that the leachate collection system would reduce the leachate level in the Land and Lakes #3 landfill and induce an inward hydraulic gradient. The numerical modeling also demonstrated that there would be no migration of leachate or leachate constituents to either the upper perched saturated zone or the deep Silurian dolomite aquifer.

- Construction of Sedimentation Basins and Reworking of Ditches. Two sedimentation basins were constructed in 1995, one in the northwest and one

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in the southeast corners of the facility.

- Improved Vegetative Cover. The vegetative cover on the landfill has been replanted, mulched, and fertilized. Any areas where the final cover system was damaged by erosion have been repaired.

- Improved Crest and Drop Inlets. Crest and drop inlets to the down drains on the west slope were redesigned and reconstructed in 1995.

- Improved Drainage Ditches along 122nd Street. The drainage ditches along 122nd Street have been cleaned, regraded, and lined with an erosion mat.

- Installation of an Active Gas Collection System. An active gas collection system has been installed in the landfill.

- Construction of a Leachate Detention Pond. A double-lined leachate detention pond with leak detection was constructed in 1994. This pond has the capacity to handle over 1,000,000 gallons (3,776,000 L) of leachate. This leachate is disposed of directly to the MWRDGC sewer system in accordance with approved permits.

All of the construction was performed in strict compliance with regulatory requirements, and under comprehensive construction quality control and quality assurance guidelines and plans.

Since 1991, Liquid Recovery Systems, owned by Land and Lakes Company, has operated a wastewater treatment facility located at the southwestern portion of the site. The facility treats liquid non-hazardous wastes from off-site sources, including food wastes, leachate from off-site landfills, and other wastes requiring solidification. Treated effluent is discharged to the sanitary sewer system.

2.3 ALBURN INCINERATOR

The following information on the Alburn Incinerator site was adapted from the ESI report (19 July 1995).

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The Alburn Incinerator site covers approximately 8 acres (Figure 2-4). The site is located within a fenced, undeveloped area (marshy field) about 0.25 miles north of the Paxton Landfill entrance gate at 122nd Street.

From 1967 to 1977, the Alburn site was used for landfilling operations. Wastes were reportedly disposed in excavated pits and trenches. No details are available on the types and quantities of wastes buried on the site during this period. In 1977, Alburn initiated hazardous waste incineration and hazardous waste storage/transfer operations. In 1979, U.S. EPA issued a Resource Conservation Recovery Act (RCRA) permit to Alburn for the operation of an incinerator. Alburn incinerated/stored hazardous wastes and sludges, including paints, thinners, varnishes, chlorinated solvents, styrene, ink, adhesives, waste oils, antifreeze, varnish, petroleum, naphtha, coal tar and waste solvents. Site storage and disposal methods included landfilling, incineration, operation of a surface impoundment, and bulk liquid waste storage.

In 1982, Alburn's RCRA permit was revoked due to several RCRA violations. Alburn continued to accept bulk waste until January 1983, when the ownership of the site was acquired by American Incineration. On 5 July 1983, two on-site drums exploded from heat expansion and a subsequent chemical reaction. The U.S. EPA ordered an immediate removal action on 18 July 1983. This emergency removal actions occurred from July 1983 through August 1983. The emergency removal actions involved removal of all visible sources of hazardous materials from the site, including bulk storage tanks, drums, 5-gallon pails, and lagoon sludge. In addition, the 6 inches of topsoil, assumed to be the most contaminated, was excavated. Approximately 109 cubic yards of the soil was contaminated with polychlorinated biphenyls. A 2-foot thick clay cap was placed on site; however, the exact extent and location of the clay cap has not been surveyed.

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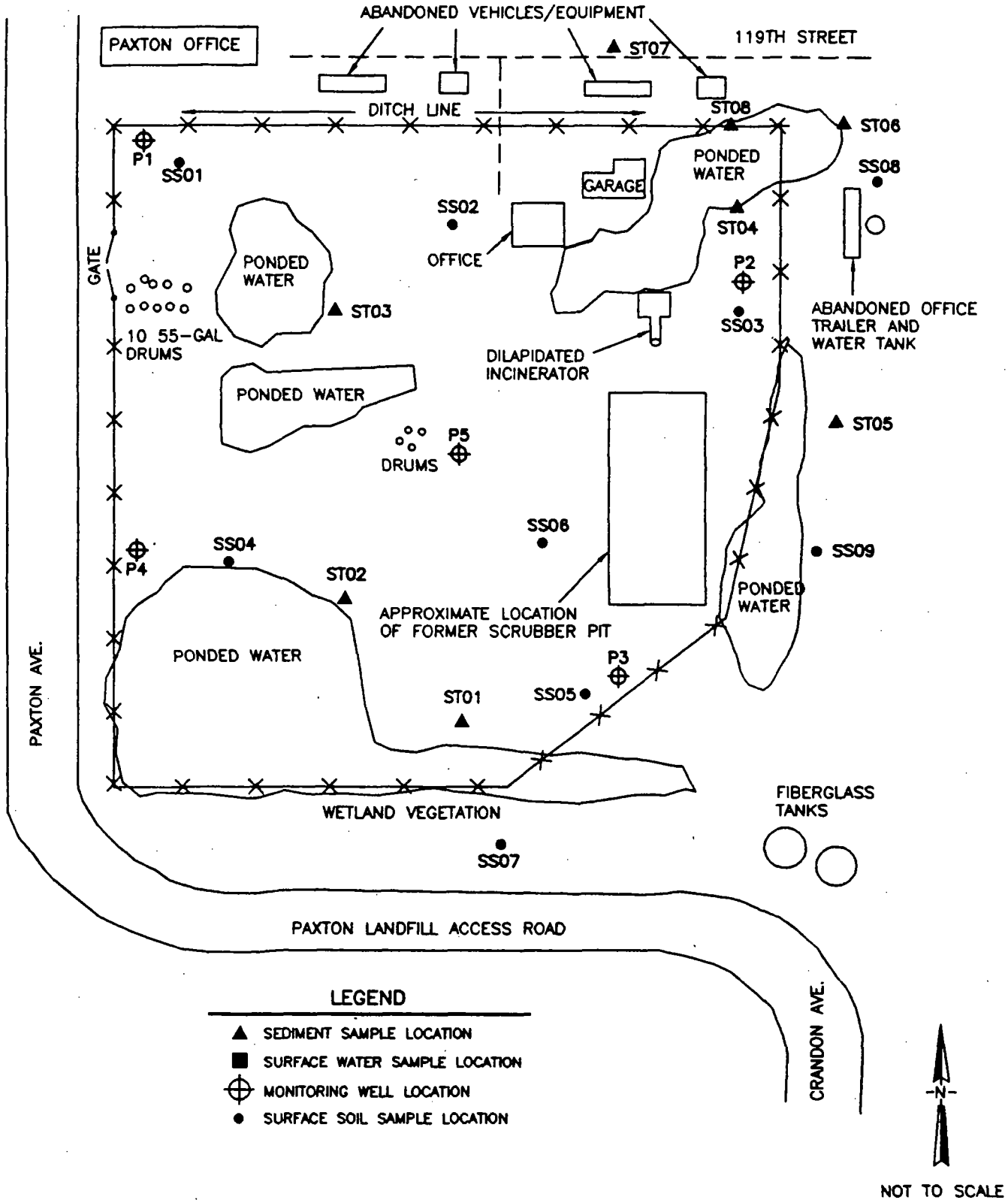

FIGURE 2-4

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ALTERNATIVE REMEDIAL CONTRACTING STRATEGY U.S. EPA CONTRACT No. 68-W8-0089 WORK ASSIGNMENT No. 91-5EF3 DOCUMENT CONTROL No. 4500-91-AOXI	ALBURN INCINERATOR Chicago, Illinois

Following the 1983 removal action, a chain link fence topped with barbed wire was constructed around the site and the site entrance gate was locked. Currently the site is inactive and unused. The remains of the incinerator are in the northeast section of the site. An office building, garage, and at least ten 55-gallon drums (assumed to contain contaminated personal protective equipment [PPE]) also remain on the property.

2.4 U.S. DRUM II

The following information on the U.S. Drum II site was adapted from the ESI Report (30 October 1995).

The U.S. Drum II site is a flat, grass-covered, 5.6 acre open field approximately 350 feet wide in the east-west direction and about 700 feet long in the north-south direction, with a concrete platform (approximately 3 feet high, 25 feet wide, and 35 feet long) in the center of the northern portion of the field (Figure 2-5). The site is inactive. Bordering the site is the Norfolk and Western railroad track to the east, a dirt and gravel road to the north (119th Street), and dirt and gravel access road to the west, and an open field, believed to be owned by Paxton Landfill Corporation, to the south. The exact location of the southern boundary is unknown. A 5-foot fence runs along the railroad tracks. A gravel or slag pile, approximately 12 feet high, 30 to 40 feet wide, and 100 feet long, is located near the southwestern site corner.

Since the 1940s, the site and adjacent areas were used as a dump for municipal and industrial wastes. During the mid to late 1970s, the site was used as a hazardous waste transfer and petroleum recovery facility, until a fire occurred in July 1975. Operations at the facility were abandoned in 1976. Alburn Company acquired the site sometime between 1976 and 1979. In 1979, the property was leased to U.S. Drum, and a waste drum

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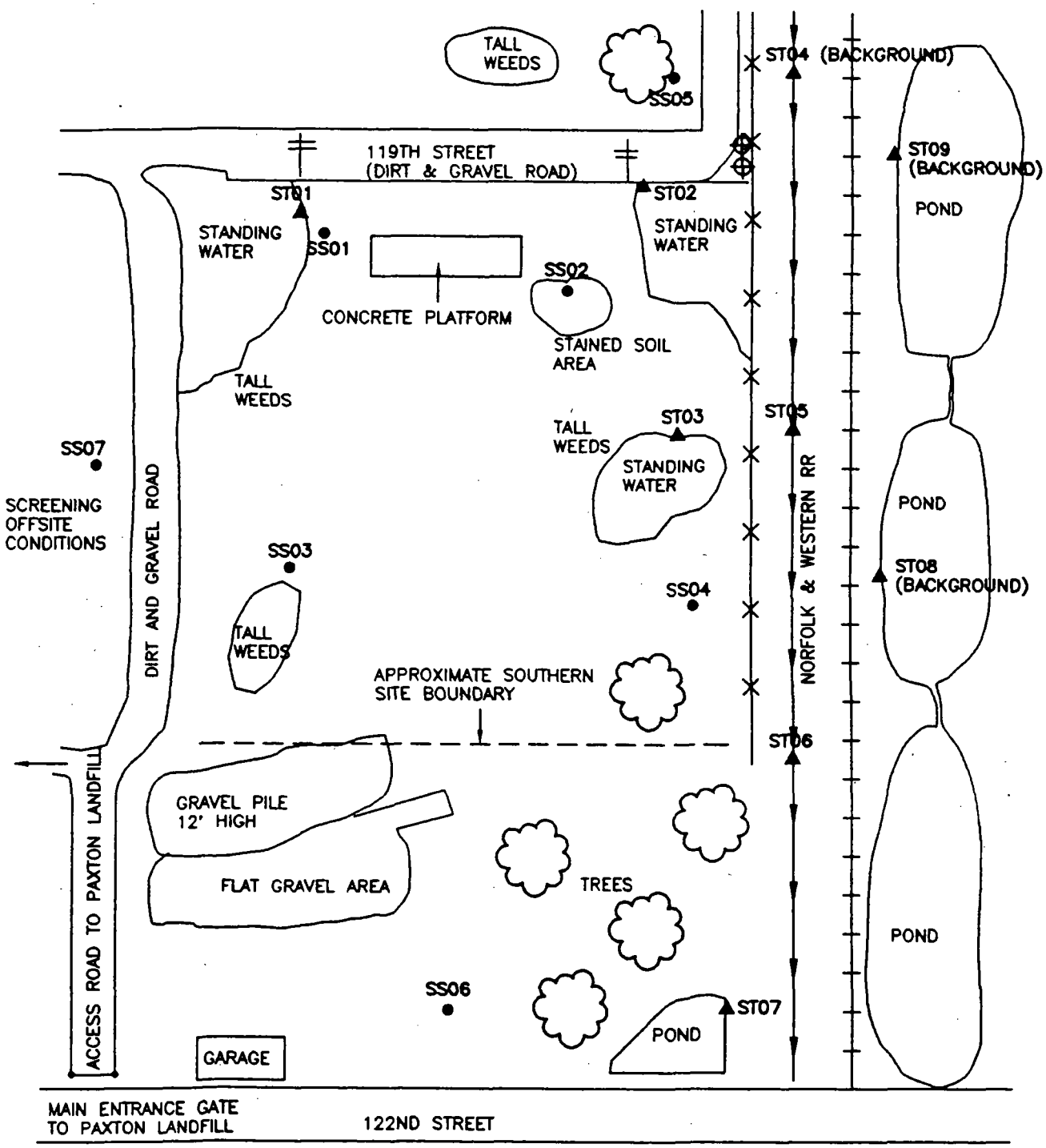

LEGEND

- ● SURFACE SOIL SAMPLE LOCATION
- ▲ SEDIMENT SAMPLE LOCATION
- ■ SURFACE WATER SAMPLE LOCATION

N

NOT TO SCALE

SITE BOUNDARIES ARE APPROXIMATE

FIGURE 2-5

ALTERNATIVE REMEDIAL CONTRACTING STRATEGY
U.S. EPA CONTRACT No. 68-W8-0089
WORK ASSIGNMENT No. 91-5EF3
DOCUMENT CONTROL No. 4500-91-AOXI

U.S. DRUM II

Chicago, Illinois

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temporary storage and transfer facility was operated at the site. The waste transfer facility was shut down in 1979.

The IEPA conducted an initial site inspection in March 1979, and found an estimated 6,000 55-gallon drums in poor condition, 4 "open dump" lagoons of assorted sludge and liquid hazardous wastes, 3 bulk liquid trucks, and approximately 25 semi-trailers. The drums were believed to contain solvents, paint wastes, tar wastes, polychlorinated biphenyls- (PCB) contaminated sludge, resins, corrosives, and cyanide compounds. There were approximately 1750 drums on site that contained carbonized and ash substances from the 1975 fire. In April 1979, U.S. Drum II was cited for numerous violations of State environmental protection laws, including operating without a permit and direct discharges of wastes to the environment.

The Cook County Circuit Court ordered the closing of the site and corrective measures in August 1979. In response to court orders, drums brought onto the property by U.S. Drum were removed. An estimated 34,100 gallons of liquid and semi-solid wastes were removed between October and December 1979. The wastes were removed without an IEPA-approved waste disposal plan. An estimated 1,750 drums, reportedly belonging to the previous site owner, were left on site inside earthen berms. IEPA reports from 1981 through 1984 indicated that many of the drums did not have caps or were bulging and leaking.

A U.S. EPA removal action occurred at the site in December 1984 through July 1985. During construction of a new access road, approximately 1,500 buried drums were discovered. It appeared that the ends of these buried drums had been cut off or punctured to allow the contents to drain into the ground prior to or at the time of burial. All observable drums (including the 1,750 drums left on the property and those found during

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road excavation), 435 cubic yards of contaminated soil and 62,000 gallons of standing water were removed. Removal areas were leveled, capped with clay, covered with soil, graded, and seeded.

Occasional standing water occurs at several points on site, along the eastern perimeter, and in the northwestern section of the site. A ditch about 4 feet deep and 5 feet wide runs along the eastern site border, along the railroad tracks. This ditch appears to drain to a small pond located south of the site, near the intersection of the railroad tracks and 122nd Street. These surface water bodies eventually discharge to the Little Calumet River approximately 0.75 miles south of the site.

2.5 PAXTON LAGOONS

The following information on the Paxton Lagoons site was adapted from the Paxton Avenue Lagoon Site Investigation (WESTON, 1989), On Scene Coordinator's Report (U.S. EPA, 1990), Site Assessment and Emergency Action Plan (WESTON, 1983), and Summary Report Field Investigation (John Mathes & Associates, Inc., 1985).

The approximately 13-acre Paxton Lagoon site was an illegal dump site since the 1950s. The site is bordered by Paxton Landfill to the north, Land and Lakes Landfill to the west, 122nd Street to the south, and Paxton Avenue to the east. The Paxton Lagoon site covers approximately 12 acres. Topography is generally flat. A site features map (pre-removal actions) is presented as Figure 2-6.

A U.S. EPA removal action was completed at the site in 1990. The U.S. EPA removal action was taken to mitigate threats posed by an unlined acidic skimmer lagoon and approximately 60 drums of hazardous materials. Approximately 2,200 cubic yards of acidic

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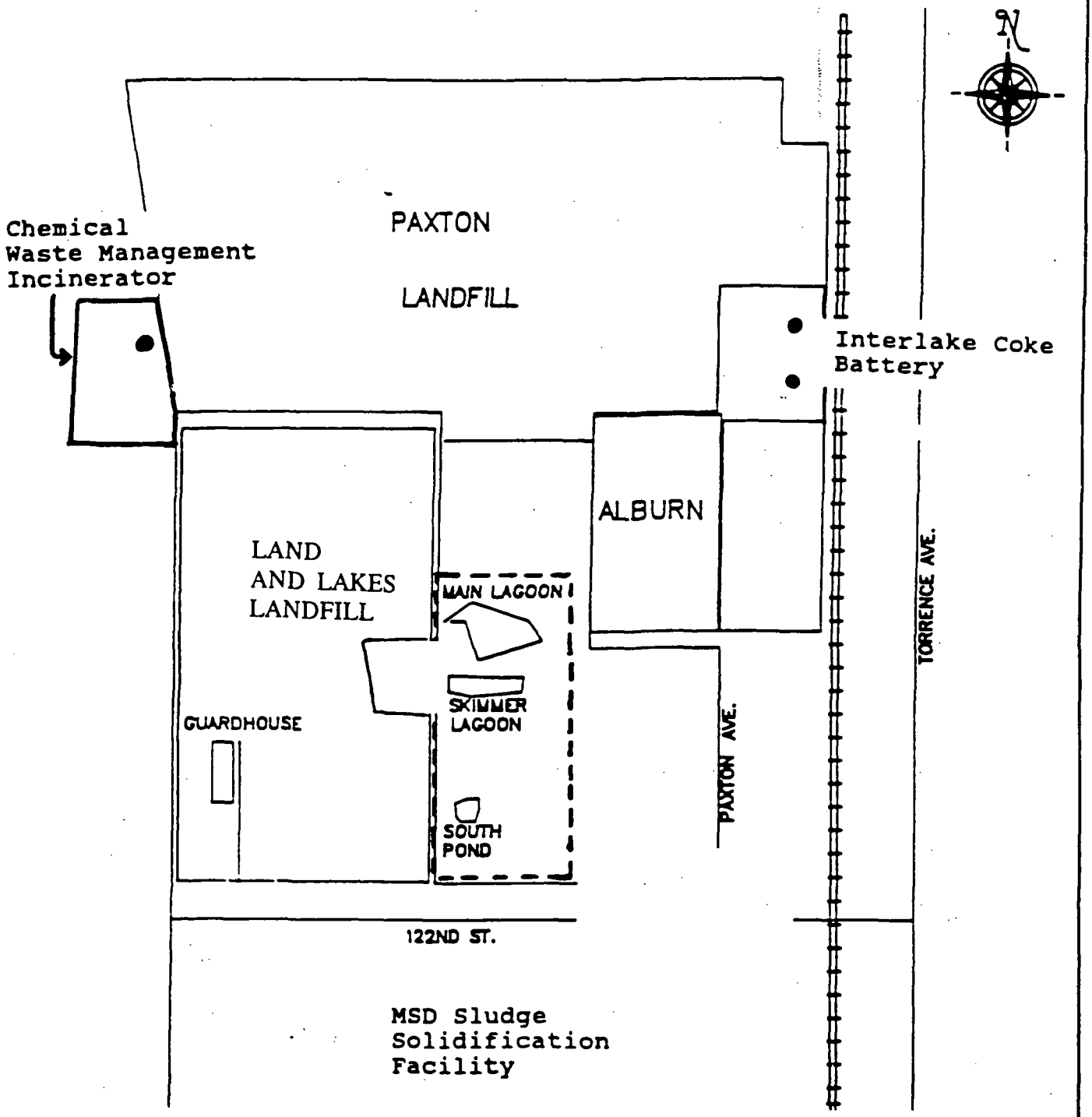

● = smokestacks

SITE BOUNDARIES ARE APPROXIMATE

SOURCE: ON SCENE COORDINATOR'S REPORT
JUNE 7, 1991

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FIGURE 2-6

ALTERNATIVE REMEDIAL CONTRACTING STRATEGY U.S. EPA CONTRACT No. 68-W8-0089 WORK ASSIGNMENT No. 91-5EF3 DOCUMENT CONTROL No. 4500- 91-AOXI	PAXTON LAGOON (PRE-REMEDIAL ACTION) LAKE CALUMET CLUSTER SITE Chicago, Illinois

lagoon contents, 44 acidic solid drums, 7 base/neutral acid drums, and one inorganic acidic liquid drum were solidified and neutralized. In addition, seven drums of corrosive, flammable liquid were incinerated off-site. A total of 385 gallons of corrosive wastes were removed from the site.

A removal action to address other waste lagoons at the site was conducted at the same time by IEPA, which operated a mobile incinerator to dispose of the contents of a PCB-contaminated main lagoon and surrounding soil. All soils incinerated were classified as characteristically hazardous RCRA waste. A portion of the soil was regulated under TSCA for PCBs (Harza, 1992). Approximately 8,000 to 10,000 cubic yards of sludge tar-like material, and the contents of 3,000 to 4,000 drums were incinerated (Cosmos, 1997). Incinerated material was backfilled and/or used for site grading. After completion of removal activities, a 4.5 foot multilayer soil cover was installed by IEPA over the entire site, consisting of a geomembrane liner, sand, clay, and topsoil. The property was fertilized and seeded. The seed mixture included low profile legumes and grasses, annual and short-lived perennials, and a temporary matrix (Harza, 1992). A surface water retention pond was dug on the southern border of the site and the sides of the site were bermed to keep surface runoff within the capped area. A 8-foot high chain-link perimeter fence was erected around the site. IEPA provides continuing operations and maintenance activities at the site.

2.6 MSD #4 SLUDGE DUMP

The following information on the MSD #4 Sludge Dump site was adapted from the ESI report (25 September 1995).

The MSD #4 Sludge Dump site is bordered on the north by 122nd Street, on the east by the Norfolk and Western Railroad, on the south by the Calumet River, and on the west by

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Stony Island Avenue. The site is divided into two parcels. The northeastern parcel is operated as a gun club; the remainder of the area is owned and operated by the MWRDGC as the Stony Island Avenue Biosolids Processing (Stony) facility. A site features map is presented as Figure 2-7.

In 1980, MWRDGC personnel were notified that drums had been discovered along the Crandon Avenue access road to the Stony facility. The contents of some or all of 202 drums were disposed of on the Gun Club property along the Crandon Avenue access road. The dumping reportedly occurred in a wetland along the access road; Troch Disposal of Chicago was responsible for the drums. The drums included drums in a dumpster that was stolen from Troch Disposal and additional drums found on the site. Troch Disposal removed the drums in July 1980. During removal, Troch Disposal personnel or contractors released contents of some or all of the drums into wetlands on both sides of Crandon Avenue. An IEPA representative informed Troch Disposal personnel and management that the dumping was illegal, contaminated soil would have to be removed, and confirmatory sampling would need to be conducted. Follow-up visits to the site by IEPA representatives found that a thin layer of soil was applied to areas saturated with waste materials, no further cleanup activities associated with the drum release were detected, and no sampling was conducted.

In 1983, U.S. EPA collected sediment samples from the Lake Calumet area. One sample was collected from the ditch along 122nd St., which was downgradient of the drum release. This sample contained elevated levels of organic and inorganic constituents. Elevated levels of inorganics were also identified in other samples collected from ponds and ditches near the Stony facility.

On 19 September 1984, a U.S. EPA Field Investigation Team conducted a site inspection; however, the drum release location could not be identified. A U.S EPA Preliminary

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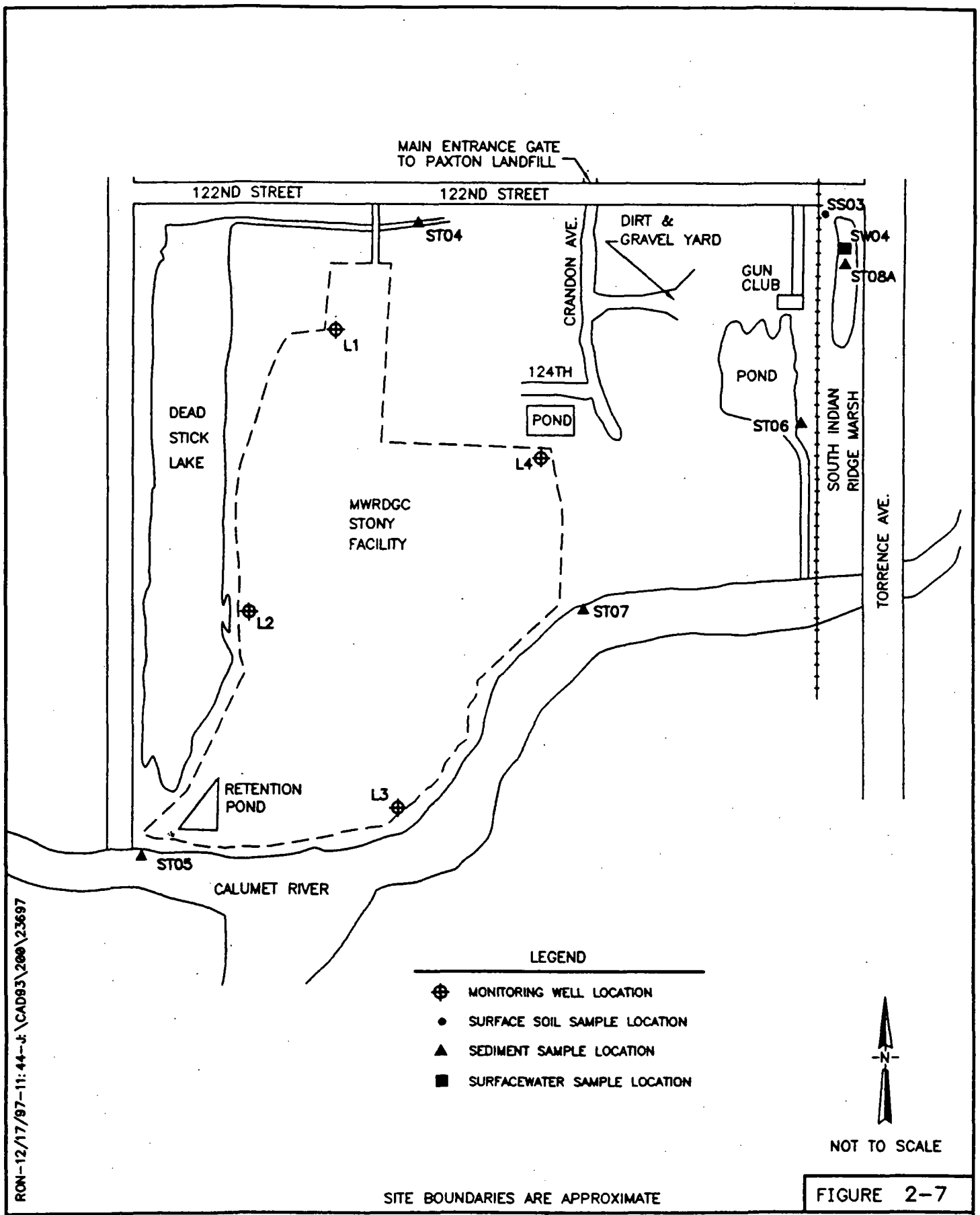

SITE BOUNDARIES ARE APPROXIMATE

FIGURE 2-7

ALTERNATIVE REMEDIAL CONTRACTING STRATEGY U.S. EPA CONTRACT No. 68-W8-0089 WORK ASSIGNMENT No. 59-5EF3 DOCUMENT CONTROL No. 4500-91-AOXI	MSD#4 SLUDGE BARREL DUMP Chicago, Illinois

Assessment Reassessment was conducted in October 1991. This assessment included a literature review and site visit. The drum release location could not be identified, though the site was assigned a medium priority and sampling was recommended to determine whether target receptors have been affected by the drum release, the possible release of sludge components before the regulation of the sludge drying facility, and the possible lead contamination in the sediments from lead shot. The sampling portion of the ESI was conducted in July 1993.

2.6.1 Gun Club

The Gun Club site covers approximately forty to sixty acres (Figure 2-8). Two ponds and several areas of wetland vegetation are on the gun club property. The Gun Club building, an outhouse, a small dock, and two skeet launching sheds are at the northern end of the pond on the eastern boundary. The site is an active facility used as a gun club.

2.6.2 Stony Facility

The Stony facility covers approximately 195 acres. Before 1980, the Stony facility area was used for disposal of dredged material from the Calumet River. The Stony facility is active and is operated in compliance with its IEPA-issued permits. The facility receives municipal sludge, dries the sludge, and transports it to CID landfill for daily landfill cover. Approximately 250 cubic yards of sludge are hauled daily from the Stony facility. The Stony property is surrounded with a six-foot chain link fence. The office, parking lots, and weighing station are located in the northern third of the L-shaped property. Asphalt-paved sludge drying beds, installed in 1991, cover most of the property. Asphalt berms around the drying beds direct runoff to a large retention pond in the southwestern corner of the property. Solids in the runoff are allowed to settle, and supernatant fluid is released to the

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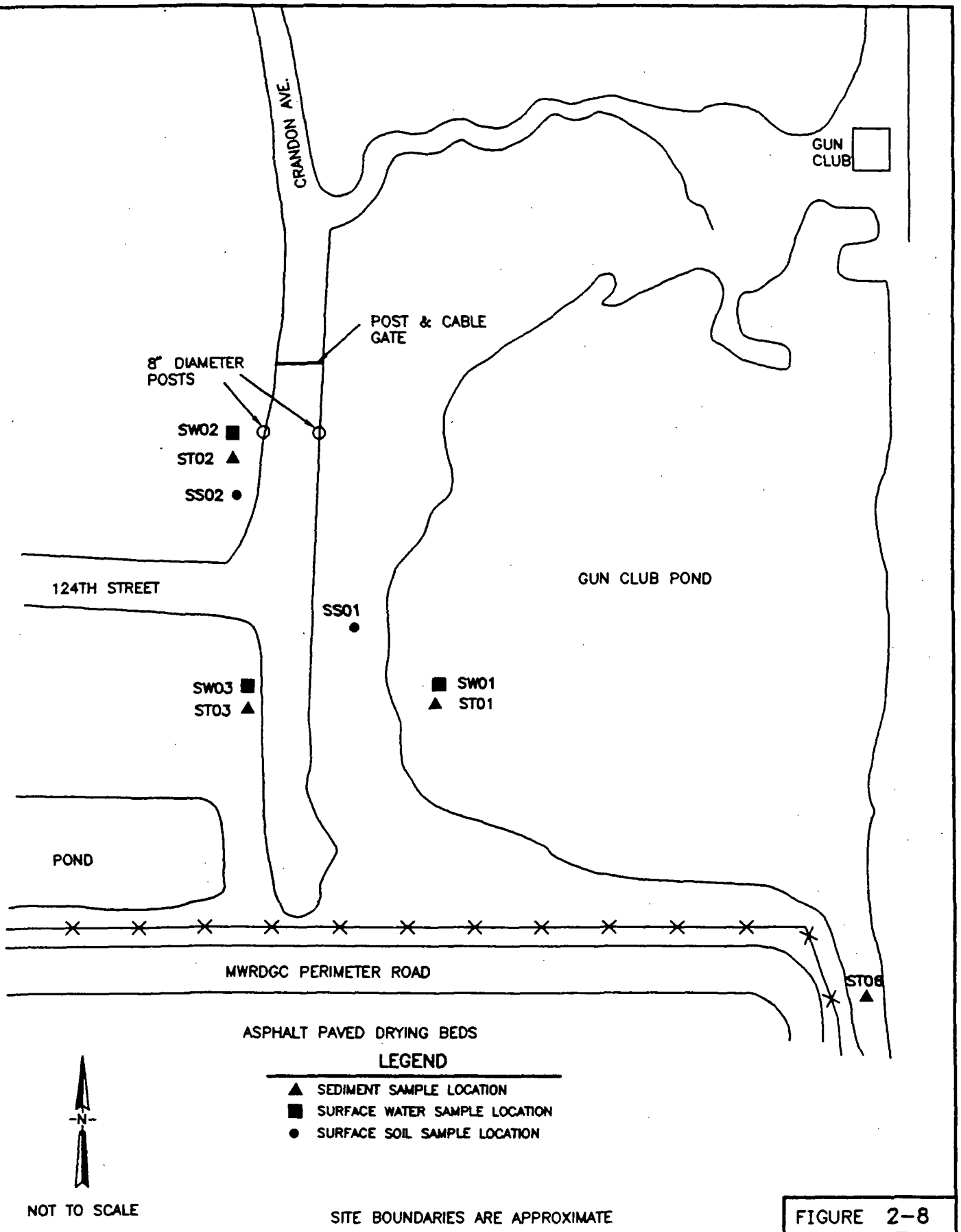

FIGURE 2-8

ALTERNATIVE REMEDIAL CONTRACTING STRATEGY U.S. EPA CONTRACT No. 68-W8-0089 WORK ASSIGNMENT No. 91-5EF3 DOCUMENT CONTROL No. 4500-91-AOXI	GUN CLUB Chicago, Illinois

sanitary sewer. Before paving the beds, the sludge was dried directly on the soil. The Stony facility will not be evaluated further in this reclamation study report because the primary focus of this Phase I report is on the adjoining sites north of 122nd Street. The Gun Club is included because of the past release.

A narrow, marshy pond called Dead Stick Pond (approximately 20 acres in size) is located along the western border of the Stony facility, along the fence. The pond receives runoff from the Gun Club and other undetermined areas to the north. Currently, the pond does not receive runoff from the Stony facility. Potential impacts from the past release on the Gun Club property and from properties north of 122nd Street to Dead Stick Pond are also considered in this reclamation study.

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SECTION 3
SITE CHARACTERISTICS

A literature review and site visits were used to characterize geology, hydrogeology, meteorology, demographics and land use, and ecology on and adjacent to the sites.

Pertinent information that was reviewed during the literature search includes National Wetland Inventory (NWI) maps, U.S. Geological Survey (USGS) topographic surveys, National Flood Insurance Maps, Cook County soil survey, geologic maps and reports for the Lake Calumet region, recent aerial photographs, and any site-specific or surrounding area ecological studies. To address such critical factors as endangered or threatened species, the Illinois Department of Natural Resources (IDNR) and the U.S. Fish and Wildlife Service (USFWS) were contacted for advice on the recorded occurrence of such species in any of the individual sites.

Natural features were qualitatively evaluated during the site visits, including geomorphic conditions (i.e.,land forms, drainage, floodplains, soils), vegetation patterns and composition (i.e., assessment of native and non-native species), wetlands, water resources (including surface and groundwater hydrology), and wildlife habitat. Such factors as the presence of remnant natural systems, or whether conditions will allow the integration of reconstructed natural systems were also assessed during the site visits.

Characteristics that were assessed during the site visits include:

- Geomorphic characteristics (e.g., landforms, surface drainage, soils) and groundwater hydrology were assessed at each site. Also, areas where reclamation alternatives may be restricted (e.g.,closed landfills) were noted. Given that the potential for reclamation, enhancement, or establishment of higher quality vegetation communities is dictated by the physical conditions

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(i.e., soils and hydrology), the physical limitations of the sites to feasibly support higher quality vegetation communities were studied.

- Wetland and upland habitats within each individual site were qualitatively characterized by dominant plant species, and the vegetation community composition, successional status, and quality were assessed.

- Land use by mammals, birds, amphibians, and reptiles was observed. These observations are supplemented by professional judgment on the overall suitability and quality of the site for use by wildlife. These judgments are based on diversity and condition/health of the habitats, along with the size and contiguity of the sites, particularly their relationship to corridors or other important natural area systems.

- Significant surface water resources (e.g., retention ponds on Paxton Landfill) were assessed to determine the relative quality of each site as an aquatic habitat for spawning fish populations. Observations were made on water clarity/turbidity, the existence of deep/shallow habitats, changeover, and communication with other aquatic systems. Water quality parameters were measured including dissolved oxygen, conductivity, pH, and temperature.

3.1 GEOLOGY

Several sources of published literature were reviewed to provide a basic understanding of the regional geological conditions of the northeastern Illinois and northwestern Indiana area, and in particular, the site-specific conditions that would be expected at the Lake Calumet Cluster Site. These sources include:

- *Summary of the Geology of the Chicago Area*, Illinois State Geological Survey (ISGS) Circular No. 460, H.B. Willman, 1971.

- *Geohydrology, Water Levels and Directions of Flow, and Occurrence of Light-Nonaqueous-Phase Liquids on Ground Water in Northwestern Indiana and the Lake Calumet Area of Northeastern Illinois*, (USGS) Water-Resources Investigations Report 95-4253, R.T. Kay, R. F. Duwelius, T.A. Brown, F.A. Micke, and C. A. Witt-Smith, 1996.

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- *Handbook of Illinois Stratigraphy*, ISGS Bulletin 95, H.B. Willman, et. al., 1975.
- *Geologic Map of Illinois*, ISGS, H. B. Willman, et. al., 1967.
- *Groundwater Quality in the Calumet Region of Northwestern Indiana and Northeastern Illinois, June 1993*. USGS Water Resources Investigation Report 95-4244. R.F. Purrelius, R.T. Kay, and S.T. Prinos, 1996.
- *Shallow Groundwater Quality and Hydrogeology of the Lake Calumet Area, Chicago, Illinois*. George S. Roadcap and Walton R. Kelly, Illinois State Water Survey. March 1994.

A summary of the information provided in these sources is presented in the following subsections.

3.1.1 Regional Geology

The Lake Calumet Cluster Site is situated within the Chicago Lake Plain subdivision of the Great Lakes Section of the Central Lowland physiographic province. The Great Lakes Section includes younger, late-Wisconsinan glacial deposits and is characterized by prominent, rough-surfaced glacial moraines and many lakes.

The Chicago Lake Plain subdivision comprises areas that were at the bottom of glacial Lake Chicago (ancestral Lake Michigan). Areas that are very near the shoreline of present-day Lake Michigan were also covered by younger glacial Lakes Algonquin, Nipissing, and Algoma. The lake plain is characterized by relatively flat topography, and includes all areas that are between the elevations of 640 feet above mean sea level (msl) and 580 feet msl (Lake Michigan shoreline).

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3.1.2 Site Specific Geology

In the immediate vicinity of the Lake Calumet Cluster Site, the shallow stratigraphy of the lake plain consists of deposits belonging to the Carmi Member of the Equality Formation. These are primarily quiet-water lacustrine sediments consisting of well-bedded silt and clay. The Carmi Member can contain occasional lenticular deposits of sand and sandy gravel that were deposited in near-shore environments that would have been associated with beaches of the various glacial lake stages. It should be noted, however, that much of the Chicago Lake Plain is covered by "made land" that can consist of various fill materials including soil, clay, steel mill slag, highway and demolition debris, municipal solid waste (MSW), MSW ash, hazardous waste, solid industrial waste, and construction/demolition debris. This fill material is presumed to come from a variety of sources, including the former City of Chicago Calumet incinerator, local industry, and nearby steel mills. Lithologic logs show slag to be the most common fill type in the Lake Calumet area. However, MSW is the most common fill type across the Cluster Site. Actual visual observation of the Cluster Site and adjoining areas indicate that slag has been used for roadbeds throughout the cluster sites, a large stockpile of slag is placed on the southern edge of the U.S. Drum site, and extensive slag flats border the Paxton I Landfill site to the north. In addition, the level areas of cap material on the Paxton I site and filled areas to the east and west of Paxton Avenue in the vicinity north of the main entrance from 122nd Street appear to be a mix of clay, construction debris (bricks, paving stones, rubble), and slag. The composition and fertility of these materials apparently vary considerably as evidenced by the uneven growth of vegetation, ranging from none to dense in close proximity.

Because much of the Lake Calumet Cluster Site has been previously developed with waste disposal facilities, much of the site is covered by made land. This consists primarily of clay soil type backfill over much of the site, buried MSW along the northern and western

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portions of the Cluster Site and MSW ash. Based on information obtained during previous investigations completed in the vicinity of the Cluster Site, where refuse is not present, the clay fill is approximately 10 feet thick.

The fill material is underlain by an approximately 5- to 15-foot-thick Carmi Member lacustrine silt and sand deposit. This deposit is described as a yellow-to-black (highly organic muck), fine grained clayey silty sand. Over much of the site, where excavating and filling has occurred, the observed thickness of this deposit likely does not represent the original thickness. Based on the topographic map, areas to the east of the Cluster Site appear to be wetlands that have not been significantly altered. In these areas, the made land may be absent and the uppermost stratigraphic unit may be the lacustrine silt and sand deposits.

The Carmi Member lacustrine deposit is underlain by less permeable silty clay glacial till deposits. These deposits occur at depths of approximately 15 to 20 feet below the ground surface where refuse is not present to approximately 35 feet below the ground surface where excavation and filling has occurred. This glacial till is described as a gray silty clay that is slightly plastic and contains occasional rounded pebbles. Some sandy clay layers are present within this glacial till deposit. Underlying the silty clay deposit is a layer of silt that ranges from approximately 1- to 4-feet-thick.

The silty clay till and silt deposits described above are underlain by the Valparaiso Till. This till deposit occurs at depths ranging from approximately 35 to 40 feet below the ground surface and consists of dark gray silty clay or clayey silt that is extremely dense, hard, and brittle. This dense till (hardpan) deposit extends to a depth of approximately 100 feet below the ground surface where it overlies Silurian age dolomite bedrock.

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3.2 HYDROGEOLOGICAL CONDITIONS

The hydrogeological conditions at the site have been defined based primarily on information reported in the USGS Report 95-4253. The results of the review of this information is presented in the following paragraphs.

Two notable aquifers occur in the vicinity of the sites. Of primary interest to this investigation is the uppermost groundwater-bearing zone which occurs within the fill materials and the Carmi Member lacustrine sediments. The second, deeper aquifer occurs within the Silurian-Devonian carbonate bedrock. The two aquifers are hydraulically separated by the dense glacial till confining unit.

The uppermost groundwater-bearing zone occurs between the ground surface and 20 feet below the ground surface in the silty sand lacustrine deposit. This is primarily an unconfined water table aquifer; however, groundwater within this zone may occur under some confining pressures where the surface is covered by clayey backfill material or refuse. Groundwater flow within this zone will typically be controlled by the topography of the land surface which is relatively flat; therefore, for the Lake Calumet region, there will be a tendency for groundwater to flow toward Lake Michigan. However, in the immediate vicinity of the Lake Calumet Cluster Site, localized groundwater flow is also influenced by land use and surface water. The shallow groundwater-bearing zone will flow toward Lake Calumet, ponds, ditches, or other local surface water bodies. In addition, the Calumet River flows along the south and east sides of the Cluster Site. The river provides a discharge point for the uppermost groundwater-bearing zone, adding to the southward and eastward component of groundwater flow. The Paxton landfills located on the western side of the Cluster Site create localized mounding in the shallow groundwater-bearing zone. The hydraulic pressure induced by the mounding affect will tend to cause groundwater to flow

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in a generally eastward direction, with flow components to the southeast and northeast. However, at Land and Lakes #3, leachate collection systems have been designed to induce an inward hydraulic gradient. Therefore, groundwater from the shallow perched saturated zone and the deep Silurian dolomite aquifer will flow towards the landfill (Cowhey, J., 1997).

Groundwater flow in the Silurian dolomite aquifer is typically in an easterly or southeasterly direction towards Lake Michigan. However, flow in this aquifer has been significantly affected over the years by a large groundwater recovery well located at SCA Incinerator west of Stony Island Avenue, and by the groundwater recovery system in the MWRDGC Tunnel and Reservoir Plan (TARP) storm drainage tunnels (Cowhey, J., 1997; USGS Report 95-4253).

Nearly all residents within a 4-mile radius of the site are supplied by treated Lake Michigan water. No known wells using the uppermost groundwater-bearing zone as a source of water are within 4 miles of the site (U.S. Drum II ESI Report, 30 October 1995). Seven or eight private wells may exist within a 4-mile radius of the sites. These wells are screened within the Silurian bedrock aquifer (U.S. Drum II ESI Report, 30 October 1995), at depths of over 200 feet (Paxton Landfill ESI Report, 14 July 1995). The closest private well is more than 2.5 miles from the site in Hegewisch (Alburn Incinerator ESI Report, 19 July 1995). In addition, the uppermost zone lacks production capabilities (Land and Lakes #3 ESI Report, 25 March 1995). The Silurian dolomite is productive, but it has only industrial and minimal drinking water use near the site. The City of Chicago has enacted an ordinance prohibiting the installation of new drinking water wells in the city (Chapter 11-8-385 of the Municipal Code of Chicago).

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3.3 METEOROLOGY

The Lake Calumet Cluster Site is situated approximately 3.5 miles southwest of Lake Michigan. The climate in this area is classified as temperate continental. The lake effect typically increases cloudiness and precipitation, while reducing temperature extremes throughout the year. The mean annual temperature in this area is approximately 50.5 °F, and ranges from a mean of 29.9 °F in January to a mean of 84.4 °F in July. The mean annual precipitation is approximately 37.38 inches (Midwestern Climate Center, 1997). Over half of the mean annual precipitation occurs during the months from April to August. The mean average snowfall is 44.8 inches, with the majority of snow falling during the months of December through February. The median length of the growing season, with a base temperature of 32 °F is 185 days; the median date of the last spring occurrence of a base temperature of 32 °F is April 19th and the median date of the first fall occurrence of a base temperature of 32 °F is October 26th (Midwestern Climate Center, 1997).

3.4 DEMOGRAPHICS AND LAND USE

The surrounding land is used for a combination of commercial, residential, and industrial purposes. Much of the area surrounding the Cluster Sites has been used for heavy industries such as steel production, petrochemical refining and storage, automobile assembly, scrap processing, and chemical manufacturing. There are many landfills, waste incinerators, wastewater treatment plants, and unregulated waste disposal facilities located in the vicinity of the site. This includes several facilities that are part of the Lake Calumet Cluster Site.

The site is bordered to the north primarily by industrial and undeveloped properties. The 276-acre Interlake Landfill property, owned by Waste Management of Illinois, Inc. (WMII) is directly north of Paxton Landfill. This property is also known as Big Marsh. The Norfolk

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and Western Railroad borders the east property line, and east of this is Indian Ridge Marsh and Torrence Avenue. Acme Steel is located northeast of the site on the west side of Torrence Avenue. Directly south of the MSD #4 site is the junction of the Calumet River and Lake Calumet. To the west of the site is Stony Island Avenue, with industries on the west side along Lake Calumet (which is nearly a square mile of surface water), including Clean Harbors (which was formerly owned by Chem Clear), and the former CWM Incinerator (which was bought by Clean Harbors to expand its site). The Harborside Golf Complex, owned by the Port Authority, is northwest of the site and is on top of an old Port Authority (or City of Chicago) landfill. The former City of Chicago Calumet Incinerator is directly north of the golf course on 103rd Street. Immediately west of Lake Calumet and the Bishop Ford Freeway is heavy industry and the Pullman Historic District. Lake Michigan is approximately 3 miles east of the site.

Most of the Cluster Site area was surveyed and divided into lots for residential development before the 1871 Chicago fire. The streets were given names, but many were undeveloped and those streets that were developed have now fallen into disrepair.

The nearest residential area is located about one mile southeast of the site is in the community of Hegewisch, although the Cluster Site is located within the Chicago community of South Deering. While the community is large in size, it is small in population (17,775) because most of the area is consumed by Lake Calumet, the Calumet River, industry, and marshlands (The Chicago Fact Book Consortium, 1990. *Local Community Fact Book Chicago Metropolitan Area, 1990*. Department of Sociology (M/C 312), The University of Illinois at Chicago, 1007 West Harrison Street, Chicago, IL, as cited in Lake Calumet Study Committee Report, April 1997). The community is economically depressed and ethnically diverse. A breakdown of the population by Chicago communities and other municipalities within approximately 5 miles of the Cluster Site is presented in Table 3-1.

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Table 3-1

Population Data for Communities in the Lake Calumet Area
Lake Calumet Cluster Site
Chicago, Illinois

Municipality	Community Area	1990 Census Population
Chicago	Burnside	3,445
Chicago	Roseland	56,593
Chicago	Pullman	9,344
Chicago	West Pullman	20,450
Chicago	South Deering	17,775
Chicago	East Side	20,456
Chicago	Hegewisch	10,136
Chicago	Chatham	36,779
Chicago	Calumet Heights	17,465
Chicago	South Chicago	40,465
Burnham	--	3,916
Dolton	--	23,930
Riverdale	--	13,637
Calumet City	--	37,840

Source: Lake Calumet Study Committee. "Community Histories Involved in the Calumet Ecological Park". April 1997.

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3.5 ECOLOGICAL ASSESSMENT

Ecological resources on and adjacent to the site are characterized in this subsection, including:

- Wetland and Upland Habitat Delineation
- Aquatic Habitat
- Wildlife Observations
- Identification of Endangered Species

3.5.1 Wetland and Upland Habitat Delineation

Before this area was settled, most of the areas comprising the Cluster Site were either part of Lake Calumet or a marsh complex that extended eastward. Beginning with the construction of the railroad in the 1880s, the character of this land began to change. The lower wetter areas were gradually filled in, first by people wanting access to hunting lodges and then gradually by development of Lake Calumet Harbor, industry, and landfill operations.

The result of years of filling has resulted in an area that is largely upland surrounded by biologically important marsh complexes. The ten feet or more of clayey fill is largely vegetated by weedy annuals or short-lived perennials. These types of vegetation characteristically do not have very extensive root systems and do not contribute very much to the infiltration capacity of the fill material. The result is such that precipitation is not absorbed, instead it runs off the surface, contributing to the problems of flooding in the area.

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With the exception of Land & Lakes #3 and Paxton II landfills, the grade is relatively flat. It is interspersed with piles of material such as slag or cover stockpiles and intentional and unintentional open water and wetland areas. Generally, the vegetation cover consists of weedy annual species. In some areas the cover is quite substantial, while some of the units have large expanses of exposed ground. Where the ground tends to be wet the vegetation is almost 100% common reed grass (*Phragmites australis*). Photographs of the Cluster Site are presented in Appendix E.

Plant inventories were recorded for Paxton I (including LHL #1 and LHL #2), Paxton II, U.S. Drum (east), U.S. Drum (west), Alburn Incinerator, Paxton Lagoons, the area west of the entry road, and the Gun Club. A floristic quality assessment (FQA) for each unit and for the entire Cluster Site was generated using *Floristic Quality Assessment in the Chicago Region and Application Computer Programs* (Wilhelm and Masters 1994). A plant inventory of Land and Lakes #3 was not performed because the site has been seeded, and the final vegetative cover for this site can be specified in the final closure plan.

Table 3-2 shows, for each unit, the number of species present (N_n= native, N_t = total), the average coefficient of conservatism (C: 0 = weedy, 10 = conservative), the floristic quality index (FQI: $\sqrt{N}*C$), and the average wetness coefficient (W: -5 = obligate wetland, 5 = upland). These figures are based on only native species present. See Appendix F for a complete listing of plant species.

In general, if the average C is 3.5 or higher, or the FQI registers in the middle thirties or higher, it is relatively certain that there is sufficient native character in the site to be important in terms of a regional natural area perspective. As indicated by the data, none of the sites approaches the requirements needed to qualify as a natural area.

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Table 3-2

Plant Inventory Statistics
Lake Calumet Cluster Site
Chicago, Illinois

Unit	N_n	N_t	C	FQI	W
Paxton I	31	63	1.42	7.90	0.1 (Facultative)
Paxton II	11	36	0.64	2.11	1.3 (Facultative-)
U.S. Drum (east)	15	29	1.47	5.68	-0.1 (Facultative)
U.S. Drum (west)	14	34	1.43	5.35	-0.4 (Facultative)
Alburn Incinerator	11	22	1.09	3.62	-0.7 (Facultative+)
Paxtoon Lagoons	14	41	1.14	4.28	1.0 (Facultative-)
West of Entry Road	15	37	0.73	2.84	0.5 (Facultative-)
Gun Club	25	60	1.28	6.27	-0.5 (Facultative)
Total	60	143	1.83	14.20	-0.5 (Facultative)

Source: Data collected by Conservation Design Forum, Inc. on 22 July and 25 August 1997.

Facultative = Plants with a similar likelihood of occurring in both wetlands and nonwetlands.

Facultative- = Facultative- species are considered to be drier (i.e., have a lesser estimated probability of occurring in wetlands) than facultative species.

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Table 3-3 presents the combined inventories and summarizes the types of plants that were recorded from the Cluster Site.

3.5.2 Aquatic Habitat

There are numerous small, man-made ponds on the Cluster Site. These ponds provide some low to moderate quality habitat for aquatic resources. The highest quality ponds are found on the Gun Club property. These ponds and the various other ponds in the area also provide food and a stopover for a variety of migratory waterfowl. Higher quality aquatic resources are located near the site. Dead Stick Pond is located directly south, Big Marsh is located directly north, and Indian Ridge Marsh is located east and southeast of the sites. Lake Calumet is located to the west and the Calumet River is directly south of the Gun Club property. As a fishery, the Calumet River system is generally of low quality, though species diversity is fair because of proximity to Lake Michigan. Common species include alewife (*Alosa pseudoharngus*), gizzard shad (*Dorosoma cepedianum*), carp (*Cyprinus carpio*), bluntnose minnow (*Pimephales notatus*), and bluegill (*Lepomis macrochirus*) (TAMS, 1991). Species richness, diversity and equitability of the macroinvertebrate community in Lake Calumet is low (TAMS, 1991).

A description of each pond on the Cluster Site and the aquatic biota observed in the ponds is provided in the following paragraphs.

3.5.2.1 Paxton Landfill

There are three ponds located on the Paxton Landfill site. The pond in the northwest corner of the Paxton II landfill is approximately 1.5 acres in size. A drainage ditch runs east to west along the northern border of the pond. There is no inlet or outlet drainage from

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Table 3-3

Combined Inventories and Plant Types
Lake Calumet Cluster Site
Chicago, Illinois

Unit	Native (42.0%)		Non-native (58.0%)	
	Number	Percent	Number	Percent
Tree	4	2.8	5	3.5
Shrub	3	2.1	2	1.4
Vine	2	1.4	1	0.7
Forbs	41	28.7	57	39.9
Grass	4	2.8	18	12.6
Sedge	6	4.2	--	--

Source: Data collected by Conservation Design Forum, Inc. on 22 July and 25 August 1997.

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this pond. Runoff from the adjacent landfill introduces sediment into the pond. Depositional sediment contributes to the very soft bottom, and the turbid nature of the water. The banks are moderately to highly sloped, 20 - 30°. In some areas the banks have a slope of 1:1. The depth of the pond is > 3 feet. Wind action provides vertical mixing of the water.

Water quality data collected from the Paxton II pond were adequate to support most forms of aquatic biota (Table 3-4). Low water temperature and nearly saturated dissolved oxygen levels are the greatest influences on this condition. Sediment suspended in the water column and sediments on the bottom of the pond limit the number and types of aquatic species that can be sustained.

Filamentous algae is present in the Paxton II pond, but large algal mats (floating or submerged) are absent. Small fish inhabit the pond. The fish are unidentified in that they could not be clearly identified and collection of specimens for taxonomic identification was beyond the scope of this investigation. It appears that both juvenile and adult fish are present. This is indicative of a reproducing population. However, it is possible that fish are recruited from other bodies of water during large storm events. A number of aquatic organisms were observed, including species of odonates (dragonflies) and hemipterans (true bugs). Several dead crayfish were also seen. There was no indication as to how the crayfish were introduced to the pond.

There are two stormwater retention ponds within the Paxton I portion of the Paxton Landfill. The ponds are designated as LHL #1 pond and LHL #2 pond.

LHL #1 Pond—This pond is in the northeast corner of Paxton I and is approximately 1 to 1.5 acres in size. The aquatic habitat is lacustrine. Thick stands of common reed grass

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Table 3-4

Water Telemetry on 25 August 1997
Lake Calumet Cluster Site
Chicago, Illinois

Site	Temperature (°C)	Conductivity (umhos)	pH	Dissolved Oxygen (mg/L)
Paxton Landfill				
Paxton II Pond	22.5	1,058	8.1	
LHL #1 Pond	24.0	666	8.5	8.0
LHL #2 Pond	23.3	1,110	7.8	7.8
Alburn Incinerator				
Pond 1	25.0	2,230	7.8	5.9
Other Aquatic Resources				
Unknown Pond 1	22.7	1,630	7.7	8.1
Unknown Pond 2	--	--	--	--
Unknown Pond 3	23.1	6,420	8.3	6.8
Gun Club				
Pond 1	23.6	1,171	8.9	--
Pond 2	24.0	1,721	8.9	8.5

Notes:
Air temperature was 27°C.
-- = Data not collected.

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dominate the banks, but other herbaceous plants are also present. The presence of common reed made it difficult to estimate the depth of the pond. Wind action provides vertical mixing of the water in the pond. Encroachment by common reed grass into the pond is not in an advanced stage at this pond. Only the fringe of the pond has been converted to marsh conditions.

During the 22 July 1997 site visit, the water in this pond was highly turbid. However, rains the previous night could have increased the amount of suspended sediment. Water quality data were unremarkable, except for a measured pH of 8.5, which was among the higher values found in the ponds within the Cluster Site (Table 3-4).

Turtles were observed in the pond. Non-emergent macroinvertebrates (e.g., water striders, snails) were also observed in the pond. Adult emergents (e.g., dragonflies, mosquitos) were numerous, but most larval forms of these emergent species have probably already matured and left the water. The same species of fish observed in the Paxton II pond were also present in this pond.

LHL #2 Pond—This pond is approximately 0.5 to 0.75 acres in size. The west side of the pond has no bank. The other sides of the pond have low, steep banks. This pond differs from the LHL #1 pond in that the banks are much less vegetated. Some portions of the bank have no vegetation, while other portions are covered by short grasses. The substrate is firm. A percolation source was observed along the edge of the pond, with a brown material discharging to the surface. The percolate had an oily, iridescent sheen. Several dead gulls were also observed along the banks. The banks of this pond are beachlike. As previously mentioned, portions of the banks slowly slope into the water. However, the silt and clay on the bank was probably not deposited by wave action. Erosion from flood events could be responsible for the sloping banks.

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Dissolved oxygen (6.4) and pH (7.8) were lower than the values obtained at the Paxton II pond (Table 3-4). While this dissolved oxygen level was the second lowest value measured in all the ponds, it is adequate to support aquatic biota.

This pond is nearly sterile, in terms of the aquatic biota present. Just a few individuals of tolerant species were observed. No fish were observed in this pond. A crayfish hole was observed on the bank of the pond.

3.5.2.2 Alburn Incinerator

The small pond present at the Alburn Incinerator site is approximately 0.5 acres in size. Signs of possible contamination were observed in and around the pond, including several sources of percolation from below the surface, small pools with oily sheens, and brown stains on the soil. The pond is stagnant with large algal mats on the surface and the bottom. The east side of the pond has a low, gently sloped bank. The other sides of the pond are flat and the demarcation where the pond begins is unclear. Several defoliated patches were observed around the pond.

This pond yielded the poorest water quality data of any pond on the Cluster Site (Table 3-4). The dissolved oxygen level was the lowest of any site and the water temperature was the highest. The water temperature was comparable to the air temperature. These conditions lower the ecological value of the site and are not conducive to the colonization of the pond by new species.

Aquatic biota is scarce in the pond. Only the most tolerant species were observed during the site investigations, e.g., hemipterans, aquatic beetles, and fly larvae.

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3.5.2.3 Other Aquatic Resources

There are three additional small ponds with the area north of 122nd Street (named Unnamed Parcel Ponds #1, #2, and #3). These ponds currently provide limited aquatic habitat, primarily due to encroachment of common reed grass. However, the ponds have considerable ecological potential if restored and enhanced. The ponds currently support a macroinvertebrate community as diverse as the larger ponds within the Cluster Site.

No aquatic resources were found at Land and Lakes #3, Paxton Lagoon, and U.S. Drum II. The sedimentation basins on Land and Lakes #3 and Paxton Lagoons are not considered to be aquatic resources because they are man-made features designed as part of the surface water management system for the sites.

Unknown Pond 1—This small pond is north of Paxton Lagoons, east of the fence line for Land and Lakes #3, and west of Paxton Avenue. The depth of the pond is > 3 feet. The pond's substrate consists of medium to large gravel with overlying sediments. The pond is surrounded by a dense stand of common reed grass. The pond is isolated from any other aquatic resources. Encroachment by common reed grass is not in an advanced stage at this pond. Only the fringe of the pond has been converted to marsh conditions. Filamentous algae and a diversity of macroinvertebrates were observed. A leech was observed, indicating the presence of a vertebrate host. Isopods were also observed in the pond.

Water quality data collected in this pond were good (Table 3-4). The pond was found to have low water temperature, near saturated dissolved oxygen levels, and a pH less alkaline than any other pond on the Cluster Site. Conductivity was moderate in comparison to other ponds. The water quality observed in this pond would be favorable to most forms of aquatic biota.

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Unknown Pond 2—This pond is located west of Paxton Avenue and east of Paxton Lagoons. It is surrounded by an extremely dense stand of common reed grass. The aquatic habitat present measures approximately 30' x 100'. However, the original area of the pond may be three times larger. The outer portion of the pond is marsh. The pond is isolated from any other aquatic resources.

Common reed grass is presumed to have a negative impact to the water quality in this pond. The plants are causing the pond to stagnate by acting as a wind barrier. While no water quality data were collected at this pond, the dissolved oxygen levels are expected to be reduced because no vertical mixing of the water by the wind is taking place. The dense stands of common reed grass are the predominant ecological influence on the aquatic resources at this site. Duff (dead plant material not yet decomposed) and dead-standing common reed grass from previous seasons surround the pond. These remains constitute a large quantity of organic material. The same group of tolerant insects found at most of the ponds in the study area were also observed in this pond. Biota in this pond is unremarkable except for the observed presence of two species of snails.

Unknown Pond 3—This pond is next to the Norfolk & Western railroad tracks at the southeast corner of the project area. The substrate is firm and the depth is > 3 feet. Common reed grass is encroaching on the aquatic habitat, converting it to marsh. However, the problem is not as severe as the conditions at Pond 2. This pond is isolated from any other aquatic resources.

Waters in this small pond are calm, but not stagnant. The east bank of the pond is composed of stones from the railroad bed. Common reed grass and other vegetation line the remaining banks. The same group of tolerant insects found at most of the sites in the study area were also observed in this pond. Water quality data collected at this site were

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fair (Table 3-4). The conductivity was very high and the water was turbid with a brownish color. Water quality in this pond would support many species of aquatic biota, but would not support some intolerant species (i.e., sensitive).

3.5.2.4 Gun Club

There are two semi-natural ponds on the Gun Club property. The two ponds are separated by a thin strip of land (less than 50 ft wide). Water quality data obtained from the two ponds are very similar (Table 3-4). The pH level of 8.9 at the two ponds was higher than at any other pond on the Cluster Site. The high pH at these sites might be limiting to some intolerant species of organisms. Additionally, both ponds exhibit moderate turbidity.

Gun Club Pond 1—Pond 1 is just west of the Norfolk & Western railroad tracks, and just north and east of the Stony facility. This pond is the largest aquatic resource in the project area. The actual acreage of this pond is unknown, but appears to be approximately 5 acres. Pond 1 exhibits the fewest anthropogenic impacts of any of the ponds in the project area. Reportedly, this pond is a former clay pit. The banks of the pond seem stable and are covered with grass. Several trees surround the pond. These trees limit water temperature in portions of the pond by providing shade. The surface area of the pond is large and vertical mixing of the water is good. Aerial photographs and project drawings indicate that Pond 1 has a connection to the Calumet River at its southeast corner. Sheet pilings are located along the northwestern edge of the pond. The substrate is firm clay with very little sedimentation.

The banks are stable and well vegetated. Trees in the vicinity of the pond likely introduce organic material into the pond when they shed leaves and branches. This material may also influence the composition of the substrate in these ponds. Vegetation in the pond consisted

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of filamentous algae, planktonic algae, and rooted aquatic macrophytes. The same species of aquatic insects observed at the other sites were also present in this pond. Small minnows were also observed.

Gun Club Pond 2—Pond 2 is west of the southwest corner of Pond 1 and adjacent to the north side of the Stony facility. It is rectangular and slightly larger than 1 acre. Pond 2 is physically similar to the ponds north of 122nd Street, in that the banks are covered with thick stands of common reed grass. However, the surface area of the pond is too large for the reeds to block the wind totally. Limited vertical mixing of the water occurs. The substrate is firm. The water is deep at the bank, about 18 inches. Pond depth rapidly increases away from the bank.

The banks of this pond are stable. Trees in the vicinity of the pond likely introduce organic material into the pond when they shed leaves and branches. This material may also influence the composition of the substrate in these ponds. The pond is fairly trophic with lots of filamentous algae and phytoplankton. Minnows, aquatic beetles, and other insects were observed in the pond. The same species of snails observed in Unknown Pond 2 were present.

3.5.3 Wildlife Observations

Information on mammals and birds known to occur on or near the Lake Calumet Cluster Site was obtained from *Illinois-Indiana Regional Airport—Site Selection Report—Appendix E—Volume II—Technical Paper #7—Biotic Communities*, TAMS, November 1991. Sixteen species of mammals are known to occur in the area (Table 3-5). Most of these species are tolerant of habitat modification and able to survive in close proximity to humans.

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Table 3-5

Mammals Known to Occur in the Lake Calumet Area
Lake Calumet Cluster Sites
Chicago, Illinois

Common Name	Scientific Name
Opossum	*Didelphis virginiana*
Masked shrew	*Sorex cinereus*
Short-tailed shrew	*Blarina brevicauda*
Eastern mole	*Scalopus aquaticus*
Red bat	*Lasiurus borealis*
Eastern cottontail	*Sylvilagus floridanus*
Thirteen-lined ground squirrel	*Spermophilus tridecemlineatus*
Franklin's ground squirrel	*Spermophilus franklinii*
Gray squirrel	*Sciurus carolinensis*
Deer mouse	*Peromyscus maniculatus*
White-footed mouse	*Peromyscus leucopus*
Meadow vole	*Microtus pennsylvanicus*
Muskrat	*Ondatra zibethicus*
Norway rat	*Rattus norvegicus*
House mouse	*Mus musculus*
Red fox	*Vulpes vulpes*
Raccoon	*Procyon lotor*

Source: TAMS, 1991.

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Two hundred and five species of birds have been observed in the area, with up to seventy-one species breeding within the Lake Calumet search area (TAMS, 1991). Waterbirds, nonpasserine land birds, open country passerines, and woodland passerines have been sighted within the Lake Calumet area (Table 3-6). The most individuals and species observed at this site were from the waterbird group. The next largest number of individuals were in the open country passerines, while the woodland passerines had the next highest number of species (TAMS, 1991).

Animals observed during the site visits by WESTON were mostly birds. A muskrat carcass was seen on the Alburn site and mice and voles were seen throughout the sites. Signs of raccoons and eastern cottontail were also observed. Wild dogs are known to roam the sites. Evidence of fox predation on a ring-necked pheasant was seen at Paxton Lagoons. Bird species observed during site visits included ring-billed gulls, little green heron, great blue heron, black-crowned night heron, blue-winged teal, killdeer, Canada goose, mallards, American kestrel, bank swallows, and barn swallows.

3.5.4 Threatened and Endangered Species

Information on threatened and endangered species was requested from the USFWS and the IDNR. Two federal species of concern (i.e., species that are not listed under the Endangered Species Act [ESA], but are being considered for ESA listing), the black tern (*Chlidonias niger*) and common tern (*Sterna hirundo*), are known to have occurred in marshes in the vicinity of the Cluster Site (Rogner, 1997). These birds are also state-endangered species. Several species of state endangered and threatened birds and plants are known to occur in the Lake Calumet Illinois Natural Area Inventory (INAI) site (Table 3-7). The peregrine falcon, a federally endangered species, has been observed in Big Marsh.

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Table 3-6

Birds Known to Occur in the Lake Calumet Area
Lake Calumet Cluster Site
Chicago, Illinois

Common Name	Scientific Name	Breeding Status			Status	Taxa	Location
		Confirmed	Probable	Possible			
Common loon	*Gavia immer*					1	A
Pied-billed grebe	*Podilymbus podiceps*	X (A)		X (B)	SE	1	A,B
Horned grebe	*Podiceps auritus*					1	A,B,D
Double-crested cormorant	*Phalacrocorax auritus*			X (D)	SE	1	A,B,C,D
American bittern	*Botaurus lentiginosus*				SE	1	A
Least bittern	*Ixobrychus exilis*			X (B)	SE	1	B
Great blue heron	*Ardea herodias*			X (A)		1	A,B
Great egret	*Casmerodius albus*	X (B)			SE	1	A,B,C
Snowy egret	*Egretta thula*			X (A)	SE	1	A,C
Green-backed heron	*Butorides striatus*		X (A,B)			1	A,B
Little blue heron	*Egretta caerulea*				SE	1	C
Black-crowned night heron	*Nycticorax nycticorax*	X (A,B)			SE	1	A,B
Yellow-crowned night heron	*Nycticorax violaceus*					1	A,B
Canada goose	*Branta canadensis*	X (A,B,D)				1	A,B,D

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Table 3-6

Birds Known to Occur in the Lake Calumet Area
Lake Calumet Cluster Site
Chicago, Illinois
(Continued)

Common Name	Scientific Name	Breeding Status			Status	Taxa	Location
		Confirmed	Probable	Possible			
Wood duck	*Aix sponsa*			X (A)		1	A,B
Green-winged teal	*Anas crecca*		X (C)	X (B)		1	A,B,C
Mallard	*Anas platyrhynchos*	X (A,B,C)				1	A,B,C
Northern pintail	*Anas acuta*					1	A
Blue-winged teal	*Anas discors*	X (C)	X (A,B)			1	A,B,C
Northern shoveler	*Anas clypeata*					1	A,CB,
Gadwall	*Anas strepera*			X (C)		1	A,C
Ring-necked duck	*Aythya collaris*			X (C)		1	A,C
Greater scaup	*Aythya marila*					1	A
Lesser scaup	*Aythya affinis*					1	A,B,C
Scaup spp.	*Ahthya sp.*					1	D
Common goldeneye	*Bucephala clangula*					1	A,D
Bufflehead	*Bucephala albeola*					1	A,B,C,D
Hooded merganser	*Lophodytes cucullatus*					1	A,D

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Table 3-6

Birds Known to Occur in the Lake Calumet Area
Lake Calumet Cluster Site
Chicago, Illinois
(Continued)

Common Name	Scientific Name	Breeding Status			Status	Taxa	Location
		Confirmed	Probable	Possible			
Common merganser	*Mergus merganser*					1	A,D
Red-breastest merganser	*Mergus serrator*					1	A,B,D
Ruddy duck	*Oxyura jamaicensis*					1	A
Northern harrier	*Cicus cyaneus*				SE	2	A
Sharp-shinned hawk	*Accipiter striatus*				SE	2	A,D
Broad-winged hawk	*Buteo platypterus*					2	
Cooper's hawk	*Accipiter cooperii*				SE	2	B
Red-tailed hawk	*Buteo jamaiciensis*	X (B)		X (A)		2	A,B
American kestrel	*Falco sparverius*			X (A,C,D)		2	A,B,C,D
Merlin	*Falco columbarius*					2	A
Peregrine falcon	*Falco peregrinus*				FE,SE	2	A
Ring-necked pheasant	*Phasianus colchicus*			X (B)		2	A,B
Virginia rail	*Rallus limicola*		X (A,B)			1	A,B
Sora	*Porzana carolina*		X (B)	X (C)		1	A,B,C

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Table 3-6

Birds Known to Occur in the Lake Calumet Area
Lake Calumet Cluster Site
Chicago, Illinois
(Continued)

Common Name	Scientific Name	Breeding Status			Status	Taxa	Location
		Confirmed	Probable	Possible			
Common moorhen	*Gallinula chloropus*	X (A,B,C)			ST	1	A,B,C
American coot	*Fulica americana*	X (B)		X (A)		1	A,B
Sandhill crane	*Grus canadensis*				SE	1	A
Black-bellied plover	*Pluvialis squatarola*					1	A
Semipalmated plover	*Calidris pusilla*					1	A,B,C
Killdeer	*Charadrius vociferus*	X (C)	X (A,B)			1	A,B,C
American avocet	*Recurvirostra americana*					1	A
Greater yellowlegs	*Tringa melanoleuca*					1	A,C
Lesser yellowlegs	*Tringa flavipes*					1	A,B,C
Solitary sandpiper	*Tringa solitaria*					1	A,B,C
Spotted sandpiper	*Actitis macularia*		X (A,B)	X (D)		1	A,B,D
Hudsonian godwit	*Limosa haemastica*					1	A
Red knot	*Calidris canutus*					1	C
Semipalmated sandpiper	*Calidris pusilla*					1	A,C

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Table 3-6

Birds Known to Occur in the Lake Calumet Area
Lake Calumet Cluster Site
Chicago, Illinois
(Continued)

Common Name	Scientific Name	Breeding Status			Status	Taxa	Location
		Confirmed	Probable	Possible			
Least sandpiper	*Calidris minutilla*					1	A,B,C
Baird's sandpiper	*Calidris bairdii*					1	A,C
Pectoral sandpiper	*Calidris melanotos*					1	A,C
Dunlin	*Calidris alpina*					1	C
Stilt sandpiper	*Calidris himantopus*					1	A,C
Short-billed dowitcher	*Limondromus griseus*					1	A,B,C
Long-billed dowitcher	*Limnodromus scolopaceus*					1	A
Ruddy turnstone	*Arenaria interpres*					1	D
American woodcock	*Scolopaz minor*			X (A)		1	A,B
Wilson's phalarope	*Phalaropus tricolor*				SE	1	A,C
Bonaparte's gull	*Larus philadelphis*					1	A
Ring-billed gull	*Larus delawarensis*	X (D)				1	A,B,D
Herring gull	*Larus argentatus*	X (D)				1	A,B,D
Glaucous gull	*Larus hyperboreus*					1	A,D

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Table 3-6

Birds Known to Occur in the Lake Calumet Area
Lake Calumet Cluster Site
Chicago, Illinois
(Continued)

Common Name	Scientific Name	Breeding Status			Status	Taxa	Location
		Confirmed	Probable	Possible			
Iceland gull	*Larus glaucoides*					1	A,D
Thayer's gull	*Larus thayeri*					1	A,D
Caspian tern	*Sterna caspia*					1	A
Rock dove	*Columba livia*			X (A,B)		2	A,B
Mourning dove	*Zenaida macroura*		X (B)	X (A)		2	A,B
Black-billed cuckoo	*Coccyzus eythropthalmus*			X (B)		2	B
Yellow-billed cuckoo	*Coccyzus americanus*			X (B)		2	B
Common nighthawk	*Chordeiles minor*					2	A
Chimney swift	*Chaetura pelagica*	X (B)				2	A,B
Ruby-throated hummingbird	*Archilochus colubris*					2	A
Belted kingfisher	*Ceryle alcyon*	X (A)		X (B)		2	A,B
Downy woodpecker	*Picoides pubescens*	X (B)		X (A)		2	A,B
Northern flicker	*Colaptes auratus*		X (B)			2	A,B
Eastern wood-pewee	*Contopus virens*			X (B)		4	B

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Table 3-6

Birds Known to Occur in the Lake Calumet Area
Lake Calumet Cluster Site
Chicago, Illinois
(Continued)

Common Name	Scientific Name	Breeding Status			Status	Taxa	Location
		Confirmed	Probable	Possible			
Willow flycatcher	*Empidonax traillii*		X (A,B,C)			3	A,B,C
Eastern kingbird	*Tyrannus tyrannus*		X (A)			3	A
Purple martin	*Progne subis*					3	A,B
Tree swallow	*Tachycineta bicolor*	X (C)		X (A,B)		3	A,B,C
Northern rough-winged swallow	*Stelgidopteryx serripennis*	X (B)	X (A)			3	A,B
Bank swallow	*Riparia riparia*			X (A,B,D)		3	A,D
Barn swallow	*Hiundo rustica*	X (D)		X (A,B)		3	A,B,D
Blue jay	*Cyanocitta cristata*			X (B)		4	A,B
American crow	*Corvus brachyrhynchos*			X (A,B)		3	A,B
Black-capped chickadee	*Parus atricapillus*			X (A,B)		4	A,B
Winter wren	*Troglodytes troglodytes*					4	A
House wren	*Troglodytes aedon*		X (B)			3	B
Marsh wren	*Cistothorus palustris*		X (A,B,C)			3	A,B,C
Golden-crowned kinglet	*Regulus satrapa*					4	A

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Table 3-6

Birds Known to Occur in the Lake Calumet Area
Lake Calumet Cluster Site
Chicago, Illinois
(Continued)

Common Name	Scientific Name	Breeding Status			Status	Taxa	Location
		Confirmed	Probable	Possible			
American robin	*Turdus migratorius*	X (B)	X (A)			4	A,B
Gray catbird	*Dumetella carolinensis*		X (A,B)			3	A,B
Cedar waxwing	*Bombycilla cedrorum*	X (B)				4	A,B
Northern shrike	*Lanius excubitor*					3	A
European starling	*Sturnus vulgaris*	X (A)		X (B)		3	A,B
Warbling vireo	*Vireo gilvus*	X (B)		X (A)		4	A,B
Philadelphia vireo	*Vireo philadelphicus*					4	A
Tennesse warbler	*Vermivora peregrina*					4	B
Yellow warbler	*Dendroica petechia*		X (A,B)			3	A,B
Magnolia warbler	*Dendroica magnolia*					4	B
Yellow-rumped warbler	*Dendroica coronata*					4	A,B
Black-throated green warbler	*Dendroica virens*					4	A,B
Palm warbler	*Dendroica palmarum*					4	A
Northern waterthrush	*Seiurus noveboracensis*					4	B

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Table 3-6

Birds Known to Occur in the Lake Calumet Area
Lake Calumet Cluster Site
Chicago, Illinois
(Continued)

Common Name	Scientific Name	Breeding Status			Status	Taxa	Location
		Confirmed	Probable	Possible			
Common yellowthroat	*Geothypis trichas*		X (A,B)			3	A,B
Northern cardinal	*Cardinalis cardinalis*		X (B)	X (A)		4	A,B
Rose-breasted grosbeak	*Pheucticus ludovicianus*					4	A
Indigo bunting	*Passerina cyanea*	X (C)	X (A)	X (B)		3	A,B,C
American tree sparrow	*Spizella arborea*					3	A,B,C
Chipping sparrow	*Spizella passerina*					4	A
Fox sparrow	*Passerella iliaca*					4	A,B
Savannah sparrow	*Passerculus sandwichensis*					3	C
Song sparrow	*Melospiza melodia*	X (D)	X (A,B,C)			3	A,B,C,D
Lincoln's sparrow	*Melospiza lincolnii*					3	A,B
Swamp sparrow	*Melospiza georgiana*		X (B)	X (A)		3	A,B,C
White-crowned sparrow	*Zonotrichia leucophyrs*					3	B,C
White-throated sparrow	*Zonotrichia albicollis*					3	A,B
Dark-eyed junco	*Junco hyemalis*					4	A,

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Table 3-6

Birds Known to Occur in the Lake Calumet Area
Lake Calumet Cluster Site
Chicago, Illinois
(Continued)

Common Name	Scientific Name	Breeding Status			Status	Taxa	Location
		Confirmed	Probable	Possible			
Bobolink	*Dolichonyx orgzivorus*					3	B
Red-winged blackbird	*Agelaius phoeniceus*	X (A,B)				3	A,B
Yellow-headed blackbird	*Xanthocephalus xanthocephalus*	X (B)	X (A,C)		SE	3	A,B,C
Rusty blackbird	*Euphagus carolinus*					4	C
Common grackle	*Quiscala auiscula*	X (B)		X (A)		3	A,B
Brown-headed cowbird	*Molothrus ater*	X (B)		X (A)		3	A,B,C
Northern oriole	*Icterus galbula*		X (B)			4	B
House finch	*Carpodacus mexicanus*			X (B)		3	A,B
American goldfinch	*Carduelis tristis*		X (B)	X (A)		3	A,B
House sparrow	*Passer domesticus*			X (A)		3	A,C

Source: TAMS, 1991.

A = Big Marsh
B = Indian Ridge Marsh
C = Deadstick Pond
D = Lake Calumet

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Table 3-6

Birds Known to Occur in the Lake Calumet Area
Lake Calumet Cluster Site
Chicago, Illinois
(Continued)

Notes:

Status: SE = IL state endangered; ST = IL state threatened; FE = federal endangered.
Taxa:
1 = Waterbirds-loons, grebes, cormorants, swans, geese, ducks, mergansers, coots, gallinules, gulls, terns, herons, bitterns, cranes, rails, plovers, sandpipers, snipes, and phalaropes.
2 = Nonpasserine land birds—Pheasants, quail, partridges, eagles, hawks, ospreys, vultures, falcons, owls, pigeons, doves, cuckoos, nightjars, hummingbirds, kingfishers, woodpeckers, and swifts.
3 = Open country passerines—Larks, pipits, swallows, crows, mimic thrushes, starlings, weavers, buntings, and sparrows.
4 = Woodland passerines—Jays, titmice, chickadee, nuthatches, creepers, wrens, vireos, wood warblers, and tanagers.
Location: A = Big Marsh; B = Indian Ridge Marsh; C= Deadstick Pond; D = Lake Calumet.

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Table 3-7

State-Listed Species at the Lake Calumet Illinois Natural Area Inventory Site[a] Lake Calumet Cluster Sites Chicago, Illinois

Common Name	Scientific Name
Upland Sandpiper	*Bartramia longicauda*
Wilson's Phalarope	*Phalropus tricolor*
Pied-billed Grebe	*Podilymbus podiceps*
King Rail	*Rallus elegans*
Yellow-crowned Night Heron	*Nyctanassa violacea*
Great Egret	*Casmerodius albus*
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*
Black-crowned Night Heron	*Nycticorax nycticorax*
Common Moorhen	*Gallinula chloropus*
Least Bittern	*Ixobrychus exilis*
Snowy Egret	*Egretta thula*
Little Blue Heron	*Egretta caerulea*
Black Tern	*Chlidonias niger*
White Lady's Slipper	*Cyprepidium candidum*

Source: IDNR, 1997, provided in Appendix A.

Notes:

[a]Site located in Township 27 N, Range 14E, Sections 13, 14, 23, 24, 25, and 26.
Rookery located in Township 37N, Range 14E, Sections 24, 25 and 13.

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A large colony of the state-endangered black-crowned night herons, probably the largest in the Midwest, nests in Big Marsh (TAMS, 1991).

No federally-listed threatened or endangered aquatic species have been reported in the project area (Mengler, 1997). No state-listed threatened or endangered aquatic species are known to occur in the project area (Herkert, 1992; 1994).

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SECTION 4
NATURE AND EXTENT OF CONTAMINATION

Available chemical data for the sites were obtained from the U.S. EPA and reviewed for preparation of this ERS Report. Existing data and documents reviewed included:

- Preliminary Assessments.
- Site Inspections.
- ESIs.
- Removal Reports.

No soil/water testing was conducted during the ERS, though limited data collection (e.g., surface water field parameters) were measured to determine existing surface water characteristics and reclamation feasibility.

This section presents an analysis of the ESI data and summarizes the contaminant concentration levels found in different environmental media. The nature of contaminants and the extent of contamination in soil, sediment, surface water, and groundwater is also presented. The areas on the sites that may require additional contaminant characterization are listed at the end of this section and summarized as data gaps in Section 7 (Conclusions and Recommendations).

4.1 CONTAMINANT SOURCES

As discussed in Section 2 (Site Background), the various federal and state investigations of the sites indicated disposal of hazardous wastes has occurred throughout the history at several of these properties. Removal actions were performed by U.S. EPA and the IEPA at the Alburn Incinerator, U.S. Drum II, and Paxton Lagoons. In addition, the land owners

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or responsible parties have conducted removal activities at U.S. Drum II and the MSD #4/Gun Club sites. Land and Lakes #3 is an IEPA-permitted landfill that receives municipal wastes. The Paxton Landfills are not currently in operation; Paxton landfills have reportedly accepted hazardous wastes in the past. Residual surface contamination may be present in areas of the Paxton landfills that have not been capped. Subsurface contamination is anticipated since landfills remain on the property. Whether contaminant sources exist on the land outside the boundaries of the individual sites is unknown (i.e., within the Unnamed Parcel). Potential surface and subsurface soil contamination may also be associated with sewer and road construction wastes, MSW, MSW ash, and steel/iron slag that have been brought on the sites as fill material.

Steel/iron slag has been historically used as fill material within the Cluster Site and in the general Lake Calumet area. Slag typically contains high levels of metals and salts, primarily calcium, iron, magnesium, manganese, aluminum, and arsenic. Another source of fill material at the sites has been road construction spoil material which often contains polynuclear aromatic hydrocarbons (PAHs), lead, and salt contamination. Many of the PAHs, known by-products of combustion of oil, etc., were found near roads.

Fill materials used for general grading purposes, roadbed and surfacing, as well as cap material on the Paxton Landfills and the Unnamed Parcel has come from numerous sources. Although much of the cap material is reportedly clay, site observations reveal that steel/iron slag has been used as well as road construction materials. The relevance of these observations is that both slag and road construction materials typically contain contaminants which also are probably influencing the characterization of soil outside the boundaries of the Cluster Site.

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Lagoons), samples were analyzed by the U.S. EPA Contract Laboratory Program (CLP). All of the data presented is presumed to have been reviewed and validated by the U.S. EPA Region V as part of U.S. EPA CLP protocol. Thus, all ESI data is presumed to be usable.

Additional data was available for each of the sites and some was available for review, but this data was collected prior to any site removal actions and most is no longer characteristic of site conditions. The quality control samples associated with the additional information was not always available or not at a level that would meet the U.S. EPAs criteria for scoring sites for the NPL. The majority of the additional data did not have enough information available to determine quality control samples, laboratory quality, or overall data quality. Entire laboratory data packages were not available for review and validation.

4.1.2 Data Reduction, Tabulation, and Evaluation

Data evaluated included:

- Geological data (soil and sediment).
- Hydrogeological data (groundwater and surface water).

Sampling locations are presented in Figure 4-1 for all sites combined. Chemical data was organized by site, sample medium, sample depth, and sample location and is provided in Appendices B and C.

4.1.2.1 Evaluation Criteria

Given that the two goals of this study are to determine the feasibility of landscape reclamation and reuse while also being protective of human health and the local ecology,

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Slag from iron and steel making can contain high levels of metals and salts, primarily calcium, iron, manganese, magnesium, aluminum, and sulfur, with common trace amounts of chromium, arsenic, barium, copper, nickel, and lead (U.S. Steel, 1971). These slag materials usually have a high pH which results in many of the metallic contaminants being bound within the matrix of the slag and, thus, they are not readily leachable to surface or groundwater. Road construction spoil material often contains elevated levels of polynuclear aromatic hydrocarbons (PAHs), lead, and salt contamination. The elevated level of salts on many of the site surface soils is evidenced by the unusual dominance of halophytic plant species such as seaside goldenrod (*Solidago sempervirens*).

While the specific source of any of these contaminants, whether from landfilling activities, industrial processes, waste disposal, capping, or general grading with seemingly benign imported materials, is complicated and interesting, it is not particularly relevant. The relevance to the current study is the potential that any contaminants that exist on the sites pose a significant risk to human health or the local ecology and the effects these materials have on soil fertility, tilth, and transportability of contaminants.

4.1.1 Data Usability

WESTON evaluated the usability of the data for each of the sites as it was presented in individual ESI reports prepared for U.S. EPA between 1995 and 1996. An ESI report for Paxton Lagoons was not completed as Paxton Lagoons has been completely capped and long-term monitoring of this site is under the jurisdiction of the IEPA. The ESI reports contained data tables and some quality control (QC) information was available in the text portion of the ESI reports. Samples collected for each of the ESI reports were collected in accordance with a U.S. EPA-approved Quality Assurance Project Plan (QAPP) and a site-specific sampling and analysis plan (SAP). For the ESI sampling at each site (except Paxton

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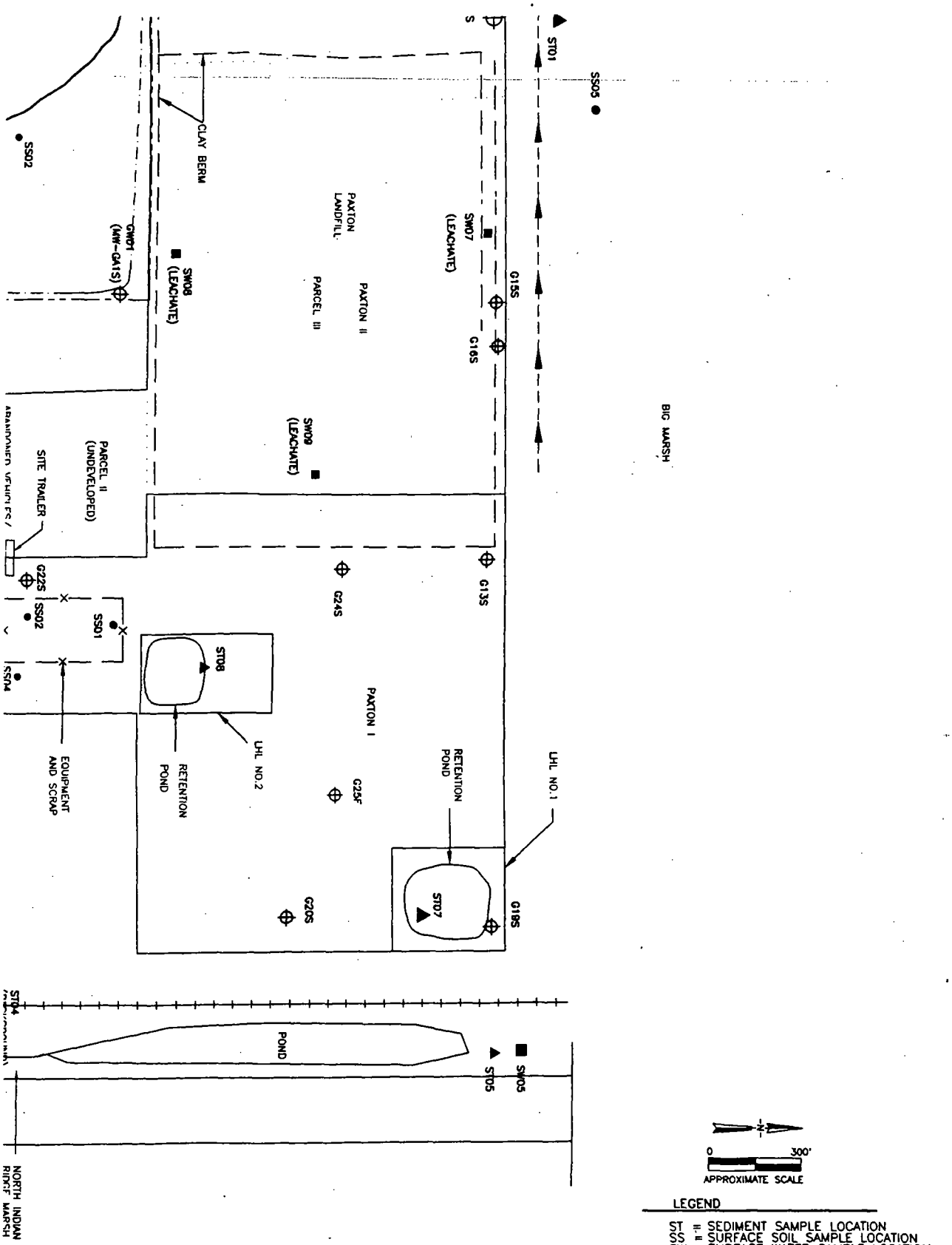

SITE BOUNDARIES ARE APPROXIMATE

DIAL CONTRACTING STRATEGY
TRACT No. 68-W8-0089
MENT No. 91-5EF3
NTROL No. 4500-91-APCW

SAMPLING LOCATIONS
LAKE CALUMET CLUSTER SITE
Chicago, Illinois

SCALE:	DRAWN:	DATE:	DWG. NO.	FIGURE
AS NOTED	R.J.B	9/97	18797	4-1

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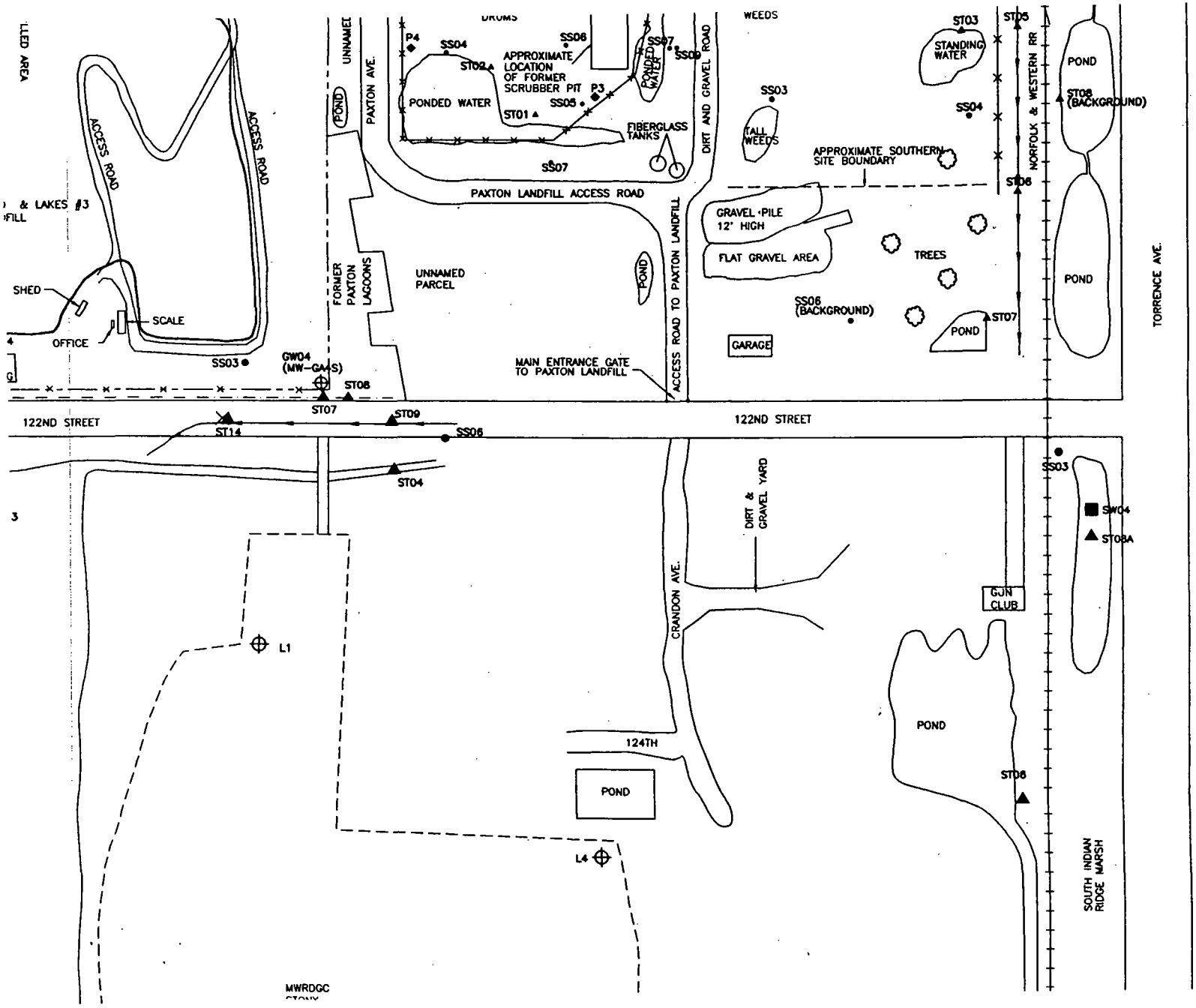

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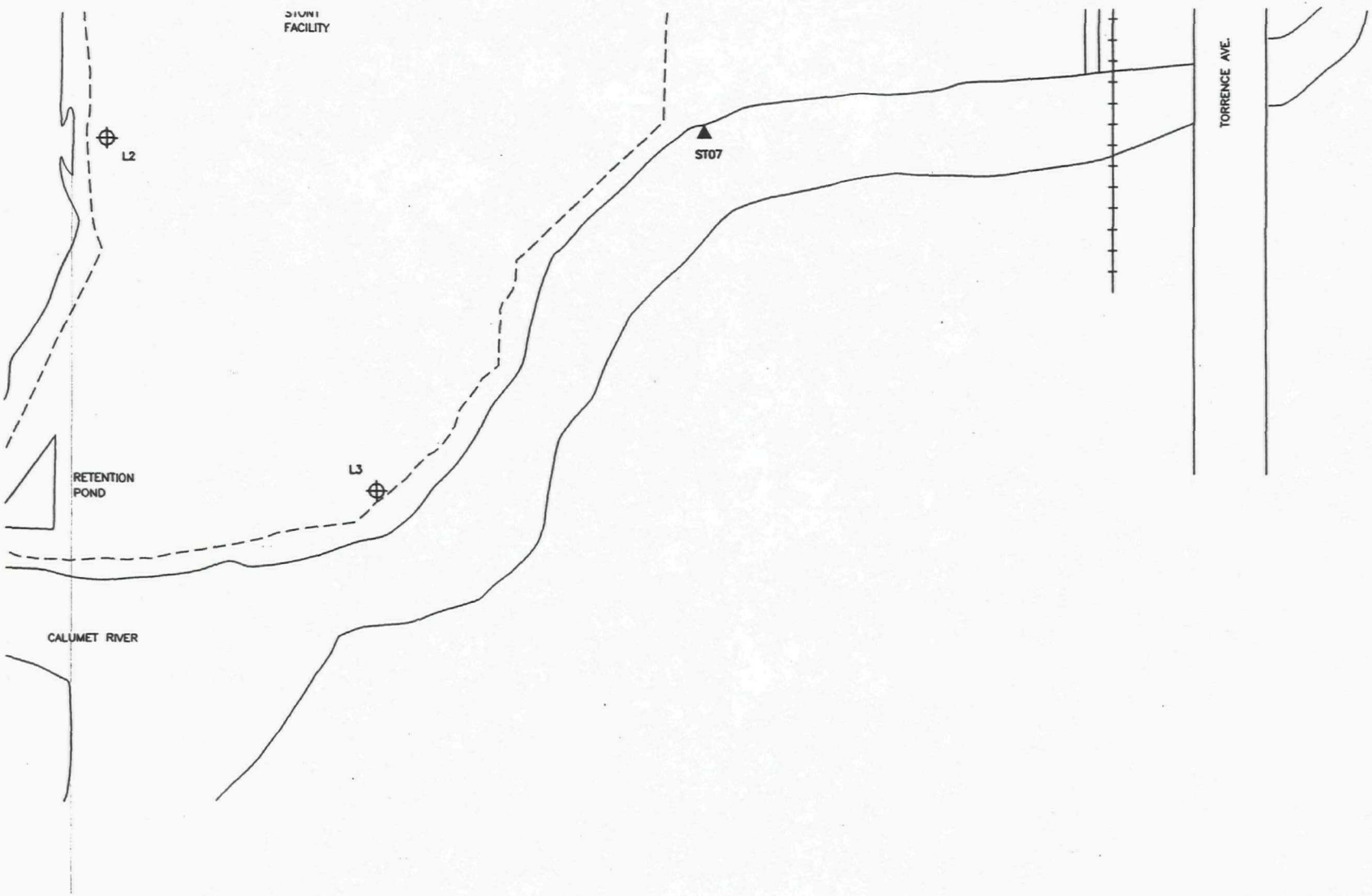

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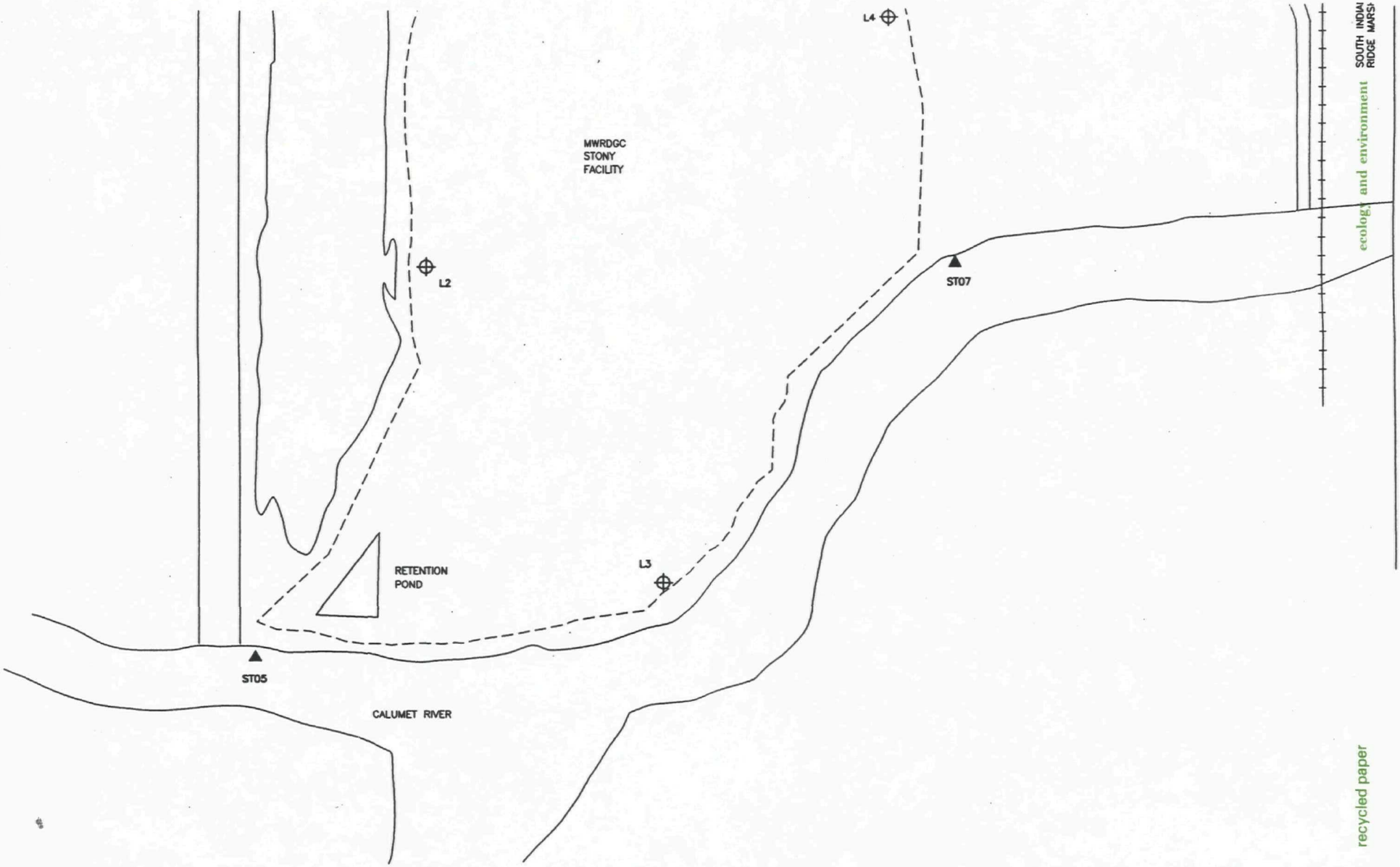

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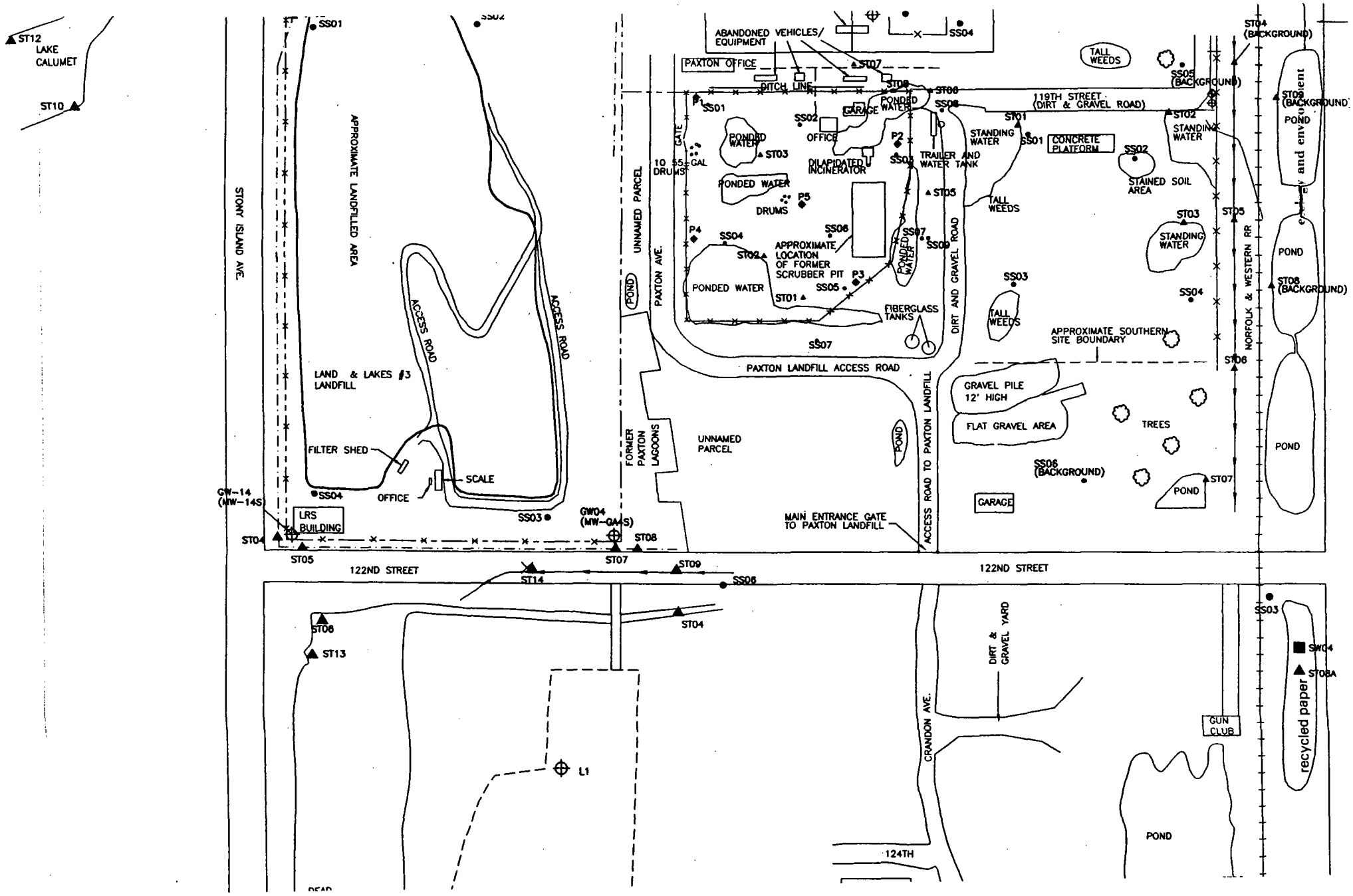
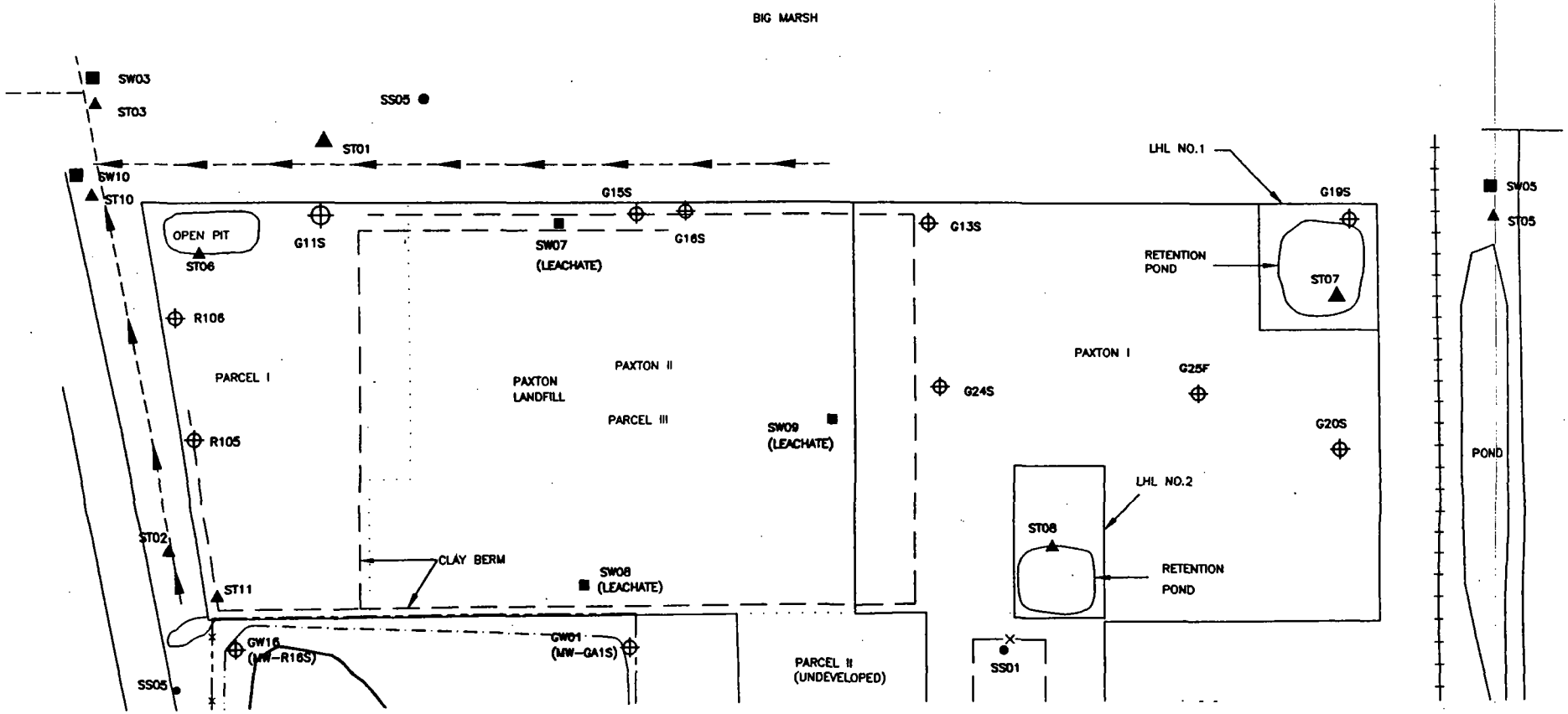


ST12
LAKE CALUMET
ST10
STONY ISLAND AVE.
APPROXIMATE LANDFILLED AREA
LAND & LAKES #3 LANDFILL
ACCESS ROAD
FILTER SHED
SCALE
OFFICE
LRS BUILDING
GW-14 (MW-14S)
GW04 (MW-GA4S)
ST04
ST05
ST07
ST08
ST09
ST14
ST13
ST06
SS01
SS02
SS03
SS04
SS05
SS06
SS07
SS08
SS09
P1
P2
P3
P4
P5
ST01
ST02
ST03
ST04 (BACKGROUND)
ST05 (BACKGROUND)
ST06 (BACKGROUND)
ST07
ST08 (BACKGROUND)
ST08A
SW04
122ND STREET
UNNAMED PARCEL
PAXTON AVE.
FORMER PAXTON LAGOONS
POND
ABANDONED VEHICLES/ EQUIPMENT
PAXTON OFFICE
DITCH LINE
GARAGE
PONDED WATER
OFFICE
DILAPIDATED INCINERATOR
TRAILER AND WATER TANK
10 55-GAL DRUMS
DRUMS
APPROXIMATE LOCATION OF FORMER SCRUBBER PIT
FIBERGLASS TANKS
PAXTON LANDFILL ACCESS ROAD
DIRT AND GRAVEL ROAD
ACCESS ROAD TO PAXTON LANDFILL
MAIN ENTRANCE GATE TO PAXTON LANDFILL
119TH STREET (DIRT & GRAVEL ROAD)
STANDING WATER
CONCRETE PLATFORM
STAINED SOIL AREA
TALL WEEDS
APPROXIMATE SOUTHERN SITE BOUNDARY
GRAVEL PILE 12' HIGH
FLAT GRAVEL AREA
TREES
NORFOLK & WESTERN RR
DIRT & GRAVEL YARD
CRANDON AVE.
124TH
GUN CLUB
L1
recycled paper



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the evaluation of site contamination considers both the implications for reclamation potential and for human and ecological health impacts.

To evaluate the potential for human health impacts from these sites, soil, sediment, groundwater, and sediment data were compared to risk-based screening concentrations (Appendix B). Soil and sediment data were compared to IEPA Tier I soil cleanup objectives for commercial/industrial land use (IEPA, 1997). Commercial/industrial cleanup levels were used because the sites are landfills or former waste disposal areas that have been capped. Residential land use is the most restrictive land use, and under residential land use human activities are associated with the greatest potential for exposures. However, assuming residential future land use of these waste disposal areas is not a realistic anticipated future land use. "Future land use assumptions allow the baseline risk assessment and the feasibility study to focus on the development of practicable and cost-effective remedial alternatives, leading to site activities which are consistent with the reasonable anticipated future land use" (U.S. EPA, 1995). Input from community groups and local businesses indicates that wildlife habitat, open space, and nature observation are the desired end uses for the Cluster Site.

If an IEPA Tier I soil remediation objective was not available for a constituent, U.S. EPA Region III (1996) risk-based concentrations for industrial land use were applied in this evaluation. Proxy values for chemicals within the same chemical class were used for chemicals that lacked risk-based criteria.

Groundwater and surface water data were compared to IEPA Class I and Class II groundwater cleanup objectives and U.S. EPA Region III (1996) risk-based concentrations for groundwater ingestion (Appendix B). As defined by 35 IAC Part 620.210, a Class I groundwater source (i.e., a potable resource groundwater) is defined as any geological

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material that is located 10 feet or more below the ground surface and is capable of sustaining a groundwater yield, from up to a 12-inch diameter borehole, of 150 gallons per day from a formation that is 15 feet thick or less. In addition, the geologic material defined as a Class I groundwater source will have a hydraulic conductivity that is greater than 1 x 10^{-4} cm/sec. A Class II groundwater source is defined (35 IAC 620.220) as a geologic material that does not meet the provisions described for a Class I groundwater source and is also not considered a Class III (i.e., special resource groundwater) or a Class IV (i.e., other groundwater source) as defined by 35 IAC Parts 620.230 and 620.240, respectively.

Groundwater is not used as the potable water supply in Chicago. The City of Chicago has an ordinance prohibiting installation of new wells, and the closest private well is 2.5 miles from the site and is set in the bedrock aquifer. The shallow water-bearing zone at the Cluster Sites would be considered a Class II groundwater. However, a comparison to Class I criteria [which are similar to U.S. EPA maximum contaminant levels (MCLs)] was performed as a conservative means to evaluate potential threats associated with human use of surface water (e.g., swimming, wading).

To evaluate the potential for ecological impacts from these sites, sediment, groundwater, and surface water data were compared to ecological screening benchmarks (Appendix C). To evaluate potential impacts to aquatic resources inhabiting the ponds and wetlands on the Cluster Site and the ponds, rivers, lake, and wetlands downgradient of the sites, groundwater and surface water data were compared to federal and state ambient water quality criteria for the protection of aquatic life. As a means of characterizing aquatic toxicity, ambient water quality criteria (AWQC) have been developed for the protection of 95 percent of all aquatic life where sufficient data are available (U.S. EPA, 1992). Not only fish, but also aquatic invertebrates and plants are protected (U.S. EPA, 1986).

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Various agencies (OMOE, 1993; NOAA, 1990; U.S. EPA, 1996; Jones et al., 1996) have developed sediment quality criteria and benchmarks for the assessment of toxicological effects on sediment-associated biota. Note that these benchmarks are not remediation goals; remediation goals must consider the adverse effects on habitat and remobilization of contaminants caused by removal or remediation of sediments (Jones et al., 1996). In addition, the sediment benchmarks should not be considered as the sole measure of sediment toxicity; rather, field studies (e.g., community analyses) and toxicity tests are primary indicators of sediment toxicity (Jones et al., 1996). The sediment benchmarks provide a means to determine which chemicals are most likely causing toxicity. Use of multiple benchmarks provides an indication of the likelihood and nature of effects. For example, exceeding one benchmark may provide weak evidence of real effects while exceeding numerous benchmarks may provide strong evidence of real effects (Jones et al., 1996).

The Ontario Ministry of Environment (OMOE) has developed aquatic sediment quality guidelines which are a set of numerical guidelines for freshwater systems in Ontario and include No Effect, Low Effect, and Severe Effect levels. At the No Effect Level, no impact on water quality uses or benthic organisms is expected. The Low Effect Level is the level of sediment contamination that can be tolerated by the majority of benthic organisms. The Severe Effect Level is the level of sediment contamination at which pronounced disturbance of the sediment-dwelling community is expected. The National Oceanic and Atmospheric Administration (NOAA) has developed sediment effect ranges to determine concentrations of chemicals which are likely to result in effects based upon available sediment data collected primarily in marine and estuarine environments throughout the United States. The Effects Range-Low (ER-L) values represent the lower tenth percentile of the range of concentrations in which effects were observed or predicted. The Effects Range-Median (ER-M) values represent median concentrations. The U.S. EPA (1996) has published

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Ecotox Thresholds (ETs) for screening contaminants at CERCLA sites. Values are available for 8 metals and 41 organics in sediment. Oak Ridge National Laboratory (Jones et al., 1996) has developed preliminary remediation goals (PRGs) for sediment which are the lowest value of numerous sediment benchmarks.

4.1.2.2 Comparison to Human Health Risk-Based Concentrations

Appendix B presents a comparison of discrete soil sample data to risk-based concentrations. Discrete sediment data is also compared to risk-based concentrations in Appendix B. It should be noted that the comparison to risk-based concentrations is a screening evaluation of potential risks posed by these sites, and may not represent the actual risk posed by the sites. Results of these comparisons are presented in Figures 4-2 through 4-8.

In the Lake Calumet area, intense industrial and waste disposal activities have been occurring for well over a century. An estimate of ambient, background conditions is difficult to determine. Site-specific background samples were collected from the sites during the ESIs. The background locations selected for the ESIs do not necessarily represent natural or ambient concentrations. Rather these locations represent current conditions outside the site boundaries, resulting from a long history of industrial and waste disposal activity. Sample locations that lie outside the boundaries and upgradient/sidegradient of all the sites were considered to be off-site locations for this evaluation. Chemical concentrations in off-site samples were also compared to risk-based concentrations.

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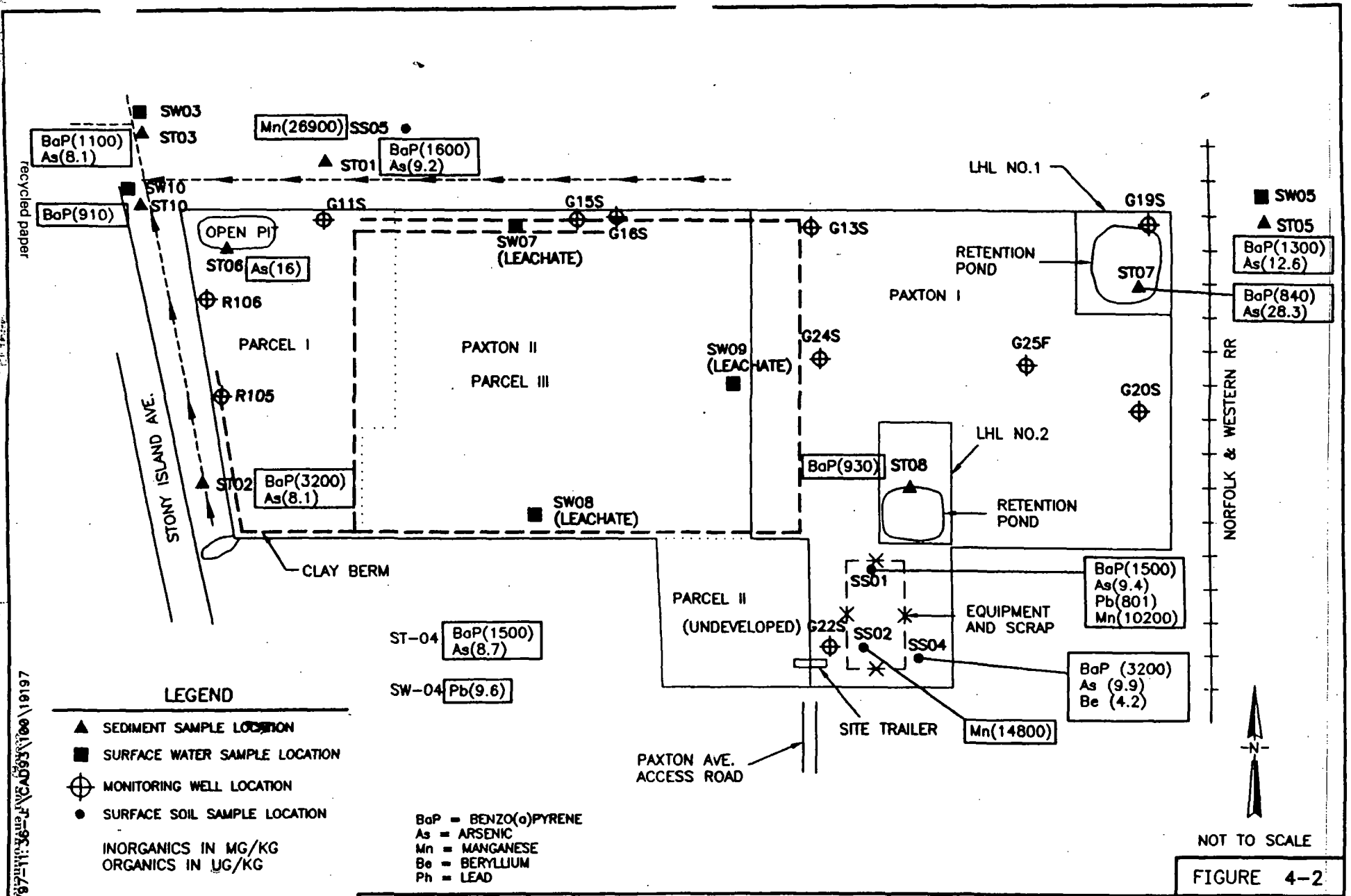

FIGURE 4-2

ALTERNATIVE REMEDIAL CONTRACTING STRATEGY
U.S. EPA CONTRACT No. 68-W8-0089
WORK ASSIGNMENT No. 91-5EF3
DOCUMENT CONTROL No. 4500-91-AOXI

ONSITE SAMPLE LOCATIONS:
EXCEEDENCES OF SOIL AND SEDIMENT
REMEDIATION OBJECTIVES
PAXTON LANDFILL CORPORATION
Chicago, Illinois

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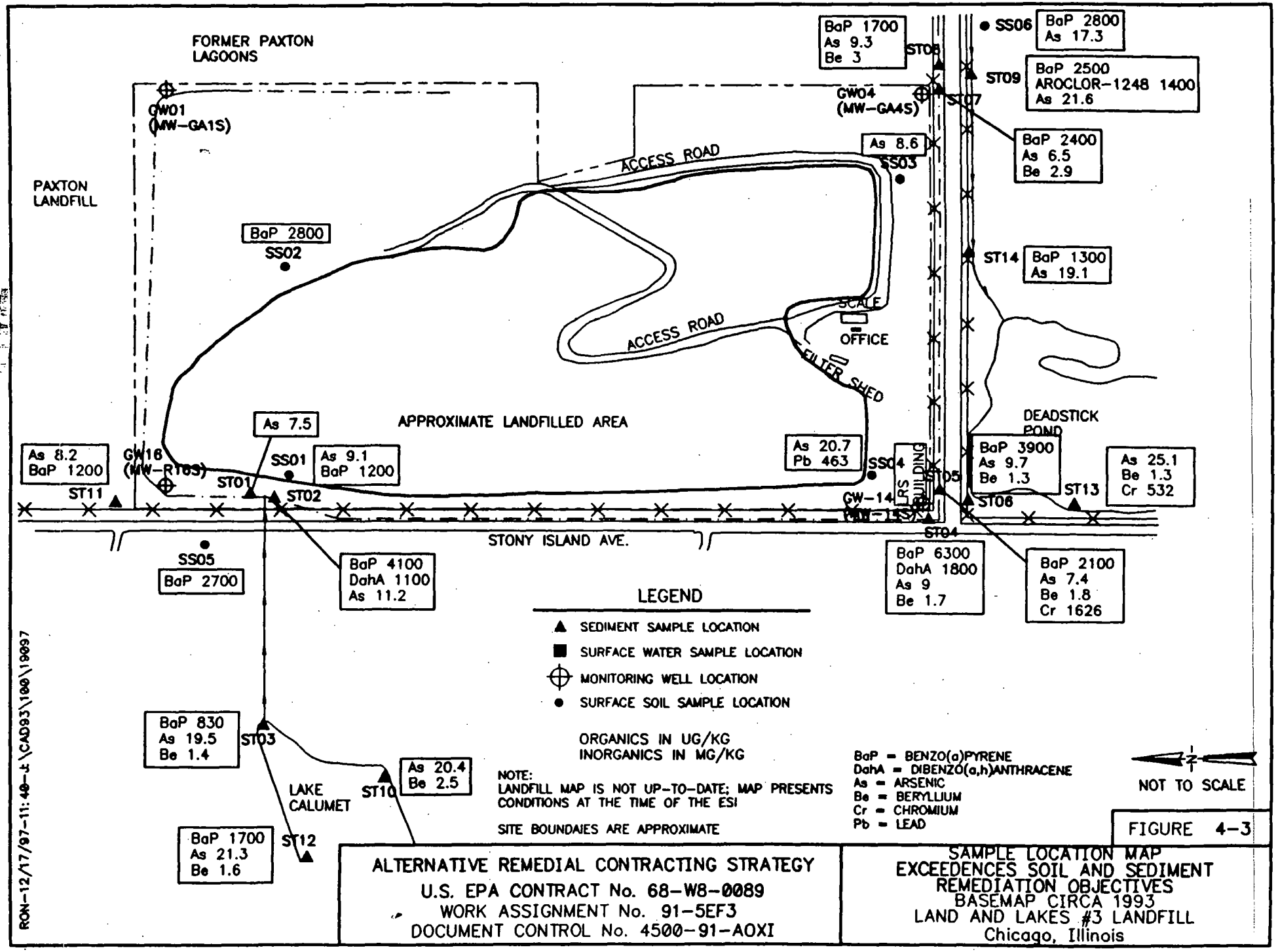
FORMER PAXTON LAGOONS
PAXTON LANDFILL
GW01 (MW-GA1S)
BaP 2800
SS02
ACCESS ROAD
ACCESS ROAD
APPROXIMATE LANDFILLED AREA
As 7.5
As 8.2
BaP 1200
GW16 (MW-R103)
ST11
ST01
SS01
As 9.1
BaP 1200
ST02
SS05
BaP 2700
BaP 4100
DahA 1100
As 11.2
STONY ISLAND AVE.
BaP 830
As 19.5
Be 1.4
ST03
LAKE CALUMET
ST10
As 20.4
Be 2.5
BaP 1700
As 21.3
Be 1.6
ST12
BaP 1700
As 9.3
Be 3
ST08
GW04 (MW-GA4S)
ST07
As 8.6
SS03
SCALE
OFFICE
FILTER SHED
As 20.7
Pb 463
SS04
LRS BUILDING
GW-14
ST05
ST04
BaP 6300
DahA 1800
As 9
Be 1.7
SS06
BaP 2800
As 17.3
ST09
BaP 2500
AROCLOR-1248 1400
As 21.6
BaP 2400
As 6.5
Be 2.9
ST14
BaP 1300
As 19.1
DEADSTICK POND
BaP 3900
As 9.7
Be 1.3
ST06
ST13
As 25.1
Be 1.3
Cr 532
BaP 2100
As 7.4
Be 1.8
Cr 1626
LEGEND
SEDIMENT SAMPLE LOCATION
SURFACE WATER SAMPLE LOCATION
MONITORING WELL LOCATION
SURFACE SOIL SAMPLE LOCATION
ORGANICS IN UG/KG
INORGANICS IN MG/KG
NOTE:
LANDFILL MAP IS NOT UP-TO-DATE; MAP PRESENTS CONDITIONS AT THE TIME OF THE ESI
SITE BOUNDAIES ARE APPROXIMATE
BaP = BENZO(a)PYRENE
DahA = DIBENZO(a,h)ANTHRACENE
As = ARSENIC
Be = BERYLLIUM
Cr = CHROMIUM
Pb = LEAD
NOT TO SCALE
FIGURE 4-3
ALTERNATIVE REMEDIAL CONTRACTING STRATEGY
U.S. EPA CONTRACT No. 68-W8-0089
WORK ASSIGNMENT No. 91-5EF3
DOCUMENT CONTROL No. 4500-91-AOXI
SAMPLE LOCATION MAP
EXCEEDENCES SOIL AND SEDIMENT
REMEDIATION OBJECTIVES
BASEMAP CIRCA 1993
LAND AND LAKES #3 LANDFILL
Chicago, Illinois
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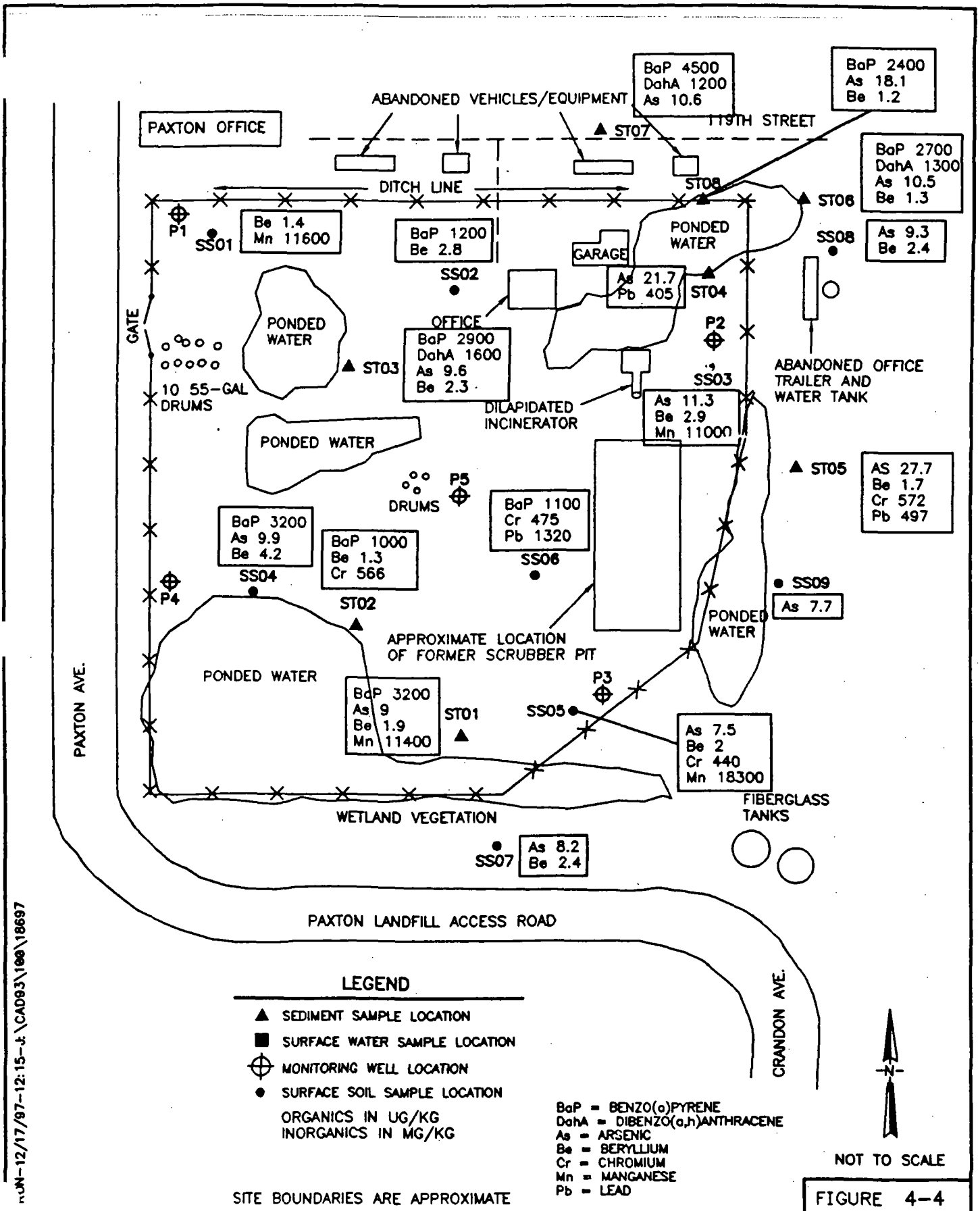

FIGURE 4-4

ALTERNATIVE REMEDIAL CONTRACTING STRATEGY
U.S. EPA CONTRACT No. 68-W8-0089
WORK ASSIGNMENT No. 91-5EF3
DOCUMENT CONTROL No. 4500-91-AOXI

ONSITE SAMPLE LOCATION MAP
EXCEEDENCES OF SOIL AND SEDIMENT
REMEDIATION OBJECTIVES
ALBURN INCINERATOR
ecology and environment
Chicago, Illinois

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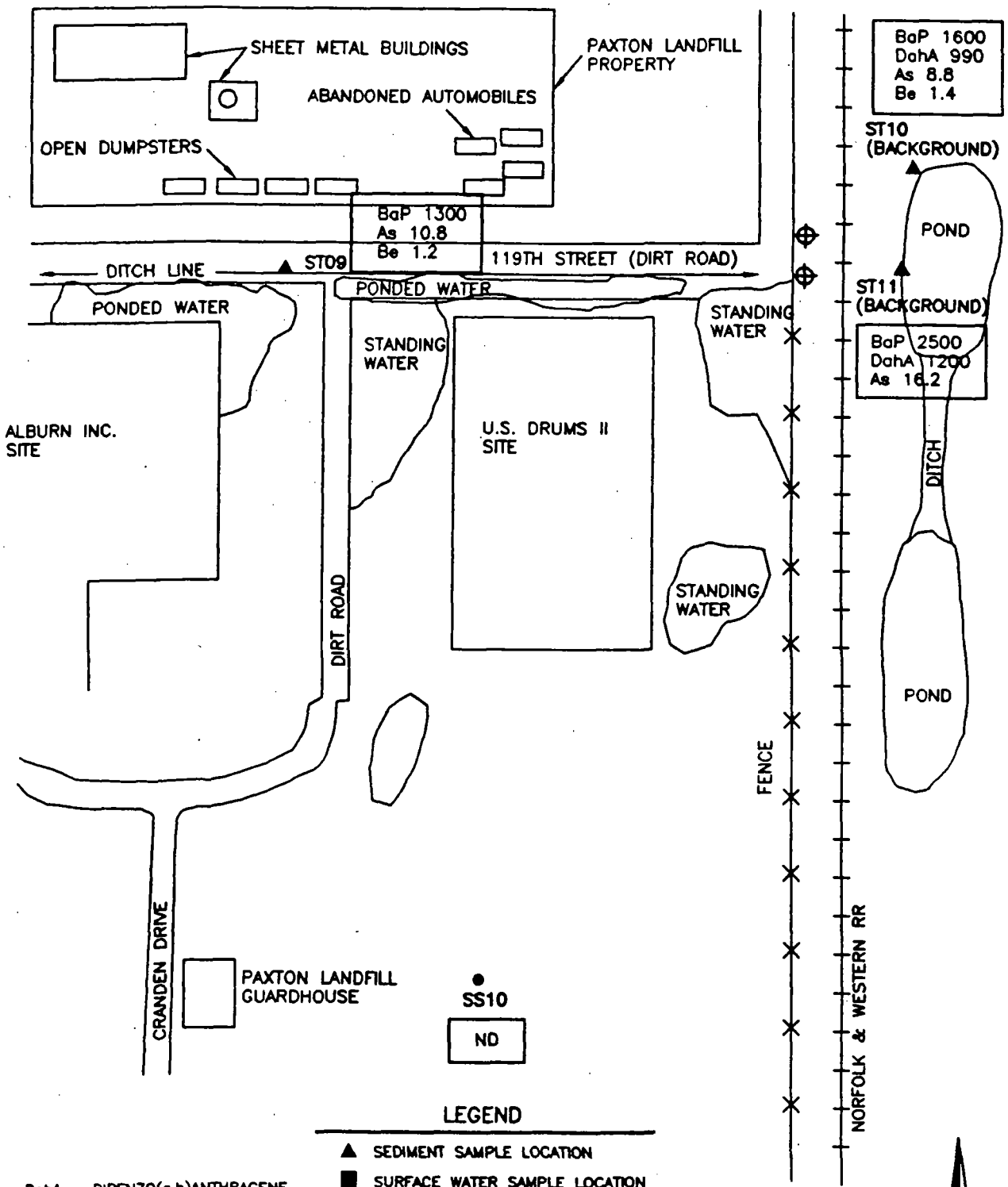

LEGEND

- ▲ SEDIMENT SAMPLE LOCATION
- ■ SURFACE WATER SAMPLE LOCATION
- ⊕ MONITORING WELL LOCATION

DahA = DIBENZO(a,h)ANTHRACENE
BaP = BENZO(a)PYRENE
As = ARSENIC
Be = BERYLLIUM

ND – NOT DETECTED ABOVE REMEDIATION OBJECTIVES
ORGANICS IN UG/KG
INORGANICS IN MG/KG

SITE BOUNDARIES ARE APPROXIMATE

NOT TO SCALE

FIGURE 4-5

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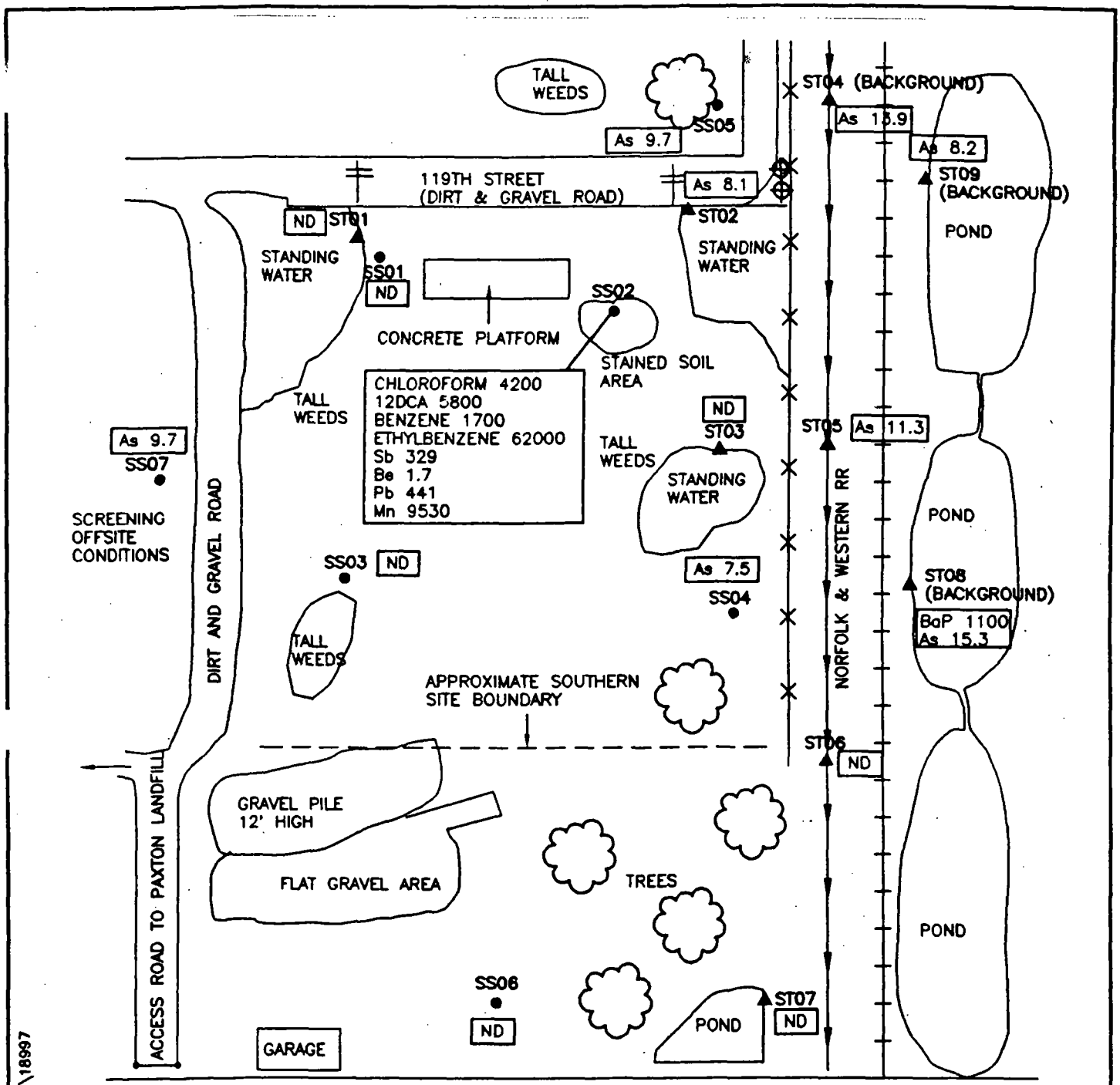
ALTERNATIVE REMEDIAL CONTRACTING STRATEGY
U.S. EPA CONTRACT No. 68-W8-0089
WORK ASSIGNMENT No. 91-5EF3
DOCUMENT CONTROL No. 4500-91-AOXI

OFFSITE SAMPLE LOCATION MAP
EXCEEDENCE OF SOIL AND SEDIMENT REMEDIATION OBJECTIVES
ALBURN INCINERATOR
Chicago, Illinois



LEGEND

- ● SURFACE SOIL SAMPLE LOCATION
- ▲ SEDIMENT SAMPLE LOCATION
- ■ SURFACE WATER SAMPLE LOCATION

ND – NOT DETECTED ABOVE REMEDIATION OBJECTIVES
ORGANICS IN UG/KG
INORGANICS IN MG/KG

BaP = BENZO(a)PYRENE
1,2DCA = 1,2-DICHLOROETHANE
Sb = ANTIMONY
As = ARSENIC
Be = BERYLLIUM
Mn = MANGANESE
Pb = LEAD

-N-

NOT TO SCALE

SITE BOUNDARIES ARE APPROXIMATE

FIGURE 4-6

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ALTERNATIVE REMEDIAL CONTRACTING STRATEGY U.S. EPA CONTRACT No. 68-W8-0089 WORK ASSIGNMENT No. 91-5EF3 DOCUMENT CONTROL No. 4500-91-AOXI	SAMPLE LOCATION MAP EXCEEDENCES OF SOIL AND SEDIMENT REMEDIATION OBJECTIVES U.S. DRUM II Chicago, Illinois

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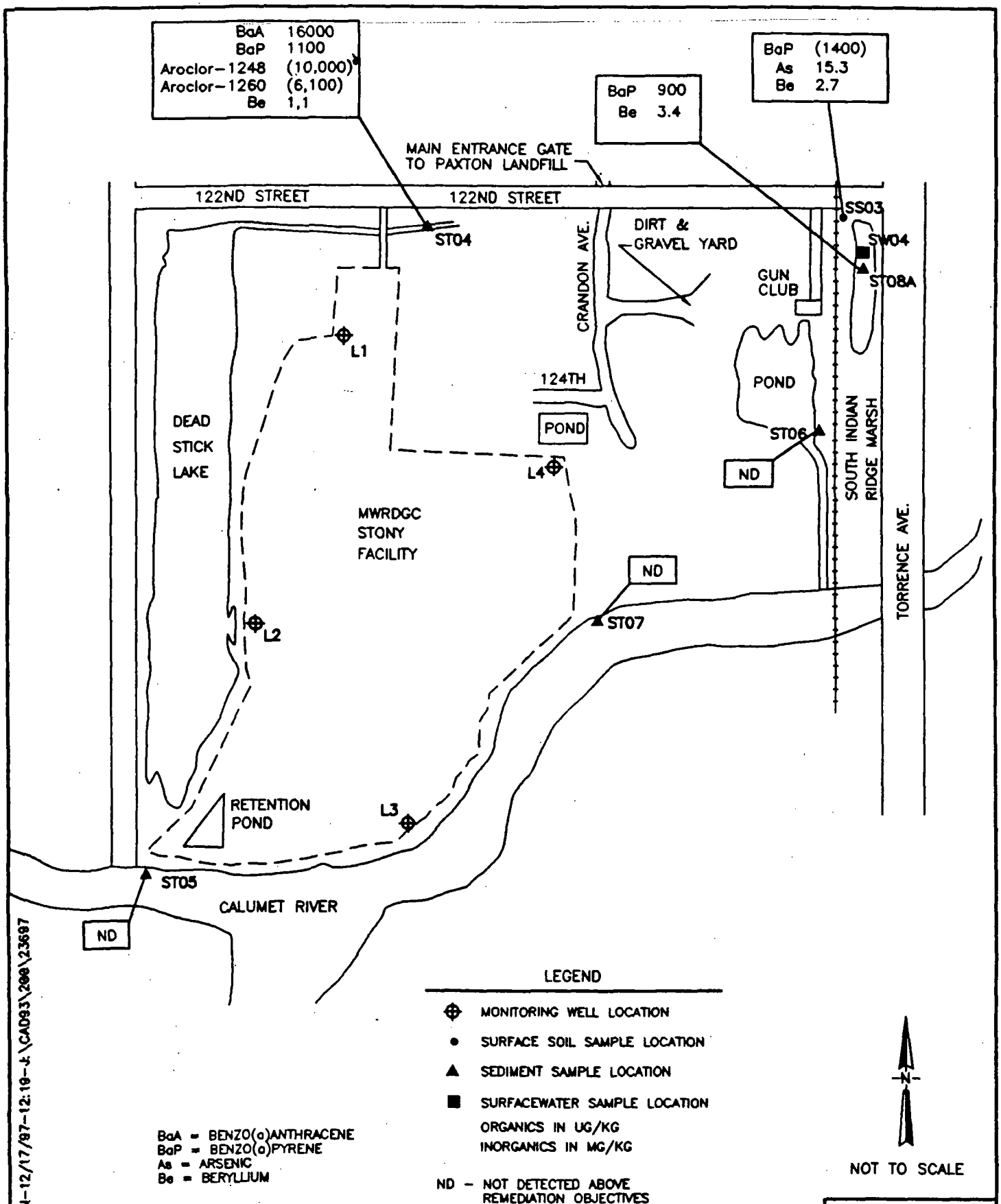

FIGURE 4-7

ALTERNATIVE REMEDIAL CONTRACTING STRATEGY
U.S. EPA CONTRACT No. 68-W8-0089
WORK ASSIGNMENT No. 59-5EF3
DOCUMENT CONTROL No. 4500-91-AOXI

EXCEEDANCES OF SOIL AND SEDIMENT REMEDIATION OBJECTIVES
MSD#4 SLUDGE BARREL DUMP
Chicago, Illinois

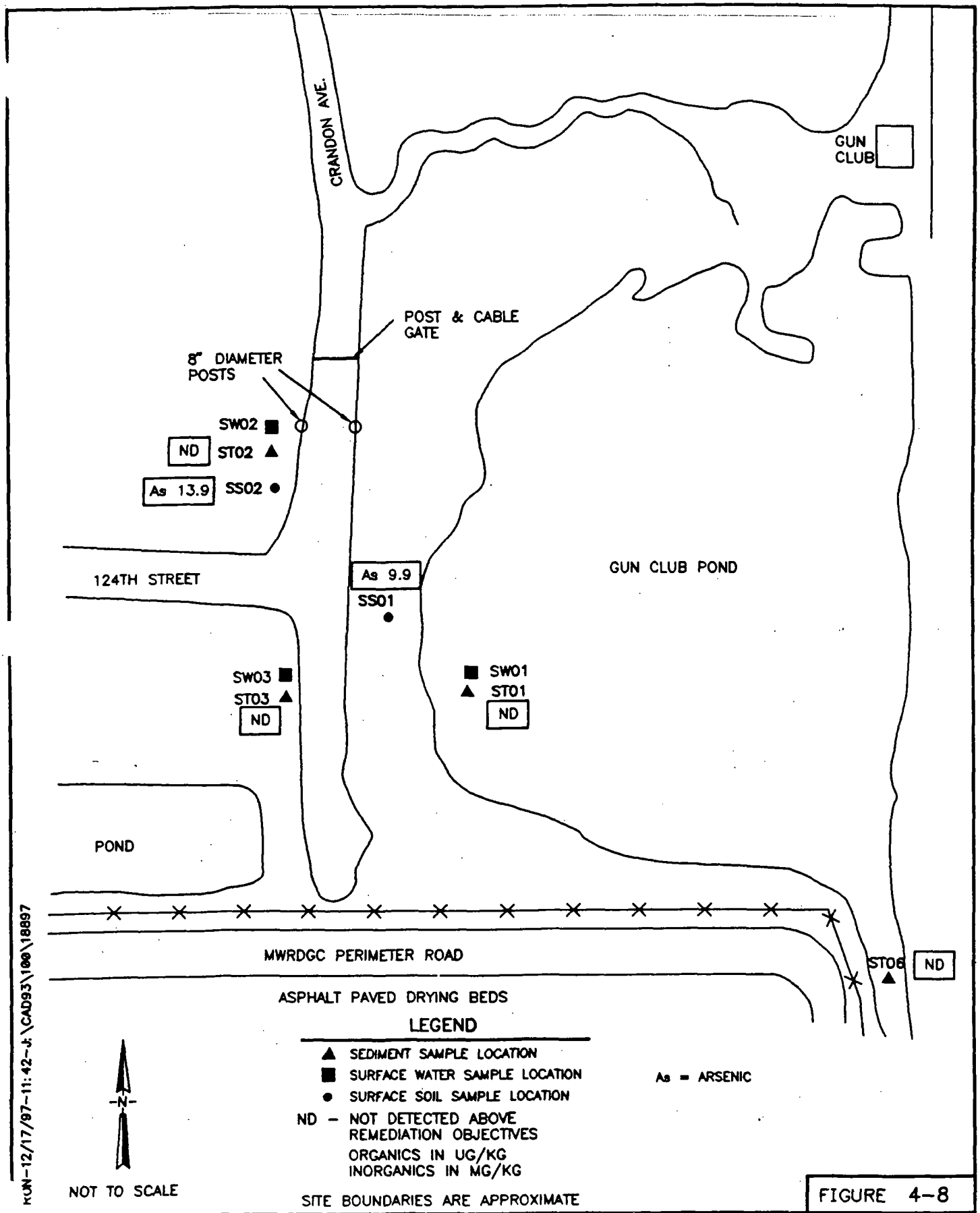

FIGURE 4-8

ALTERNATIVE REMEDIAL CONTRACTING STRATEGY
U.S. EPA CONTRACT No. 68-W8-0089
WORK ASSIGNMENT No. 91-5EF3
DOCUMENT CONTROL No. 4500-91-AOXI

DRUM RELEASE AREA
EXCEEDENCES OF SOIL AND SEDIMENT REMEDIATION OBJECTIVES
MSD #4 SLUDGE AND BARREL DUMP
Chicago, Illinois

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Soil and Sediment

Chemicals that exceeded human health risk-based concentrations in soil are listed in Table 4-1. Chemicals that exceeded risk-based concentrations in sediment are also listed in Table 4-1.

Off-site sample results were also compared to risk-based concentrations. The elevated metals and PAHs detected in the area may also be due to the long history of industrial land use in the area and/or associated with the steel/iron slag used as fill materials since these constituents were also detected at off-site sample locations. Steel/iron slag has been historically used as fill material within the Cluster Site and in the general Lake Calumet area. Slag typically contains high levels of metals and salts, primarily calcium, iron, magnesium, manganese, aluminum, and arsenic. Another source of fill material at the sites has been road construction spoil material which often contains polynuclear aromatic hydrocarbons (PAHs), lead, and salt contamination. Many of the PAHs, known by-products of combustion of oil, etc., were found near roads. The constituents detected in off-site soil and sediment at levels exceeding human-health risk-based concentrations are listed in Table 4-1.

Groundwater/Surface Water/Leachate

Appendix B presents a comparison of discrete groundwater, surface water, and leachate data to IEPA Class I groundwater standards. It should be noted that this comparison to Class I standards is a conservative evaluation of potential impacts to surface water should contaminants migrate undiluted and should the water bodies be used for recreation (e.g., swimming, wading). The comparison does not consider hydrogeologic information, groundwater flow, background, etc., which can change the results of this comparison.

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Table 4-1

Chemicals in Soil and Sediment that Exceed Human Health Risk-Based Concentrations
Lake Calumet Cluster Site
Chicago, Illinois

Chemical	Soil	Off-site Soil[a]	Sediment	Off-site Sediment[b]
Volatile Organic Compounds				
Chloroform	◆			
Ethylbenzene	◆			
1.2-Dichloroethane	◆			
Benzene	◆			
Semivolatile Organic Compounds				
Benzo(a)pyrene	◆	◆	◆	◆
Dibenzo(a,h)anthracene			◆	◆
Benzo(a)anthracene			◆	
PCBs				
Aroclor 1248			◆	
Aroclor 1260			◆	
Inorganic Constituents				
Arsenic	◆	◆	◆	◆
Antimony	◆			
Beryllium	◆	◆	◆	◆
Chromium	◆		◆	
Lead	◆		◆	
Manganese	◆	◆	◆	

◆ = exceeds remediation objective
[a]Off-site soil locations include SS05 at Paxton Landfill; SS05 at Land and Lakes #3; and SS03 at MSD#4.
[b]Off-site sediment locations include ST10/ST11 at Alburn Incinerator; ST08 at MSD#4; ST04, ST08, and ST09 at U.S. Drum II; and ST03 at Paxton Landfill.

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Results of these comparisons are presented in Figures 4-9 through 4-12. Chemicals in groundwater, surface water and leachate that exceeded groundwater standards are listed in Table 4-2.

No off-site samples were collected for groundwater or leachate. Chemicals that exceeded risk-based concentrations in off-site surface water samples are listed in Table 4-2.

4.1.2.3 Comparison to Ecological Benchmarks

Appendix C presents a comparison of discrete sediment sample data to sediment screening benchmarks and a comparison of surface water, groundwater, and leachate data to water quality criteria. It should be noted that these benchmarks are not regulatory standards, and remediation of sediments to these concentrations may impact the habitat more than the contamination.

<u>Sediment</u>

Sediment samples were collected from surface water bodies on or downstream of Land and Lakes #3, MSD #4, Paxton Landfill, and Alburn Incinerator. Chemicals in sediments identified during the ESIs that exceeded screening benchmarks are listed in Table 4-3.

Off-site sediment locations include ST10/ST11 at Alburn Incinerator, ST08 at MSD #4, ST09, ST08, and ST04 at U.S. Drum II, and ST03 at Paxton Landfill. Chemicals in off-site sediment samples identified during the ESIs that exceeded screening benchmarks are listed in Table 4-3.

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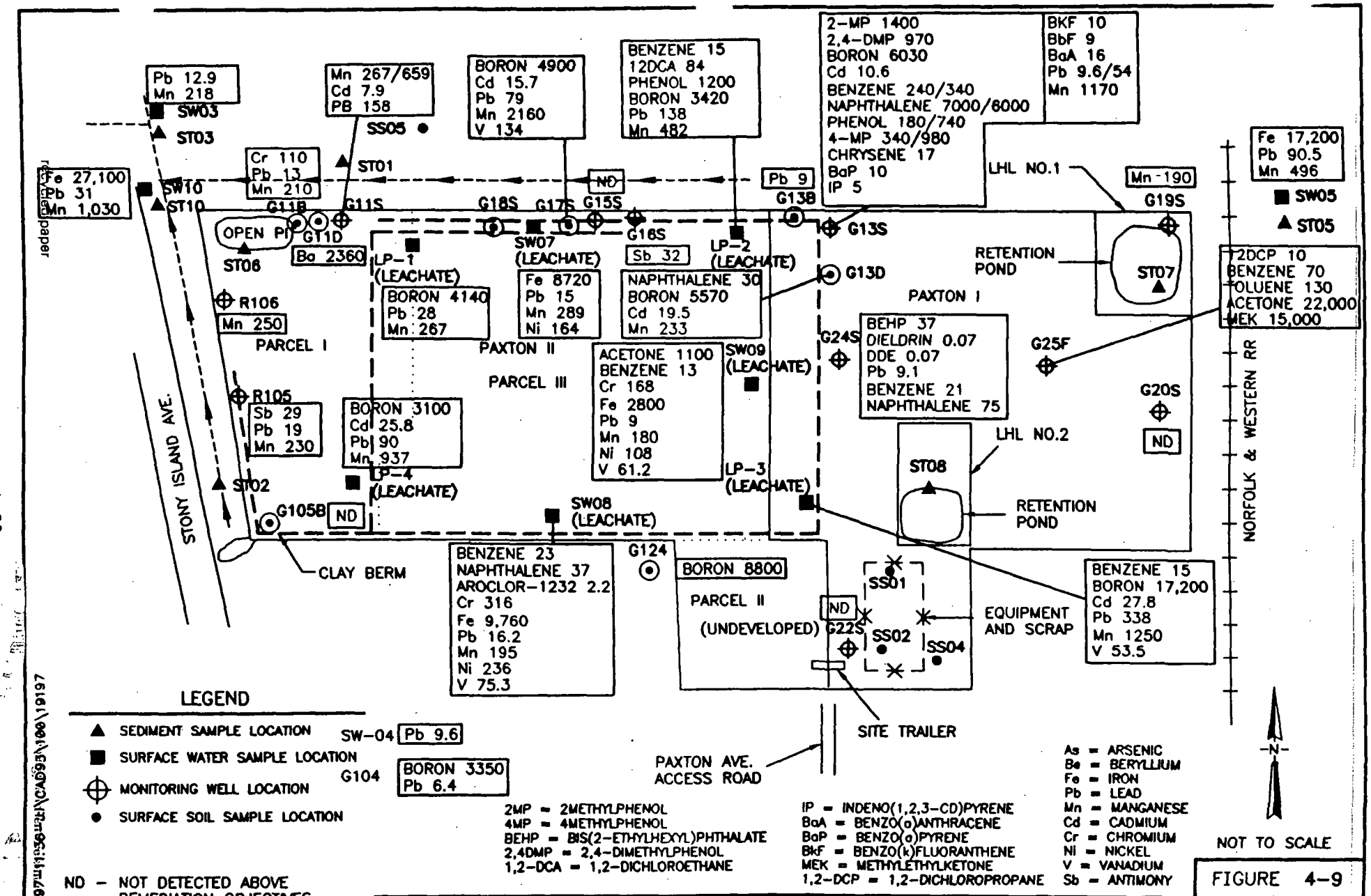

FIGURE 4-9

ALTERNATIVE REMEDIAL CONTRACTING STRATEGY
U.S. EPA CONTRACT No. 68-W8-0089
WORK ASSIGNMENT No. 91-5EF3
DOCUMENT CONTROL No. 4500-91-AOXI

ONSITE SAMPLE LOCATIONS: EXCEEDENCES OF GROUNDWATER REMEDIATION OBJECTIVES
PAXTON LANDFILL CORPORATION
Chicago, Illinois

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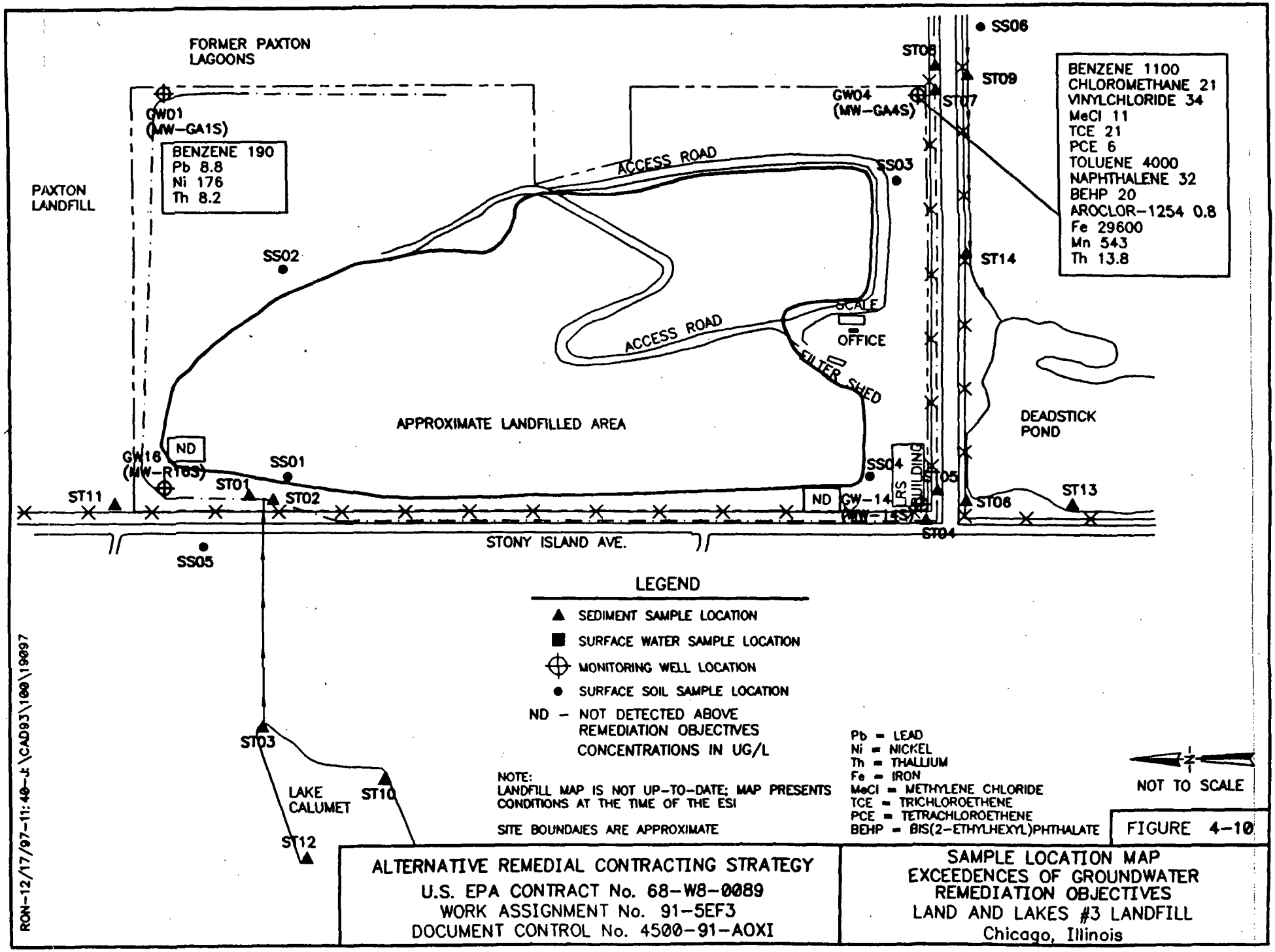


FIGURE 4-10

ALTERNATIVE REMEDIAL CONTRACTING STRATEGY
U.S. EPA CONTRACT No. 68-W8-0089
WORK ASSIGNMENT No. 91-5EF3
DOCUMENT CONTROL No. 4500-91-AOXI

SAMPLE LOCATION MAP
EXCEEDENCES OF GROUNDWATER REMEDIATION OBJECTIVES
LAND AND LAKES #3 LANDFILL
Chicago, Illinois

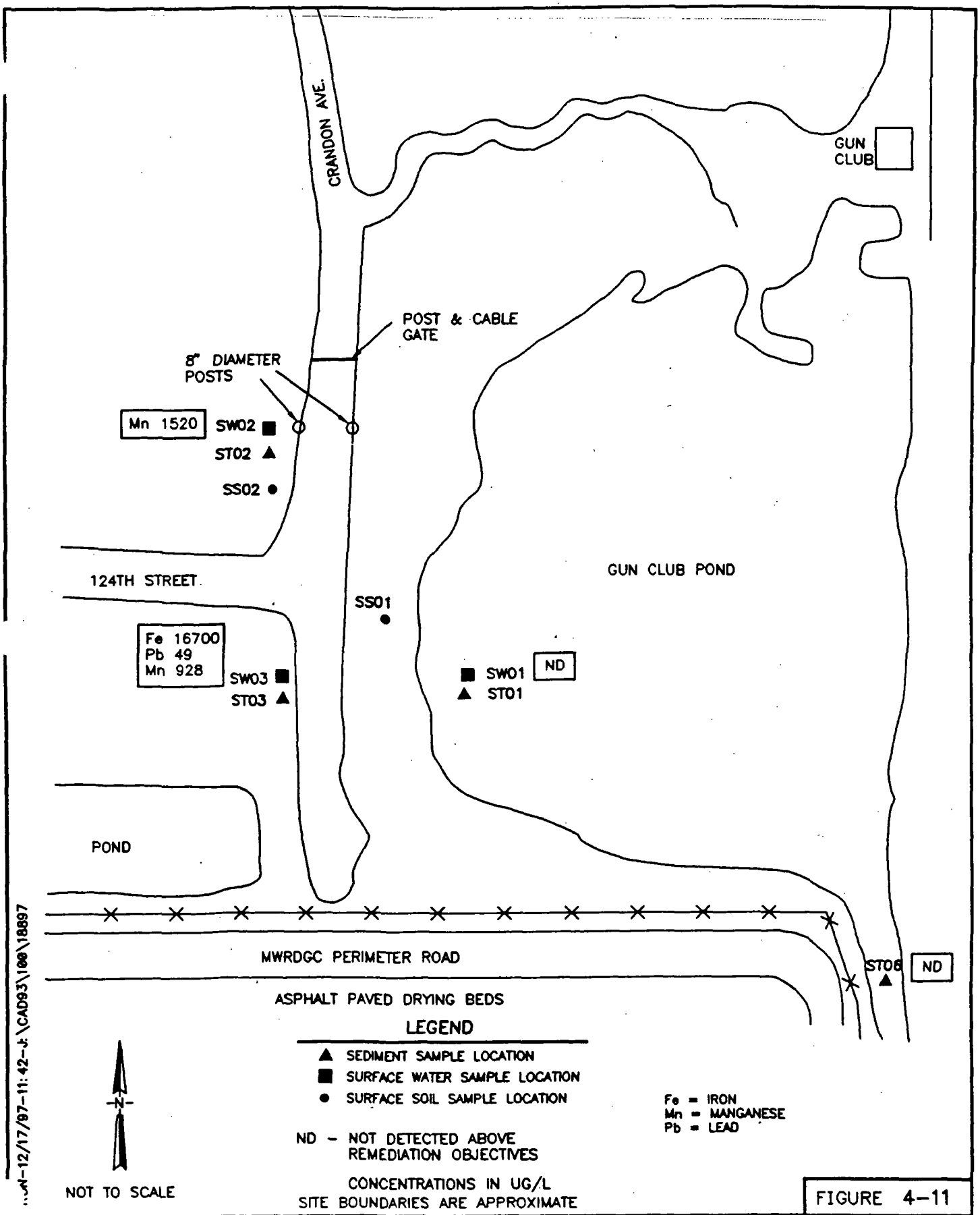
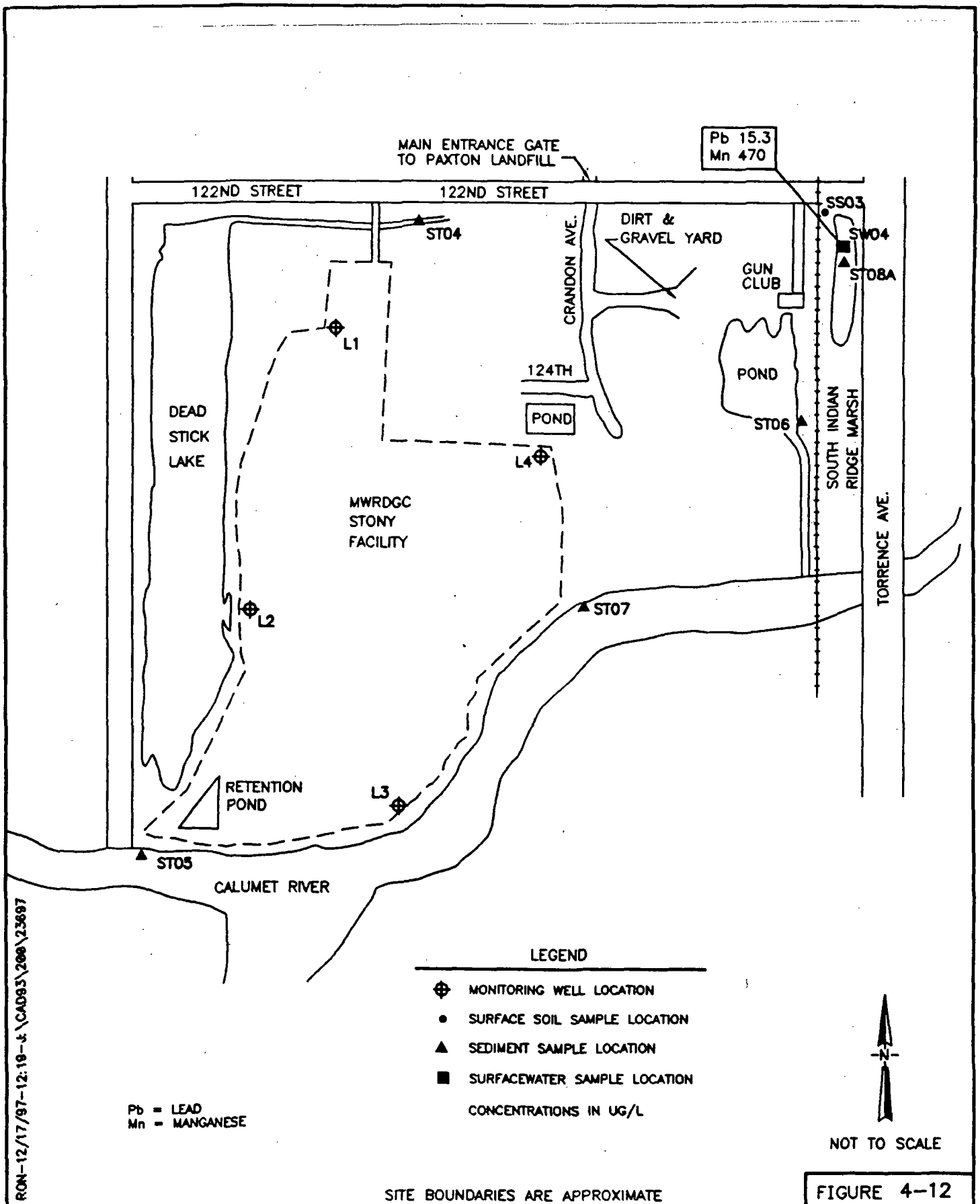


FIGURE 4-11

ALTERNATIVE REMEDIAL CONTRACTING STRATEGY
U.S. EPA CONTRACT No. 68-W8-0089
WORK ASSIGNMENT No. 91-5EF3
DOCUMENT CONTROL No. 4500-91-AOXI

DRUM RELEASE AREA
EXCEEDENCES OF GROUNDWATER
REMEDIATION OBJECTIVES
MSD #4 SLUDGE AND BARREL DUMP
Chicago, Illinois

ecology and environment



SITE BOUNDARIES ARE APPROXIMATE

FIGURE 4-12

ALTERNATIVE REMEDIAL CONTRACTING STRATEGY U.S. EPA CONTRACT No. 68-W8-0089 WORK ASSIGNMENT No. 59-5EF3 DOCUMENT CONTROL No. 4500-91-AOXI	EXCEEDANCES OF GROUNDWATER REMEDIATION OBJECTIVES MSD#4 SLUDGE BARREL DUMP Chicago, Illinois

Table 4-2

Chemicals in Surface Water, Groundwater and Leachate that Exceed Human Health Risk-Based Concentration Lake Calumet Cluster Site Chicago, Illinois

Chemical	Surface Water	Off-site Surface Water[a]	Groundwater	Leachate[b]
Volatile Organic Compounds				
Benzene			◆	◆
Toluene			◆	
Acetone			◆	◆
2-Butanone			◆	
1,2-Dichloropropane			◆	
Chloromethane			◆	
Vinyl chloride			◆	
Methylene chloride			◆	
Trichloroethene			◆	
Tetrachloroethene			◆	
1,2-Dichloroethane				◆
Semivolatile Organic Compounds				
Napthalene			◆	◆
Bis(2-ethylhexyl)phthalate			◆	
Phenol			◆	◆
4-Methylphenol			◆	
Chrysene			◆	
Benzo(a)pyrene			◆	
Indeno(1,2,3-cd)pyrene			◆	
Benzo(k)fluoranthene			◆	
Benzo(b)fluoranthene			◆	

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Table 4-2

Chemicals in Surface Water, Groundwater and Leachate that Exceed Human Health Risk-Based Concentrations Lake Calumet Cluster Site Chicago, Illinois (Continued)

Chemical	Surface Water	Off-site Surface Water[a]	Groundwater	Leachate[b]
Semivolatile Organic Compounds (Continued)				
Benzo(a)anthracene			◆	
Pesticides/PCBs				
Dieldrin			◆	
4,4-DDE			◆	
Aroclor 1254			◆	
Aroclor 1232				◆
Inorganic Constituents				
Antimony			◆	
Barium			◆	
Boron			◆	
Cadmium			◆	◆
Chromium			◆	
Iron	◆		◆	◆
Lead	◆	◆	◆	◆
Manganese	◆	◆	◆	◆
Nickel			◆	◆
Thallium			◆	
Vanadium			◆	◆

◆ = exceeds remediation objective
[a]Off-site surface water locations include SW03/SW05 at Paxton Landfill and SW03 at MSD#4.
[b]Leachate samples were only collected at Paxton Landfill

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Table 4-3

Chemicals in Sediments that Exceed Ecological Benchmarks
Lake Calumet Cluster Site
Chicago, Illinois

Chemical Name	Sediment	Off-site Sediment[a]
Volatile Organic Compounds		
Acetone	◆	◆
Toluene	◆	
Xylene	◇	
Semivolatile Organic Compounds		
Phenanthrene	◆	◆
Fluoranthene	◆	◆
Pyrene	◆	◆
Benzo(a)anthracene	◆	◆
Chyrsene	◆	◆
Benzo(k)fluoranthene	◆	◆
Benzo(b)fluoranthene	◆	◆
Napthalene	◇	◆
2-Methylnapthalene	◇	◇
Benzo(a)pyrene	◆	◆
Indeno(1,2,3-cd)pyrene	◆	◆
Benzo(g,h,i)perylene	◆	◆
Anthracene	◆	◆
Dibenzo(a,h)anthracene	◆	◆
Acenaphthylene	◆	◆
Acenaphthene	◇	◆
Dibenzofuran	◆	◆
Fluorene	◆	◆
Bis(2-ethylhexyl)phthalate	◆	

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Table 4-3

Chemicals in Sediments that Exceed Ecological Benchmarks
Lake Calumet Cluster Site
Chicago, Illinois
(Continued)

Chemical Name	Sediment	Off-site Sediment[a]
Semivolatile Organic Compounds (Continued)		
1,4-Dichlorobenzene	◆	
Di-n-butylphthalate	◆	
Diethylphthalate	◇	
Pesticides/PCBs		
Dieldrin	◆	◆
4,4-DDE	◇	◇
4,4-DDD	◇	◇
4,4-DDT	◆	◆
alpha-chlordane	◆	◆
gamma-chlordane	◇	◆
delta-BHC	◆	
gamma-BHC	◆	
beta-BHC	◆	
Methoxychlor	◆	◆
Heptachlor epoxide	◆	
Endosulfan I	◆	
Endosulfan II	◆	
Aldrin	◆	
Endrin	◆	
Endosulfan sulfate	◆	
Aroclor 1248	◇	
Aroclor 1254	◆	◆

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Table 4-3

Chemicals in Sediments that Exceed Ecological Benchmarks
Lake Calumet Cluster Site
Chicago, Illinois
(Continued)

Chemical Name	Sediment	Off-site Sediment[a]
Pesticides/PCBs (Continued)		
Aroclor 1260	◆	
Aroclor 1242	◆	◆
Aroclor 1221	◆	
Aroclor 1232	◆	
Aroclor 1016	◆	
Inorganic Constituents		
Arsenic	◆	◆
Antimony	◆	◆
Cadmium	◆	◆
Chromium	◇	◆
Copper	◇	◆
Iron	◆	◆
Lead	◇	◆
Mercury	◆	◇
Manganese	◇	◇
Silver	◇	
Nickel	◆	◆
Zinc	◆	◆

◆ = exceeds lowest screening benchmark
◇ = exceeds highest screening benchmark

[a]Off-site sediment locations include ST10/ST11 at Alburn Incinerator; ST08 at MSD#4; ST04, ST08, and ST09 at U.S. Drum II; and ST03 at Paxton Landfill.

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Surface Water/Groundwater/Leachate

Constituents in surface water, groundwater and leachate that exceeded water quality criteria for the protection of aquatic life are listed in Table 4-4. It should be noted that total metal concentrations were measured in surface water, while the water quality criteria (WQC) are based on dissolved (i.e., available) metal concentrations.

No off-site samples were collected for groundwater and leachate. The constituents that exceeded WQC in off-site surface water samples are listed in Table 4-4.

4.2 CONTAMINANT DISTRIBUTION AND TRENDS

The Cluster Site as a whole is considered when evaluating contaminant distribution and trends. In addition, trends in the potential risk to human and ecological receptors are evaluated separately. Preliminary risk assessments have been prepared by the U.S. EPA based mostly on recent ESIs for these sites. One of the primary focuses of the ERS was the direct contact risk which relates directly to the surface soil pathway. Risk to humans and ecological receptors may be greatly diminished by addressing this pathway. The results of the risk assessments are summarized in this subsection.

4.2.1 Contaminant Trends in Relation to Human Health Impacts

4.2.1.1 Soil and Sediment

The primary contaminants in soil are benzo(a)pyrene, arsenic, beryllium, and manganese. Elevated volatile organic compounds (VOCs), chromium, and antimony were measured at one location only, suggesting a potential hot spot of these contaminants, though the samples were collected below a six inch depth, limiting the potential for exposure. Most soil

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Table 4-4

Chemicals in Groundwater, Surface Water, and Leachate that Exceed Ecological Benchmarks Lake Calumet Cluster Site Chicago, Illinois

Chemical Name	Surface Water	Off-site Surface Water[a]	Groundwater	Leachate
Volatile Organic Compounds				
Carbon Disulfide			◆	
Toluene	◆		◇	◇
Benzene			◆	
Ethylbenzene			◇	◇
Xylene			◇	◇
Acetone			◆	
2-Butanone			◆	
Chlorobenzene			◆	
4-Methyl-2-pentanone			◆	
Semivolatile Organic Compounds				
Phenanthrene			◆	◆
Fluoranthene			◆	
Benzo(a)anthracene			◆	
Napthalene			◆	◆
2-Methylphenol			◇	
Benzo(a)pyrene			◇	
Anthracene			◇	
Dibenzofuran			◇	
Fluorene			◆	
Phenol			◇	
Bis(2-ethylhexyl)phthalate			◆	

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Table 4-4

Chemicals in Groundwater, Surface Water, and Leachate that Exceed Ecological Benchmarks Lake Calumet Cluster Site Chicago, Illinois (Continued)

Chemical Name	Surface Water	Off-site Surface Water[a]	Groundwater	Leachate
Pesticides/PCBs				
Aroclor 1254				
Aroclor 1232				◇
Inorganic Constituents				
Aluminum	◇	◇		◇
Antimony			◆	
Barium	◇	◆	◇	◇
Beryllium	◆			◆
Boron				◇
Calcium	◆		◆	
Cadmium				◇
Chromium	◇		◇	
Copper	◇	◆	◇	◇
Cyanide	◇	◇	◇	
Cobalt			◆	
Iron	◆		◆	
Lead	◆	◇	◇	◇
Magnesium			◆	◆
Manganese	◆	◆	◆	◆
Potassium	◆		◆	
Nickel			◆	◆

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Table 4-4

Chemicals in Groundwater, Surface Water, and Leachate that Exceed Ecological Benchmarks Lake Calumet Cluster Site Chicago, Illinois (Continued)

Chemical Name	Surface Water	Off-site Surface Water[a]	Groundwater	Leachate
Inorganic Constituents (Continued)				
Sodium			◆	◆
Thallium			◆	
Vanadium	◆		◆	◆
Zinc	◇	◇	◆	◆

◆ = exceeds chronic criteria
◇ = exceeds acute and chronic criteria

[a]Off-site surface water locations include SW03/SW05 at Paxton Landfill and SW03 at MSD#4.

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contamination was found at the Alburn Incinerator site. Heavy metal and PAH contamination on the Cluster Site may be due to a combination of waste disposal, slag use, and vehicular traffic in the area. For example the highest manganese concentration (26,900 mg/kg) was detected off-site in an area of potential slag disposal north of Paxton II. The highest benzo(a)pyrene concentration was near the equipment shed on Paxton Landfill, an area where heavy machinery is stored and repaired.

The primary contaminants in the sediment are benzo(a)pyrene, dibenzo(a,h)anthracene, benzo(a)anthracene, PCBs, arsenic, beryllium, chromium, and manganese. Chromium and lead were found at elevated concentrations in Dead Stick Pond. Arsenic and benzo(a)pyrene were at elevated concentrations in LHL #1 pond, and benzo(a)pyrene was elevated in LHL #2 pond and in the drainage ditches at Paxton Landfill. The same constituents, plus dibenzo(a,h)anthracene and beryllium were at elevated concentration in the drainage ditches around Land and Lakes #3 and in sediment from Lake Calumet and in sediment from ponded water along 119th Street near Alburn Incinerator. Chromium was at elevated concentrations in a ditch along 122nd Street near Land and Lakes #3. However, Surface water runoff from Land and Lakes #3 is currently captured and collected in the leachate system and is discharged to the sewer system under a permit to the MWRDGC (Cowhey, J., 1997). Near U.S. Drum II, only arsenic was detected in a sample along 119th Street. In on-site sediment samples, arsenic ranged from 7.4 to 28.3 mg/kg and in off-site samples arsenic ranged from 8.1 to 15.3 mg/kg. Most contamination was found in ponded waters at Alburn Incinerator and included arsenic, beryllium, manganese, chromium, lead, benzo(a)pyrene, and dibenzo(a,h)anthracene. PCBs were elevated in sediment from a drainage ditch on the south side of 122nd Street. As noted above, PAHs may be associated with vehicular traffic since benzo(a)pyrene was also at elevated concentrations in off-site samples and heavy metal concentrations may be associated with slag use in the area.

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4.2.1.2 Groundwater/Surface Water/Leachate

Numerous VOCs, semi-volatile organic compounds (SVOCs), pesticides/PCBs, and heavy metals were found in groundwater and leachate at elevated concentrations. At Land and Lakes #3, shallow groundwater contamination was greatest on the northeast and southeast sides of Land and Lakes #3, near Paxton Lagoons and Paxton II. Thus, this contamination may be attributed to these sites rather than Land and Lakes #3. At Paxton Landfill, groundwater contamination was greatest in shallow wells on the east side of Paxton II and within Paxton I. However, no VOCs or SVOCs were at elevated concentrations in surface water, suggesting that either contamination has not reached these water bodies, or that transport processes have resulted in significant dilution. Elevated metals were measured in drainage ditches near Paxton Landfill, though elevated metals were also found at off-site locations. At the Gun Club Pond #1, iron, manganese, and lead were at elevated concentrations within areas of standing water, though no metals were above objectives within Pond #1.

4.2.2 Contaminant Trends in Relation to Ecological Impacts

4.2.2.1 Sediment

While elevated VOCs were measured in sediments, these constituents are not expected to have long-term impacts because of their volatilization potential. Contaminants that sorb to sediments were found throughout the ponds and drainage ditches on and adjacent to the cluster sites. SVOCs were measured at elevated concentrations throughout; however, only a few constituents exceeded the most severe benchmarks. Pesticides/PCBs were found scattered throughout the sites. The highest PCB concentration was found in a drainage ditch along the south side of 122nd Street, near the Gun Club. The most contamination was found at Alburn Incinerator, where PAHs, pesticides, metals (primarily chromium, iron,

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lead, manganese, and zinc) were found in areas of ponded water. Pesticides/PCBs, metals, and VOCs exceeded the lowest benchmark at U.S. Drum II; no severe benchmarks were exceeded here. Only metals were of concern at Pond 1 at Paxton II, while PAHs, pesticides, and metals were of potential concern at LHL #1 pond and LHL #2 pond. However, no exceedances of severe levels were noted in these ponds.

PAHs were found in almost every sediment sample collected; however, PAHs were also found in off-site samples. Heavy metals (primarily arsenic, cadmium, copper, iron, manganese, and zinc) are a potential concern at Dead Stick Pond and the ditches entering the pond. In Lake Calumet, PAHs and metals are of potential concern. Low levels of PCBs were also found in the lake. At the Gun Club, SVOCs, DDD, PCBs, iron, lead, manganese, and silver are of potential concern in ditches on the property. Drainage from the Dead Stick Pond to the Calumet River contained elevated levels of manganese, though this constituent was also found at elevated levels in off-site samples.

4.2.2.2 Groundwater/Surface Water/Leachate

Groundwater and leachate are not expected to discharge to surface water without dilution. However, the assumption of no dilution was made in this conservative evaluation of potential impacts to aquatic organisms in on site and downgradient surface water features. In surface water samples, elevated aluminum, barium, and copper were measured, though at concentrations similar to off-site samples. In ditches and standing water, cyanide was also a concern. For groundwater, elevated VOCs, PCBs, barium, copper, and cyanide were present. In leachate, elevated VOCs, barium, aluminum, chromium, boron, cadmium, copper, and zinc were present. Higher concentrations of all contaminants were found in leachate and groundwater than in surface water. This suggests that fate processes will result in a decrease in contaminant concentrations that are discharged to surface water.

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4.2.3 Human Health and Ecological Risk Assessment

Draft risk assessments were prepared by U.S. EPA for the individual sites within the cluster to present preliminary findings regarding human health and ecological risks. The risk assessments were based on data and information presented in the ESI reports. These risk assessments also evaluated the site under current land use conditions.

Exposure to groundwater was considered to be an incomplete exposure at the Cluster Site since no one is drinking the groundwater at the sites and because the City of Chicago and neighboring communities are supplied water from Lake Michigan. Consumption of fish and waterfowl was not evaluated in any of the risk assessments. None of the on-site ponds support a fishery and hunting is illegal in Chicago. However, fishing occurs in Lake Calumet and other larger water bodies in the vicinity of the Cluster Site. Poaching may also occur. Inhalation of dust and ingestion of sediment are also potential exposure pathways at these sites that were not evaluated.

While these are potential exposure pathways at these sites, these pathways were not evaluated for several reasons. It has been proposed that a potential human health risk may develop because animals within the Cluster Site could accumulate COPCs in their tissues. Consumption of contaminated fish and waterfowl can be a potential concern for humans. The scope of this study did not allow for a determination of the presence of impacted wildlife or for the quantification of COPCs in animal tissue. Therefore, this potential exposure scenario is qualitatively discussed at this time. For off-site water bodies, the fish and waterfowl consumption pathways were not evaluated because of the complexities related to the multiple sources of contamination in the area, especially contamination found in Lake Calumet. Ecological reclamation of the habitat present in the Cluster Site, as proposed in this report, is not expected to increase the likelihood that any animals from the Cluster Site

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will be consumed by humans. On the contrary, the proposed ecological reclamation is expected to either decrease or have no impact on human health risks from consumption of animals present on the Cluster Site. The most probable source of human exposure to contaminants is through fish and waterfowl consumption.

There are several reasons why ecological reclamation of the Cluster Site is not expected to result in an increased human health risk associated with fish and waterfowl consumption. The proposed enhancements to the aquatic habitat will not result in water bodies that can support a recreational fishery and therefore no such fisheries have been proposed. Passive recreation is the recommended end use for the site, and as such, permitted activities will not include fishing. Most, if not all fish inhabiting the ponds will be non-game species. The proposed pond enhancements would not provide habitat favorable to the propagation of any game or panfish that are able to make their way into these ponds. Therefore, there would be no incentive or attraction for fishing on the Cluster Site.

Similarly, human health risks from consumption of wild game would not be expected to increase as a result of reclamation activities. Hunting on the Cluster Site is prohibited by City Ordinance (Chicago Illinois Municipal Ordinance 8-24-050). Reclamation of the terrestrial habitat is not expected to increase the human health risks from consumption of animals if illegal hunting is already taking place on the Cluster Site. Ecological reclamation and any associated remedial actions should decrease human health risks for the Cluster Site and adjacent areas that are ecologically connected to the Cluster Site. After reclamation, the general and ecological condition of the Cluster Site will be improved over the current conditions. Additionally, the increased use of the Cluster Site would make illegal hunting more difficult and therefore decrease potential human health risks.

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Incidental ingestion of sediment was not considered to be a major route of exposure due to the relatively low level of direct sediment contact which is likely to occur. Inhalation of dust may be of potential concern, for the sites where there is little or no vegetative cover in existence. However, the proposed reclamation alternatives will greatly reduce dust formation and will limit or restrict contaminant migration to nearby water bodies.

In assessing the human health risks posed by a site, the National Contingency Plan (NCP) establishes 1E-06 (one in one million) as a "point of departure " for establishing remediation goals. Excess cancer risks lower than 1E-06 are not addressed by the NCP. Excess cancer risks in the range from 1E-04 (one-in-10-thousand) to 1E-06 (one-in-one-million) may or may not be considered acceptable, depending on site-specific factors such as the potential for exposure, technical limitations to remediation, and data uncertainties. In an April 1991 OSWER Directive (9355.0-30) from the U.S. EPA Assistant Administrator to Regional Directors, the U.S. EPA further clarified the acceptable carcinogenic risk range by stating that when reasonable maximum exposures for both current and future land use are less than 1E-04, action is generally not warranted, unless there are adverse environmental impacts. However, it should be noted that the same directive indicates that the risk manager may decide that risk less than 1E-04 is unacceptable due to site-specific issues. For noncarcinogens, when a calculated hazard quotient or hazard index exceeds a value of one, there may be a potential health risk.

The draft risk assessments for the sites include the following documents, which are summarized in the following subsections. Human health and ecological risk assessments were not conducted for the Paxton Lagoons site.

- Pullen, Lara. 1997. Draft Risk Assessment, Paxton Landfill Corporation, Chicago, IL. 30 April 1997.

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- Pullen, Lara. 1997. Draft Risk Assessment, Alburn Incinerator, Chicago, IL. 30 April 1997.

- Pullen, Lara. 1997. Draft Risk Assessment, U.S. Drum II, Chicago, IL. 30 April 1997.

- Pullen, Lara. 1997. Draft Risk Assessment, MSD #4 Sludge and Barrel Dump, Chicago, IL. 30 April 1997.

- Pullen, Lara. 1997. Draft Risk Assessment, Land and Lakes #3, Chicago, IL. 9 May 1997.

- Karecki, Ed. 1996. Preliminary Ecological Assessment, MSD #4 Sludge and Barrel Dump, Chicago, IL, Draft. Memorandum from Ed Karecki, U.S. Fish and Wildlife Service Biologist, Technical Support Section to Larry Schmitt, Remedial Project Manager, Remedial Response Section #2. 20 February 1996.

- Karecki, Ed. 1997. Preliminary Ecological Assessment —Final Draft, Paxton Landfill Corporation, Chicago, IL. Memorandum from Ed Karecki, U.S. Fish and Wildlife Service Biologist, Technical Support Section to Pablo Valentin, Remedial Project Manager, Remedial Response Section #2. 7 July 1997.

- Karecki, Ed. 1996. Preliminary Ecological Assessment —Final Draft, Land and Lakes #3, Chicago, IL. Memorandum from Ed Karecki, U.S. Fish and Wildlife Service Biologist, Technical Support Section to Larry Schmitt, Remedial Project Manager, Remedial Response Section #2. 1 July 1996.

- Karecki, Ed. 1996. Final Draft Preliminary Ecological Assessment —Alburn Incinerator, Chicago, IL., Memorandum from Ed Karecki, U.S. Fish and Wildlife Service Biologist, Technical Support Section to Larry Schmitt, Remedial Project Manager, Remedial Response Section #2. 30 August 1996.

- Karecki, Ed. 1996. Preliminary Ecological Assessment —U.S. Drum II, Chicago, IL, Draft. Memorandum from Ed Karecki, U.S. Fish and Wildlife Service Biologist, Technical Support Section to Larry Schmitt, Remedial Project Manager, Remedial Response Section #2. 15 March 1996.

Screening Risk Assessments

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Paxton Landfill—For the Paxton Landfill site, a worker would have a 5E-05 increased risk of contracting cancer from ingestion of benzo(a)pyrene in soil and dermal contact with benzo(a)pyrene in soil and sediment. This risk estimate falls within the range of 1E-4 to 1E-06; thus, cancer risks may be acceptable at this site. Exposure to benzo(a)pyrene (a PAH) and manganese in soil through incidental ingestion and dermal contact and exposure to benzo(a)pyrene in sediment through dermal contact were evaluated. The hazard index for these exposure scenarios did not exceed one.

Land and Lakes #3—For the Land and Lakes #3 site, a worker would have a 5E-05 increased risk of contracting cancer from the ingestion of benzo(a)pyrene, dibenzo(a,h)anthracene, and beryllium from soil, dermal contact with benzo(a)pyrene, benzo(a)anthracene, and dibenzo(a,h)anthracene in soil, and dermal contact with benzo(a)pyrene, benzo(a,h)anthracene, benzo(b)fluoranthene, and dibenzo(a,h)anthracene in sediment. The risk estimates fall within the range of 1E-04 to 1E-06; thus, risks may be acceptable at this site. The risk assessment evaluated exposure to benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, dibenzo(a,h)anthracene, bis(2-ehthylnexyl)phthalate, PCBs, beryllium, and manganese in soil and exposure to benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, dibenzo(a,h)anthracene, aldrin, PCBs, beryllium, antimony, manganese, and iron in sediment. The hazard index for these exposure scenarios did not exceed one. The screening risk assessment was based on sample data collected during the ESI; some sampling points may have been from daily or intermediate cover and not from the final cover system which exists over portions of the landfill today. No sampling was conducted for this ERS.

Alburn Incinerator—For the Alburn Incinerator site, it was concluded that a trespasser would have a 5E-06 increased risk of contracting cancer from dermal exposure to benzo(a)pyrene in sediments. This risk estimate falls within the range of 1E-04 to 1E-06;

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thus, risks may be acceptable at this site. Exposure to manganese in soil through incidental ingestion and dermal contact and exposure to manganese, beryllium, Aroclor-1260, benzo(b)fluoranthene (a PAH), and benzo(a)pyrene in sediment through dermal contact were evaluated. The hazard index for these exposure scenarios did not exceed one. Exposure to surface water was not evaluated since the water on the property is assumed to be temporary.

U.S. Drum II—For the U.S. Drum II site, it was concluded that a trespasser would have a 1E-06 increased risks of contracting cancer from dermal exposure to PCBs in sediment. This risk estimate falls within the range of 1E-04 to 1E-06; thus, risks may be acceptable at this site. Exposure to hexachlorobutadiene, benzo(a)anthracene, bis(2-ethylhexyl)phthalate, benzo(a)pyrene, and PCBs in soil through incidental ingestion and dermal contact and exposure to PCBs in sediment through dermal contact were evaluated. The hazard index for these exposure scenarios did not exceed one.

MSD #4—For the MSD #4 site, it was concluded that an individual who has recreational exposure at the site would have a 9E-07 increased risk of contracting cancer from dermal exposure to benzo(a)anthracene and benzo(b)fluoranthene, which are carcinogenic PAHs, and PCBs in sediment. This risk estimate is expected to be acceptable because it falls below the 1E-06 "point of departure" for evaluating risks at Superfund sites. There were no chemicals of potential concern (COPCs) in soil and surface water at this site, though only one soil sample was collected during the ESI.

Ecological Evaluation

Paxton Landfill—The preliminary ecological assessment for Paxton Landfill identified naphthalene, tetrahydrofuran, 2-methylphenol, copper, and nickel as COPCs in groundwater.

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Discharge of undiluted groundwater to surface water poses a potential threat to nearby surface waters. The primary ecological areas of concern are Big Marsh, Lake Calumet, and surrounding wetlands. Based on chronic toxicity data, the undiluted groundwater concentrations of naphthalene, nickel, and copper pose a potential threat to aquatic organisms, if groundwater contaminants are allowed to migrate off site.

Land and Lakes #3 —Elevated levels of bis(2-ethylhexyl)phthalate, cadmium, and cyanide were present in site soil; however, the soil samples were likely from daily or intermediate cover and not from the final cover system. Elevated levels of PAHs were present in site drainage ditches, and may have affected surface waters. However, surface water runoff is now captured and managed with the leachate collection system and discharged to a sewer system under a permit to the MWRDGC (Cowhey, J., 1997). Discharge of undiluted groundwater to surface water may have affected nearby surface waters. Elevated levels of iron, nickel, cyanide, benzene and toluene were measured in monitoring wells during the ESI. Land and Lakes has since constructed a slurry wall, excavated the shallow perched saturated zone and induced an inward hydraulic gradient at the site. The preliminary ecological assessment for Land and Lakes #3 based on ESI data, identified Aroclor-1248, pyrene, cadmium, and mercury as COPCs in sediments of Dead Stick Pond. It should be noted that contaminants in Dead Stick Pond may be the result of activities at the MSD #4 dump site also. The only contaminants measured in Dead Stick Pond and Lake Calumet that were also measured at the Land and Lakes #3 site at elevated levels were cadmium and pyrene. The primary ecological areas of concern are Deadstick Pond, Lake Calumet, and surrounding wetlands. There is potential for severe effects to benthic organisms in sediments, and future risks to Dead Stick Pond, Lake Calumet, and surrounding wetlands if contaminants in site soils and groundwater are allowed to migrate off site. However, information provided by Land and Lakes Company (Cowhey, J., 1997) indicates that

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groundwater at this site remains on-site due to an inward hydraulic gradient caused by the leachate collection system.

Alburn Incinerator—Elevated levels of chrysene, bis(2-ethylhexyl)phthalate, lead, and cadmium in site soils and elevated levels of naphthalene, chromium, manganese, and lead in site sediments are the COPCs at the Alburn Incinerator site. The site and surrounding lakes and wetlands are of potential concern for ecological receptors. The site contains ponded water and vegetation which makes it attractive to wildlife. The site also contains elevated levels of mixed wastes which are at levels likely to cause severe impacts to soil/sediment invertebrates and potentially other wildlife. It does not appear that the cap has been successful in isolating contamination.

U.S. Drum II—For the U.S. Drum II site, results of chemical analyses in soil and sediment indicated elevated levels of xylene, barium, mercury, vanadium, and zinc in the stained soil southeast of the concrete platform. The area of contamination appears to be found only in this portion of the site and may be the result of disposal which occurred after the removal and capping. The primary ecological areas of concern are the off-site wetland. Sediment sampling in the pond located south of the site, which receives drainage from the railroad ditch, does not indicate that contaminant migration has occurred. Based on the information currently available, the site appears to pose a low level of ecological risk and further action is not recommended.

MSD #4—In the preliminary ecological assessment for MSD #4, lead, PCBs, copper, and chromium are COPCs in sediment at the inlet to Deadstick Pond. A detailed risk evaluation could not be performed, though preliminary risks indicated a potential for severe effects to benthic invertebrates. The Gun Club wetlands may also contain elevated levels of spent lead shot, if the deposition zone of the trap/skeet range occurs in the wetland. The

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spent shot would primarily be a hazard to waterfowl which feed in the wetlands. If contamination has reached the lake, the aquatic community in the lake may be impacted.

4.3 DATA GAPS

After evaluating the available site data, it is recognized that there are limitations to the chemical data that has been collected from the sites. While data gaps are presented for each site, any future sampling activities should be designed to evaluate the Cluster Site as a whole, especially shallow groundwater testing. The data gaps that may be addressed at each site prior to implementing ecological reclamation of the sites include:

Paxton Landfills

- Determine depth of cap at Paxton I, LHL#1, and LHL#2 landfills.
- Test shallow groundwater at LHL#2 landfill, in Indian Marsh to the east, and Big Marsh to the north.
- Test surface water and sediment in Pond #1, LHL#1 pond, and LHL#2 pond.
- Perform biotic community analysis in Pond #1, LHL#1 pond, and LHL#2 pond.

Land and Lakes #3

- No data gaps.

Alburn Incinerator

- Perform extent of contamination study to determine extent of cap.
- Test shallow groundwater.

U.S. Drum II

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- Test shallow groundwater.
- Test shallow groundwater in Indian Ridge Marsh to the east.

Unnamed Parcel

- Perform extent of contamination study.
- Test shallow groundwater.
- Test surface water and sediment in Pond #1, Pond #2, and Pond #3.
- Perform biotic community analysis in Pond #1, Pond #2, and Pond #3.

Gun Club

- Test shallow groundwater.
- Test shallow groundwater in Indian Ridge Marsh to the east.

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SECTION 5
FATE AND TRANSPORT

The fate and transport of the contaminants of potential concern (COPCs) present at the Cluster Site and the primary geochemical factors influencing their concentrations and behavior are discussed in this section. The physical characteristics of the site and the nature and extent of contamination, which have a substantial influence on the factors affecting the fate and transport of contaminants, are also addressed.

5.1 CONTAMINANT CHARACTERISTICS

Chemicals which exceed risk-based corrective action objectives are considered COPCs. The primary COPCs at these sites are several VOCs, PAHs, and heavy metals. Physical and chemical properties of the COPCs are listed in Appendix D.

5.2 TRANSPORT PROCESSES

The following paragraphs present a brief description of the primary transport processes for the COPCs. Migration characteristics of the COPCs are presented in Appendix D.

5.2.1 VOCs

Generally, VOCs are soluble in water. High vapor pressures and Henry's Law Constants indicate that these compounds are fairly volatile, and will tend to escape from surface water. Low organic carbon partition coefficients suggest that these compounds are not strongly adsorbed by organic materials, and low octanol-water partition coefficients (K_{ow}) suggest that these compounds would not be expected to accumulate in biological tissue. Thus,

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biomagnification in the food chain is not expected for VOCs. Because of their high solubility and low K_{ow}s, these compounds are expected to be mobile in the aquatic environment. Biodegradation and volatilization are important fate processes for VOCs.

5.2.2 Polynuclear Aromatic Hydrocarbons (PAHs)

Adsorption onto suspended solids and particulate matter and complexation with natural organic substances are probably the most important environmental transport processes for these compounds. In general, PAHs have a moderate to high potential to be adsorbed to soils and sediments. Sorption increases with increasing organic carbon content. These compounds can also migrate to ground or surface waters by leaching, but this is generally a slow process. Volatilization of these compounds is generally not expected to be a major fate process. While PAHs may be bioaccumulated, they are quickly metabolized and eliminated from most organisms. Thus, biomagnification in the food chain is not of concern. Biodegradation is probably the most important fate process for this group of COPCs, although because of their high molecular weights, degradation is expected to be a slow mechanism.

5.2.3 Metals

While pure metallic forms are insoluble in water, many of the metal salts are soluble to varying degrees. The primary fate of metals in relation to groundwater and surface water transport is adsorption. Metals may be released into solution depending on pH, the particular chemical state present, and the presence of aerobic or anaerobic conditions at a site. For example, arsenic is generally quite mobile and may be leached from soil depending on the specific oxidation state present, while sorption processes exert a dominant effect on the distribution of lead in the environment. While all the metals have the potential to

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bioconcentrate to some degree, only organic mercury is expected to biomagnify through the food chain.

5.3 CONTAMINANT MIGRATION TRENDS

After a chemical is released into the environment, it may be transported (e.g., convected downstream in water), physically transformed (e.g.,volatilized), chemically transformed (e.g., via oxidation/reduction), biologically transformed (e.g.,biodegradation), or bioaccumulated in one or more media (U.S. EPA, 1989). Contaminant migration pathway analysis identified other (non-source) environmental media and off-site areas potentially affected by chemical migration.

The following subsections qualitatively address the transport of chemicals measured in soil, sediment, surface water, and groundwater at the sites, their potential to be transported to other environmental media, and their potential to migrate off site.

5.3.1 Soil

Surface soil is typically considered the top two to three feet of soil, with most exposure occurring within the top 6 inches. For subsurface soil exposure scenarios, subsurface soil typically ranges to 10 feet in depth. VOCs, PAHs, and inorganics have been measured in surface soil samples collected from the sites. While subsurface (>2 ft below ground surface [bgs]) soil samples were not collected from the sites, contamination is anticipated throughout most of the sites based on their historic use (i.e., waste disposal). Potential surface and subsurface soil contamination may also be associated with sewer and road construction wastes and steel/iron slag that have been brought on the site as fill materials. Soil contaminants could migrate to downgradient receptor areas or into other environmental

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media. The following paragraphs summarize the most important soil contaminant migration pathways for the Cluster Site.

5.3.1.1 Soil-to-Shallow Water Bearing Zone Migration

Chemicals in surface and subsurface soil can potentially leach into the shallow water-bearing zone. Such migration occurs when water infiltrates through the soil, carrying with it dissolved organic and inorganic chemicals. Part of the chemicals in the leachate would be absorbed by the soil beneath the contaminated zone, but the dissolved fraction could continue to move downward into the groundwater. Contaminants have been detected in monitoring wells on the Paxton Landfills. At Land and Lakes #3, extensive groundwater modeling has been performed (as required by Part 811 of 35 IAC) to evaluate the potential for migration of leachate constituents from the landfill to the shallow perched saturated zone and the deep Silurian dolomite aquifer. The results of this modeling demonstrate that leachate constituents will not migrate through the lining system of the landfill into either the shallow, perched saturated zone or the deep Silurian dolomite aquifer during the active life of the landfill (7 years), post-closure care period (30 years), or the 70-year modeling period after the post-closure care period (Cowhey, J., 1997). Thus, migration of contaminants from soil to the shallow water-bearing zone is a complete migration pathway for portions but not all of the Cluster Site. However, capping of the landfills and the other sites will limit precipitation from infiltrating the soil and wastes that remain on the sites. If caps are extensively used on the at-grade sites, they should be designed and constructed as a unit across all sites to prohibit shallow groundwater from simply migrating to uncapped areas. Establishment of vegetation will also aid in capturing precipitation.

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5.3.1.2 Soil-to-Air Migration

Chemicals in surface soil could potentially enter the atmosphere via dust entrainment or vaporization. Residual contaminants (especially inorganic parameters) bound to surface soils may be transported as suspended particulates or dust, and may migrate from the site. Factors influencing the potential for dust entrainment into the atmosphere includes surface roughness, surface soil moisture, soil particle sizes, kind and amount of vegetative cover, amount of soil surface exposed to eroding wind force or vehicular traffic, physical and chemical properties of the soil, wind velocity, and other meteorological conditions (U.S. EPA, 1983). While most of the source areas are covered with vegetation or capped (i.e., Land and Lakes #3, Paxton Lagoons, U.S. Drum II, Gun Club), others are not completely covered or capped (i.e., Paxton Landfills, Alburn Incinerator, and Unnamed Parcel). Dust formation may be significant during extended periods of dry weather. As a result, COPCs bound to the soil matrix may be present in the air or dusts at the Cluster Site.

VOCs have relatively high vapor pressures and Henry's Law Constants, facilitating their release from the soil to air. Contaminated surface soils that have been exposed to natural weathering for some time are likely to have lost the bulk of any volatile contaminants due to volatilization to the atmosphere, leaching to groundwater, or runoff to surface water. SVOCs, including PAHs, generally have lower vapor pressures and Henry's Law constants, so that volatilization is not a major transport process, although it can occur. Inorganic compounds are not expected to volatilize from soil. Under current site conditions, volatilization from soil is not expected to be great because, with the exception of the Gun Club and the Unnamed Parcel, the sites have been partially or completely capped with clay which restricts volatilization to the atmosphere. In addition, VOCs were only measured above corrective action objectives at one location (SS02 at 10-12" bgs) on U.S. Drum II.

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5.3.1.3 Soil-to-Surface Water

Organic and inorganic contaminants of potential concern may be mobilized during precipitation events when soils become suspended in stormwater runoff. Flooding is a major concern in the Lake Calumet area and there are ponds, lakes, and wetlands on or in the vicinity of the Cluster Site. Sheet erosion of contaminants could occur where contamination is at the surface. However, with the exception of the Gun Club and the Unnamed Parcel, the sites have been partially or completely capped with at least one foot of clay fill. Vegetation will also restrict runoff of contaminants. U.S. Drum II, Paxton Lagoons, and the Alburn Incinerator have been seeded. The western 18 acres of Land and Lakes #3 has been certified closed and seeded. In addition, the entire south and southeastern portions of the Land and Lakes #3 have been covered and seeded (Cowhey, M., 1997). At the Land and Lakes #3 landfill, cover is placed on the waste daily, and drainage from the waste materials and daily cover is collected with the leachate, and is discharged to the sewer system under a permit to the MWRDGC. Drainage from the intermediate cover systems is not contaminated and is discharged to the surface water management system under IEPA permit. All surface water discharge for the site is monitored and regulated under an NPDES permit (Cowhey, J., 1997). Thus, while there is some potential for soil contaminants to migrate to surface water, this is not expected to be a primary migration pathway throughout the Cluster Site.

5.3.2 Groundwater

Groundwater is potentially the primary contaminant transport pathway associated with the Cluster Site. A shallow groundwater bearing zone occurs from between the ground surface and 20 feet below ground surface (bgs) within the fill material and the Carmi Member lacustrine sediments that underlie the area. However, exposure to groundwater does not

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represent a significant exposure pathway for human receptors because water in this area is supplied by Lake Michigan and installation of new wells is prohibited by a city ordinance. The closest residential well is over 2.5 miles from the sites and is set in the bedrock aquifer.

The potential for horizontal migration of contaminated shallow groundwater poses a future threat to surface water and wetland habitat in close proximity to the site. COPCs have been measured in surface water. Chemicals that sorb to organic materials in an aquifer (e.g., PAHs, PCBs) are retarded in their movement through groundwater. Due to retardation, the sorbed chemical will travel at a linear velocity that is lower than groundwater flow velocity. Thus, while horizontal migration is a primary migration pathway for portions of the Cluster Site, contaminant migration is slowed by fate processes such as retardation.

In addition to horizontal migration, the COPCs can migrate vertically. However, vertical migration will be at a much slower rate. Contaminants have been detected in the shallow groundwater-bearing unit. Based on the geology and hydrogeology of the area, vertical migration of contaminants is expected to be restricted by a dense glacial till confining unit overlying the Silurian-age bedrock aquifer. Land and Lakes Company has performed numerical modeling as required by the IEPA permitting process, which indicates that the Land and Lakes #3 landfill will not impact deep groundwater quality during the active life (7 years) or a 100-year period following the active life of the landfill (Cowhey, J., 1997). Thus, vertical migration of COPCs to the deeper groundwater is not expected to be a primary migration pathway at the Cluster Site.

Shallow groundwater contaminants could also migrate into other environmental media, as summarized below.

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5.3.2.1 Groundwater-to-Air Migration

Chemicals in shallow groundwater can volatilize to soil pore spaces and reach the soil surface and the surrounding air by diffusion where it could potentially migrate short distances. Volatilization from a water table aquifer is affected by depth to the water table and the moisture content of the unsaturated soil column, and is most rapid if depth to groundwater is shallow. This migration pathway is only of concern for VOCs. Diffusion (i.e., molecular movement from high concentration to areas of lower concentration), advection (i.e., solute transport by motion of flowing), and mechanisms (i.e., concentration reducing through mixing) are substantial inhibitors of chemical migration to the ground surface. In addition, precipitation events on the surface would result in percolation downward through the soil, mixing the COPC in the air-filled pore spaces and transporting it downward back to the perched water. The uppermost groundwater-bearing zone occurs at the surface to within 20 feet bgs at most of the sites. Elevated concentrations of VOCs have been measured in shallow wells on Paxton Landfill. In addition, elevated concentrations of VOCs have been measured in the open leachate sumps on the Paxton Landfill. At Land and Lakes #3, the shallow perched zone was excavated, and the contaminated materials in the shallow perched saturated zone were placed in a lined, permitted landfill cell. Shallow groundwater outside the cell boundaries and beyond the slurry wall and compacted liner (i.e., beyond the boundaries of Land and Lakes #3) is contaminated. Thus, migration of VOCs to the atmosphere from groundwater is a limited potential migration pathway at these sites.

5.3.2.2 Groundwater-to-Surface Water Migration

Contaminants in the shallow groundwater could migrate to the surface waters on the sites, drainage ditches that run through and adjacent to the sites, or to off-site surface water

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bodies including the Calumet River, Indian Ridge Marsh, Pag Marsh, Lake Calumet, and Dead Stick Pond. Groundwater flow in this region is generally towards Lake Michigan, though within the Cluster Site localized groundwater flow is influenced by land use and surface water. Shallow water flow generally follows site topography, and discharges to Lake Calumet, ponds, ditches, or other local surface water bodies. The Paxton landfills create localized mounding in the shallow groundwater-bearing zone, which tends to cause groundwater to flow in an eastward direction with flow components to the southeast and northeast. In addition, the Calumet River flows along the south and east sides of the Cluster Site, providing a discharge point for the uppermost groundwater-bearing zone, and adding to the eastward component of groundwater flow. There is a sand unit underlying the eastern half of the Cluster Site which is continuous with the sand under Indian Ridge Marsh (Roadcap and Kelly, 1994). Thus, contaminants in shallow groundwater within this sand layer may migrate from the site, though there is limited groundwater data to verify this assumption. Water quality data collected by the Illinois State Water Survey (Roadcap, 1997) showed higher ammonium-N levels on the west side of Indian Ridge Marsh next to the Cluster Site, in comparison to the east side of the marsh near Torrence Avenue. Water quality improved significantly during storm events, suggesting that the contamination is from groundwater, not surface water runoff.

However, at Land and Lakes #3, the leachate collection systems have been designed to induce an inward hydraulic gradient. Therefore, groundwater from the shallow perched saturated zone and the deep Silurian dolomite aquifer will flow towards the landfill and not vice-versa (Cowhey, J., 1997).

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5.4 SEDIMENT/SURFACE WATER

Surface water on the sites includes a variety of small ponds and a network of drainage ditches that eventually discharge off-site. There are at least two culverts that drain surface water from the Cluster Site to Indian Ridge Marsh (Roadcap, 1997). At Land and Lakes #3 and Paxton Lagoons, surface water management systems have been developed to restrict potential migration of contaminants through the surface water pathway.

Contaminants in the on-site surface water features may eventually enter the soil system by seeping from the ponds or ditches. The PAHs and metals detected in sediments would be expected to move slowly from the surface water system and would likely remain bound to soil and sediments directly adjacent to the water. Over time, these contaminants may leach into the subsurface soil, or be carried off-site as suspended particulates in surface water. Thus, migration of contaminants through the surface water and sediment pathways are of potential concern for portions of the Cluster Site.

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SECTION 6
ECOLOGICAL RECLAMATION ALTERNATIVES

6.1 OBJECTIVES

The goals of the project include development of alternatives to create natural communities of higher quality and, in the process, effectively remediate or manage risk from environmental contamination problems on the individual sites or migration of contaminants to adjacent sites. A major focus of the effort was directed at identifying reclamation options that provide ease of reclamation, while at the same time increase biodiversity, improve wildlife habitat, provide multiple environmental or recreational functions and benefits, and result in the creation of attractive landscapes with overall maintenance cost reduction.

Alternative reclamation uses are considered so that areas that do not lend themselves to reestablishment of an ecological community of acceptable quality might still be considered for compatible uses. The potential for specific reclamation goals was judged based on ecological quality potential and physical/chemical constraints of the individual sites. The Ecological Reclamation Plan will essentially develop a new landscape working with the physical conditions and constraints that the existing landscape provides. Another goal of the reclamation plan to manage the Cluster Site as a component of the local ecosystem, not as individual sites. Overall, the final reclamation plan must be tempered and moderated by the recognition that if contamination exists to such a degree that some type of remediation is necessary, the physical conditions of those portions of the site might be altered and the ultimate landscape cover will accordingly be adjusted.

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6.2 RECLAMATION ALTERNATIVES DESCRIPTION

6.2.1 General Alternatives

Soil, sediment, surface water, and groundwater contamination have been recorded for some areas of the Cluster Site; however, few samples have been collected from the area outside the boundaries of the sites (i.e., the Unnamed Parcel) and several of the ponds. The reclamation alternatives described herein assume that remediation will not be required; that remediation activities (where needed) will be conducted prior to reclamation; and/or that the reclamation alternatives themselves may serve as alternatives to traditional remediation. Data gaps and recommendations for remedial actions at the Cluster Site are summarized in Section 7 (Conclusions and Recommendations).

General ecological reclamation alternatives were developed for the terrestrial and aquatic resources in the project area after several site visits. These alternatives will provide a strong foundation for a continuing effort to enhance the natural resources of the Cluster Site. The reclamation alternatives address the diversity of conditions encountered and the sensitivity of the ambient land, and they attempt to unify the Cluster Site in order to simplify the management of ecological processes. The result will be an area that contributes to the diversity of wildlife habitat, provides open space for passive and active recreation, manages risk from environmental contamination, lessens the impact of flooding on adjacent land, and provides opportunities for research on a variety of ecological and environmental questions.

For the terrestrial resources, the reclamation alternatives focus on initiation of ecological enhancement of highly degraded areas through improvement of soil and vegetation. While the ERS initially evaluates the sites individually due primarily to differences in potential threats posed by the property (e.g, permitted, active landfill versus inactive landfill), the ecological reclamation plan considers the sites as a whole. A short-term goal is to establish a foundation of prairie and wetland vegetation native to the Lake Calumet region. Table

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6-1 presents a list of dry prairie, mesic prairie, and wet prairie species that could be planted at the site. With annual maintenance, native prairie and wetland species will out-compete cool season grasses and shallow-rooted species, resulting in increased ecological diversity.

Reclamation activities will also provide research opportunities for a variety of studies, such as biosolid augmentation of slag, plant growth on slag, phytoremediation, contaminated release during prescribed burns, and control of common reed grass. It is anticipated that terrestrial reclamation activities will continue over the long-term, with the continued expansion of biodiversity through the on-going addition of conservative plant species. It is also a long-term goal of this project to have other property owners in the area voluntarily join in the ecological reclamation plan.

Establishment of a diverse prairie landscape is proposed for the Cluster Site because prairie species have numerous qualities that make them an excellent choice for reclaiming the site. Obvious advantages of prairie vegetation over old field vegetation are that prairie plants are largely perennial with well developed root systems capable of capturing and retaining water, prairie vegetation is self-sustaining, and native animals prefer prairie vegetation. The following paragraphs summarize the characteristics of prairie vegetation, its development, and maintenance. Also discussed is the potential for prairie vegetation to bioaccumulate contaminants.

Characteristics of Prairie Vegetation

Prairie vegetation has the ability to effectively capture and retain surface water on site. If a site is treated to minimize stormwater runoff, the need for storm water retention wetlands is virtually eliminated. By developing a dense vegetative cover, soil runoff will be minimized and contaminants will remain almost immobile.

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Table 6-1
Potential Plant Species List
Lake Calumet Cluster Site
Chicago, Illinois

Dry Prairie Species Listc

C	SCIENTIFIC NAME	W	WETNESS	COMMON NAME
2	Allium canadense	3	FACU	WILD ONION
7	Allium cernuum	1	[FAC-]	NODDING WILD ONION
5	Andropogon gerardii	1	FAC-	BIG BLUESTEM GRASS
5	Andropogon scoparius	4	FACU-	LITTLE BLUESTEM GRASS
6	Anemone cylindrica	5	UPL	THIMBLEWEED
1	Asclepias verticillata	5	UPL	WHORLED MILKWEED
8	Aster azureus	5	UPL	SKY-BLUE ASTER
5	Aster ericoides	4	FACU-	HEATH ASTER
9	Aster laevis	5	UPL	SMOOTH BLUE ASTER
8	Baptisia leucantha	2	FACU+	WHITE WILD INDIGO
8	Bouteloua curtipendula	5	UPL	SIDE-OATS GRAMA
5	Cassia fasciculata	4	FACU-	PARTRIDGE PEA
6	Coreopsis palmata	5	UPL	PRAIRIE COREOPSIS
5	Coreopsis tripteris	0	FAC	TALL COREOPSIS
7	Desmodium canadense	5	UPL	HOARY TICK TREFOIL
6	Desmodium illinoense	5	UPL	ILLINOIS TICK TREFOIL
6	Dodecatheon meadia	3	FACU	SHOOTING STAR
8	Echinacea pallida	5	UPL	PURPLE CONEFLOWER
3	Echinacea purpurea	5	UPL	BROAD-LEAVED PURPLE CONEFLOWER
4	Elymus canadensis	1	FAC-	CANADA WILD RYE
2	Euphorbia corollata	5	UPL	FLOWERING SPURGE
2	Gaura biennis pitcheri	4	FACU-	COMMON GAURA
9	Helianthus mollis	5	UPL	DOWNY SUNFLOWER
8	Helianthus rigidus	5	UPL	PRAIRIE SUNFLOWER
5	Heliopsis helianthoides	5	UPL	FALSE SUNFLOWER
6	Kuhnia eupatorioides corymbulosa	5	UPL	FALSE BONESET
4	Lespedeza capitata	3	FACU	ROUND-HEADED BUSH CLOVER
6	Liatris aspera	5	UPL	ROUGH BLAZING STAR
8	Liatris pycnostachya	1	FAC-	PRAIRIE BLAZING STAR
4	Monarda fistulosa	3	FACU	WILD BERGAMOT
0	Oenothera biennis	3	FACU	COMMON EVENING PRIMROSE
8	Parthenium integrifolium	5	UPL	WILD QUININE
4	Penstemon digitalis	1	FAC-	FOXGLOVE BEARD TONGUE
9	Petalostemum purpureum	5	UPL	PURPLE PRAIRIE CLOVER
7	Phlox pilosa fulgida	1	FAC-	SAND PRAIRIE PHLOX
6	Physostegia virginiana arenaria	5	[UPL]	PRAIRIE OBEDIENT PLANT
9	Potentilla arguta	4	FACU-	PRAIRIE CINQUEFOIL
4	Ratibida pinnata	5	UPL	YELLOW CONEFLOWER
1	Rudbeckia hirta	3	FACU	BLACK-EYED SUSAN
7	Ruellia humilis	4	FACU-	HAIRY RUELLIA

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Dry Prairie Species List (continued)

5 Silphium integrifolium deamii	5 UPL	DEAM'S ROSIN WEED
5 Silphium laciniatum	5 UPL	COMPASS PLANT
5 Silphium terebinthinaceum	3 FACU	PRAIRIE DOCK
5 Smilacina stellata	1 FAC-	STARRY FALSE SOLOMON'S SEAL
3 Solidago graminifolia nuttallii	0 [FAC]	HAIRY GRASS-LEAVED GOLDENROD
5 Solidago juncea	5 UPL	EARLY GOLDENROD
4 Solidago nemoralis	5 UPL	OLD-FIELD GOLDENROD
4 Solidago rigida	4 FACU-	STIFF GOLDENROD
5 Sorghastrum nutans	2 FACU+	INDIAN GRASS
7 Stipa spartea	5 UPL	PORCUPINE GRASS
2 Tradescantia ohiensis	2 FACU+	COMMON SPIDERWORT
5 Vernonia altissima taeniotricha	0 [FAC]	HAIRY TALL IRONWEED
7 Veronicastrum virginicum	0 FAC	CULVER'S ROOT

Mesic Prairie Species List

C SCIENTIFIC NAME	W WETNESS	COMMON NAME
2 Allium canadense	3 FACU	WILD ONION
5 Andropogon gerardii	1 FAC-	BIG BLUESTEM GRASS
5 Andropogon scoparius	4 FACU-	LITTLE BLUESTEM GRASS
2 Apocynum sibiricum	-1 FAC+	PRAIRIE INDIAN HEMP
5 Aster ericoides	4 FACU	HEATH ASTER
4 Aster novae-angliae	-3 FACW	NEW ENGLAND ASTER
10 Carex bicknellii	5 [UPL]	COPPER-SHOULDERED OVAL SEDGE
4 Carex brevior	3 [FACU]	PLAINS OVAL SEDGE
9 Desmodium canadense	5 UPL	HOARY TICK TREFOIL
3 Echinacea purpurea	5 UPL	BROAD-LEAVED PURPLE CONEFLOWER
4 Elymus canadensis	1 FAC-	CANADA WILD RYE
2 Gaura biennis pitcheri	4 FACU-	COMMON GAURA
5 Helenium autumnale	-4 FACW+	SNEEZEWEED
2 Helianthus grosseserratus	-2 FACW-	SAWTOOTH SUNFLOWER
5 Heliopsis helianthoides	5 UPL	FALSE SUNFLOWER
6 Liatris spicata	0 FAC	MARSH BLAZING STAR
4 Monarda fistulosa	3 FACU	WILD BERGAMOT
0 Oenothera biennis	3 FACU	COMMON EVENING PRIMROSE
5 Panicum virgatum	-1 FAC+	SWITCH GRASS
4 Penstemon digitalis	1 FAC-	FOXGLOVE BEARD TONGUE
7 Phlox pilosa fulgida	1 FAC-	SAND PRAIRIE PHLOX
6 Physostegia virginiana	-5 [OBL]	OBEDIENT PLANT
5 Pycnanthemum virginianum	-4 FACW+	COMMON MOUNTAIN MINT
4 Ratibida pinnata	5 UPL	YELLOW CONEFLOWER
1 Rudbeckia hirta	3 FACU	BLACK-EYED SUSAN
5 Silphium perfoliatum	-2 FACW-	CUP PLANT
1 Solidago rigida	3 FACU	CANADA GOLDENROD

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Mesic Prairie Species List (continued)

3 Solidago graminifolia nuttallii	0 [FAC]	HAIRY GRASS-LEAVED GOLDENROD
5 Solidago juncea	5 UPL	EARLY GOLDENROD
5 Sorghastrum nutans	2 FACU+	INDIAN GRASS
5 Thalictrum dasycarpum	-2 FACW-	PURPLE MEADOW RUE
5 Thalictrum dasycarpum hypoglaucum	-2 FACW-	SMOOTH MEADOW RUE
6 Thalictrum revolutum	0 FAC	WAXY MEADOW RUE
5 Vernonia fasciculata	-3 FACW	COMMON IRONWEED
7 Veronicastrum virginicum	0 FAC	CULVER'S ROOT
7 Zizia aurea	-1 FAC+	GOLDEN ALEXANDERS

Wet Prairie Species List

C SCIENTIFIC NAME	W WETNESS	COMMON NAME
5 Actinomeris alternifolia	-3 FACW	WINGSTEM
4 Alisma subcordatum	-5 OBL	COMMON WATER PLANTAIN
4 Asclepias incarnata	-5 OBL	SWAMP MILKWEED
4 Aster novae-angliae	-3 FACW	NEW ENGLAND ASTER
3 Aster simplex	-5 OBL	PANICLED ASTER
9 Boltonia latisquama recognita	-5 [OBL]	FALSE ASTER
3 Calamagrostis canadensis	-5 OBL	BLUE JOINT GRASS
4 Carex cristatella	-4 FACW+	CRESTED OVAL SEDGE
6 Carex lacustris	-5 OBL	COMMON LAKE SEDGE
8 Carex lurida	-5 OBL	BOTTLEBRUSH SEDGE
4 Carex pellita	-5 OBL	BROAD-LEAVED WOOLLY SEDGE
3 Carex stipata	-5 OBL	COMMON FOX SEDGE
3 Carex tribuloides	-4 FACW+	AWL-FRUITED OVAL SEDGE
2 Carex vulpinoidea	-5 OBL	BROWN FOX SEDGE
4 Eupatorium perfoliatum	-4 FACW+	COMMON BONESET
4 Glyceria striata	-3 [FACW]	FOWL MANNA GRASS
5 Helenium autumnale	-4 FACW+	SNEEZEWEED
2 Helianthus grosseserratus	-2 FACW-	SAWTOOTH SUNFLOWER
3 Helianthus tuberosus	0 FAC	JERUSALEM ARTICHOKE
5 Iris virginica shrevei	-5 OBL	BLUE FLAG
4 Juncus torreyi	-3 FACW	TORREY'S RUSH
5 Mentha arvensis villosa	-5 [OBL]	WILD MINT
6 Mimulus ringens	-5 OBL	MONKEY FLOWER
7 Physostegia virginiana speciosa	-3 [FACW]	SHOWY OBEDIENT PLANT
5 Pycnanthemum virginianum	-4 FACW+	COMMON MOUNTAIN MINT
6 Scirpus cyperinus	-5 OBL	WOOL GRASS
4 Scirpus pendulus	-5 OBL	RED BULRUSH
5 Scirpus validus creber	-5 OBL	GREAT BULRUSH
5 Silphium perfoliatum	-2 OBL	CUP PLANT
4 Spartina pectinata	-4 FACW+	PRAIRIE CORD GRASS
4 Verbena hastata	-4 FACW+	BLUE VERVAIN

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Note:
Each species is preceded by its coefficient of conservatism (where C = 0 to 10, weedy to conservative), and followed by its wetness coefficient (where W = -5 to +5, wet to dry), and corresponding National Wetland Category (OBL = obligate wetland species, FAC = facultative species, UPL = upland species).

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Prairie vegetation can survive in a 1- to 5-foot initial depth of soil cover. A properly closed landfill has a thick clay cap that is then covered with vegetation. The purpose of the vegetative cover is to keep water where it falls, letting it evapotranspire through prairie vegetation, rather than allowing it to run off. Even though prairie plants are known for their deep roots, they are not known to penetrate a properly installed cap.

In prairie systems, most of the water that infiltrates into the upper soil layer is actually evapotranspired in amounts that nearly match the amount of precipitation. Thus, lateral movement of any water-soluble contaminants in an organic-rich rhizosphere is likely to be minimal, particularly if the pH is around 7 or higher. Studies at Iowa State University have found that a five-year old restored prairie growing on worn out clay loams can sustain an infiltration rate of 7.5 inches per hour. While there is no data on 1- to 4-year-old restored prairies, it is probable that infiltration rates are established relatively rapidly if a 5-year old prairie can sustain a 100-year rainfall event.

Prairie Development

Prairie development is generally successful on clay loams, but in heavily compacted clays, such as are found at the Cluster Site, it may take years for native root systems to begin to fully develop. Such sites will have stunted growth and development, will remain weedy with annuals, and will be subject to surface water erosion. Thus, soil conditioning (through increasing soil oxygen and organic matter levels) will be needed throughout most of the Cluster Site. In addition, soil at the site are expected to be high in chlorides due to the extensive use of slag as fill material, making the soil unfavorable to the establishment of diverse native species. Soil conditioning and the application of natural area management should increase biodiversity of native species.

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Prairie Maintenance

Burning is the prescribed tool to maintain prairie vegetation. Any maintenance prescription for annual burning includes the proper conditions under which burning can take place. The prescription will take into account certain parameters such as wind direction, wind speed, relative humidity, temperature, and the condition of the vegetation. Prescribed burning should not interfere with the day-to-day activities of an area. For example, burning has been successfully used along busy interstate highways. There is a lack of research, however, on the potential for contaminant transport of particulates during the burning of dried prairie vegetation. Prairie plants are largely perennial and herbaceous; when they die back in the fall, many of the nutrients and heavy metals leach back into the soil, particularly since present-day rains are typically acidic. Many volatile organics absorbed to foliar structures are exposed to volatilization and photo-degradation. It is unclear what happens to those unleached metals that remain and it is unknown what if any other oxidants are derived from volatile organics exposed to the relatively low combustion temperatures of prairie fires.

Native vegetation in the area has evolved with fire; therefore, fire has become a necessary component of a successful system. Without it, old field vegetation will develop whose management requires mowing. Virtually all the phytomass of prairie plants is perennial, so mobile contaminants do not accumulate beyond the one year production of above-ground biomass due to die back in the fall. If this yearly production of biomass is not burned, then contaminants will remain available. However, none of the COPCs found in soil at the site are expected to biomagnify. Prairie plants include numerous species and the above-ground phytomass will oxidize more rapidly in conjunction with annual burning than currently occurs in undecomposed duff. Contaminants present on the site may be accumulating in the existing weedy vegetation.

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In a system with low species diversity such as currently present in the Cluster Site, contaminants would be accumulating in very few species, which in turn are consumed by very few herbivores. In contrast, if bioavailable contaminants are taken up by a diversity of prairie species, it is likely that contaminant concentrations would be diffusely distributed and the likelihood that they would bioaccumulate in any one specific herbivore would be less than a system with low diversity. Bioassays can be performed to evaluate the potential for bioaccumulation.

Aquatic Resources

For the aquatic resources, three general reclamation alternatives were developed including:

1. Enhancement

    - Use the ponds to support and enhance development of wetlands and other types of terrestrial habitats. Ponds can be used to separate two different terrestrial habitats to keep them distinct and minimize encroachment of one habitat into the other. The ponds can also be used to augment terrestrial habitats, adding diversity to the area.

    - Join existing bodies of water where feasible to increase integrity and stability of aquatic ecosystems.

    - Physical enhancements of ponds, including regrading and stabilization of banks. Ponds would also benefit from mechanical elimination of nuisance plants, e.g.,common reed grass.

2. Leave in place—A pond will be left as it is or minimally modified. Development of terrestrial habitats will be directed around the ponds or the sites can be left to develop naturally.

3. Elimination—The ponds can be eliminated to increase the acreage of terrestrial or wetland habitat or to develop non-ecological facilities.

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The proposed enhancement alternative for the ponds within the Cluster Site would call for the ponds to be temporarily or possibly completely drained. Once the ponds are refilled, they would be recolonized by many of the same species that currently inhabit them. However, a number of organisms not presently inhabiting the ponds will likely establish themselves after enhancement is complete (Table 6-2). The nature of the habitat in the ponds is homogenous and unstructured. The proposed enhancements will introduce heterogeneity and structure. The diversity of the macroinvertebrate community will increase as the heterogeneity of the habitat increases. Greater diversity in the macroinvertebrate community indicates a higher quality ecological system. Below is a list of some of the macroinvertebrates that are likely to populate the ponds after enhancement. The appearance of some taxa,(e.g., ephemeroptera) will indicate improving conditions. Establishment of a sport fishery is not anticipated under any of the reclamation alternatives.

6.2.2 Reclamation Planning Units

The baseline assessment and data evaluation performed for the individual sites led to the identification of a spectrum of feasible and practical goals and values that can be achieved on the individual sites. The overall area was subdivided into planning units based on their respective limitations and potential to achieve certain ecological values. Some areas, for example the landfills that rise prominently above the landscape, may lend themselves to recreational end uses, but their physical characteristics might ultimately limit their ecological quality. On the other hand, in areas where the soil and hydrology will support a higher quality vegetative community, that will become the recommended end goal. In all cases, the management of human health and ecological risk related to residual environmental contamination was considered in development of ecological enhancement goals. The planning units defined for the Lake Calumet Cluster Site, the proposed reclamation alternatives, and a recommended end use for both terrestrial and aquatic systems are described in the following subsections.

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Table 6-2

Macroinvertebrates Likely to Colonize the Post-Enhancement Ponds
Lake Calumet Cluster Site
Chicago, Illinois

Scientific Name	Common Name	Comments
*Turbellaria**	Flatworms	
Nematoda	Roundworms	
Tardigrada	Water bears	
*Annelida**	Segmented worms	
Oligochaetes	Earthworms	
*Hirudinea**	Leeches	
Crustacea	Shrimp	
Cladocera	Water fleas	
Copepoda	Fish lice	
Ostracoda	Seed shrimps	
*Isopoda**	Sow bugs	
*Amphipoda**	Scuds	
*Decapoda**	Crayfish	
*Gastropoda**	Snails	
*Insecta**	Insects	A large and diverse class that contains several orders that will be represented in the post-enhancement habitat.
Ephemeroptera	Mayflies	
*Odonata**	Dragonflies	Several species of dragonflies and damselflies were observed.
*Hemiptera**	True bugs	Several species observed.
Megaloptera	Alderflies	
Trichoptera	Caddisflies	
*Coleoptera**	Beetles	

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Table 6-2

Macroinvertebrates Likely to Colonize the Post-Enhancement Ponds
Lake Calumet Cluster Site
Chicago, Illinois
(Continued)

Scientific Name	Common Name	Comments
*Diptera**	True flies	This order includes a relatively large number of families, including flies. As the quality and the stability of the habitat is improved other families in this diverse group should colonize the project site.

* = Groups observed in project area during site visits.

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6.2.2.1 Paxton II

Site Description

Terrestrial

Paxton II is an inactive landfill that is approximately 150 feet above grade, which makes the site one of the highest promontories in the local region. Paxton II was evaluated separately from Paxton I because it is an above grade landfill while Paxton I is an at grade landfill. Paxton I restoration alternatives are discussed in Subsection 6.2.2.3. The total waste disposal area is approximately 42 acres. The landfill is covered with approximately one foot of material consisting of spoil and debris from sewer and construction projects and is almost entirely without any vegetative cover. The sides are very steep and have large erosional gullies that appear to be regraded regularly. There is no evidence of topsoil dressing or a gas collection system. A road winds its way to the top and trucks haul leachate collected at the bottom to the top and discharge it back into the landfill.

The cover material, height, and slope of the landfill pose a challenge to reclamation. If these conditions cannot be improved, reclamation activities will be aggressive and somewhat experimental.

Aquatic

The pond in the northwest corner of this site is approximately 1.5 acres in size. A drainage ditch runs east to west along the northern border of the pond. There is no inlet or outlet drainage from this pond. Runoff from the adjacent landfill introduces sediment into the pond. This pond is described in Subsection 3.5.2.

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Reclamation Alternative/End Uses

Terrestrial

Irrespective of the end-use plan, the installation of a vegetative cover sufficient to prevent erosion of the slopes is imperative. In order to quickly assess the potential of the present cap as a growth medium, test plots of annual rye and oats can be installed. If the test plots show poor growth, organic matter (topsoil or biosolids) may need to be added. During the settling period, the cover can consist of a standard mix of 15 to 20 native grasses and forbs and a temporary cover mix. This mix will quickly cover the landfill and can be easily replaced and augmented over time. Once the end use plan is designed, the final cover should take into account not only the recreational uses but the ecological management for the landfill vegetation (i.e.,burning, mowing, etc.). An important goal of whatever is chosen as the final cover is control of erosion from the slopes. The design of the gas venting system will also affect the type of vegetation management (i.e.,burning versus mowing) used on the landfill.

At a typical landfill, the angle of the slope is not anticipated to restrict growth of prairie vegetation. In nature, vegetation is able to grow on 32 to 34% slopes and does not produce runoff. However, vegetation establishment maybe difficult on the compacted clay slopes of Paxton II because of the severity of the slopes, even if the cap is conditioned with a fairly favorable mixture of organic material. The angle of the slope at Paxton II should be measured if there are no analogous vegetative communities in nature that could be used as a restoration guide for clay loams with these slopes, the gentling of the slopes at Paxton II would be indicated.

The proposed reclamation plan includes:

- Improve leachate collection system.

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- Provide gas venting system, preferably bunkered underground system.
- Place final soil and vegetative cover onto landfill.
- If a final cover is not placed on the landfill, plant test plots with rye or oats to quickly determine the capacity of the present cap as a growth medium. If test plots show poor growth, build up organic matter and oxygen in soil cover by tilling in biosolids and planting a general plant mix for a 2 to 3 year period.
- Drill in dry prairie plant mix after soil tilth has been established.
- Provide for long-term annual maintenance of dry prairie through burning or mowing, depending on the gas venting system.

An obvious end use for such a dramatic hill would be as an overlook for the entire area. The vistas from the top are very dramatic; on a clear day, downtown Chicago can be seen. The existing road can be improved for light traffic and/or a walking trail and the top is flat and broad enough to include several overlook points with vista interpretative signs.

Aquatic

This pond is one of the largest aquatic resources in the northern portion (north of 122nd Street) of the Cluster Site. It is possible that flow from the drainage ditch along the north side of the landfill could be diverted to augment flows to the pond. Bank stabilization with deep-rooted vegetation would help to reduce erosion and runoff. The recommended development alternative for this pond is enhancement of the aquatic resources present. The enhancement activities for this pond include:

- Preparation of basin—Common reed grass is not present in this pond. It should not be necessary to eliminate any vegetation.
- Introduce structure to increase physical complexity—The size of the pond will allow some diversity of habitat. Different habitats can be placed far enough apart to minimize their interaction.

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- Stabilize and revegetate banks—The banks are badly eroded due to runoff from adjacent areas. Most of the banks will have to be revegetated because vegetation along the bank is spotty.

- Connect with nearby water resources—The drainage ditch on the northern border of the site could be used to augment flows into the pond. Flow from the ditch could be diverted into the pond. The pond could be designed as a flow-through system with the water entering the pond and immediately returning to the ditch at the opposite end of the pond, or the design could allow flow to return to the ditch only when a particular flood level is reached. A hydrologic analysis of the site will have to be conducted to determine the best design. The proposed connection would be contingent on the source and content of the water in the drainage ditch and the physical integrity of the enhanced pond.

- Other factors—Runoff from the landfill adjacent to the pond is increasing the amount of bank erosion. This runoff must be controlled. The runoff can be directed elsewhere (e.g., into the drainage ditch) or it can be reduced or eliminated by making changes to the landfill. The potential for leachate discharge to the pond should be eliminated. This can be accomplished by improving the leachate collection system for Paxton II and by developing a leachate collection system for Paxton I. Additional chemical data for surface water and sediment should be collected.

Once the proposed enhancements to the pond are complete, the relatively larger size of the pond will make it more resistant to environmental perturbances than the smaller ponds in the project area. Environmental incidents that can negatively impact a small pond include drought, introduction of chemicals, and disease. The sparse vegetation presently lining the banks of the pond are inadequate to substantially minimize erosion. As the terrestrial system is concurrently restored, the established vegetation will minimize erosion into the ponds.

In addition, with the proposed enhancements in place this pond can be developed into a stable, lacustrine habitat. The resulting habitat can be used for ecological experiments, education, wildlife habitat, or limited recreational opportunities. The enhanced pond will also add to the aesthetic value of the area.

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6.2.2.2 Land and Lakes #3

Site Description

Terrestrial

This site is an active landfill that covers approximately 79 acres reaching 70 feet above grade. On the certified closed western portion, the landfill has a cover of two feet of compacted clay and six inches of topsoil with established vegetation. The cover for the balance of the landfill will comply with Subtitle D requirements which call for a minimum of three feet of clay plus a 3-foot vegetative protective cover, or one foot of clay, a geomembrane and three feet of vegetative protective cover (Cowhey, M., 1997).

Aquatic

No apparent aquatic resources exist at this site.

Reclamation Alternative/End Uses

Terrestrial

After the landfill has closed and a final grade has been achieved, the existing cover can be augmented with prairie grasses and forbs. The final cover should be decided based upon the design of the overall end use plan for the Cluster Site. An important goal of whatever is chosen as the final cover is control of erosion from the slopes. The Land and Lakes #3 closure plan can incorporate a dry prairie plant mix. However, any modifications to the closure plan must be permitted through the IEPA. The design of the gas venting system will affect the type of vegetation management that will be used on the landfill (e.g., mowing or burning), though it is anticipated that mowing will be the primary means of vegetation management.

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Land and Lakes #3 will be conducting operations on the property for at least 30 years after the final closure of the site, and operations of the Liquid Recovery Facility plan, the gas recovery system, and yard waste composting will continue. Therefore, removal of buildings is not a short-term possibility at this site (Cowhey, M., 1997).

The proposed reclamation plan includes:

- Add dry prairie plant mix to existing vegetative cover on closed western portion.
- Plant dry prairie plant mix during closure activities for remainder of landfill.
- Provide for long-term annual maintenance through mowing.

Wildlife habitat, open space, nature observations are the probable end uses of this property. Overlook points may also be placed on the landfill.

6.2.2.3 Paxton I

Site Description

Terrestrial

For the purposes of this report, Paxton I is considered to encompass all flat land north of 119th Street, which includes Paxton I landfill, LHL #1 Landfill, LHL #2 Landfill, and parcel II of Paxton II. Paxton I is an inactive below grade landfill covered with several feet of compacted clay. The vegetation ranges from nonexistent or sparse weeds to thick stands of common reed grass. Apparently, topsoil and/or a perennial cover crop was not installed after the clay cap was put in place. The aerial photograph of the site from April 1994 indicates expansive areas of Paxton I as bare, recently disturbed surface. The existing soil is very poor in organic matter and there are several unnatural looking hillocks scattered

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around the site that contribute to ephemeral pooling of water. Access roads constructed from slag traverse the site. A few wet spots were discolored and liquids and gases were emanating from below the surface. The existing vegetation suggests alkaline conditions high in halides.

Aquatic

This site contains two stormwater retention ponds. The ponds are designated as LHL #1 pond and LHL #2 pond. LHL #1 pond is similar in size to the Paxton II pond while LHL #2 pond is significantly smaller. These ponds are described in Subsection 3.5.2.

Reclamation Alternative/End Use

Terrestrial

The abandoned buildings and debris should be removed from the site and a gas venting system put in place. The design of the gas venting system will affect the type of vegetation management that will be practical on the site. If a bunkered system is installed, it will be possible to maintain the landscape with burning; otherwise mowing will be used. A leachate collection system should also be installed. The hillocks should be smoothed out to achieve a natural topography. The addition of organic matter into the soil can be achieved by tilling in the existing vegetation or augmentation with biosolids in areas devoid of vegetation. Tilling in the vegetation will contribute both to the build up of organic material and the control of common reed grass. This process may take two to three years; therefore, a temporary cover crop should be installed. After the soil tilth has begun to establish, a wet-mesic prairie species mix can be planted and a prairie maintenance regime initiated.

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The proposed reclamation plan includes:

- Remove buildings and debris.
- Provide gas venting system, preferably bunkered underground system.
- Provide leachate collection system.
- Grade hillocks to blend with site topography.
- Build up organic matter and oxygen in soil cover by tilling in biosolids (e.g., sewage sludge) for a 2 to 3 year period.
- Plow in existing vegetation for a 2 to 3 year period to use the phytomass of the ruderals (i.e. plants that grow in wastes), such as common reed grass, build up organic matter and condition soil. Plowing under common reed grass will not control it, and plowing can help it expand. After the second or third year of plowing, herbicide will be needed to help eradicate this species. Prairie plants will be planted into the conditioned soil after one or more herbicide treatments.
- Drill in wet to mesic prairie (wetland) plant mix after soil tilth has been established.
- Provide for long-term annual maintenance of prairie through burning and mowing.

This area is close to Big Marsh, an ecologically important wildlife area. The best use of this site would be for passive recreation, such as nature hikes, educational uses, and wildlife observation. Possible interpretive paths could be created.

Aquatic

The two ponds located on this site are physically different in several ways. However, the recommended development alternative for each pond is the same, though these physical differences may call for different end uses of the ponds. Alternatively, the two ponds are

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close enough to consider connecting them to increase the size of the resource and to create a more stable aquatic habitat.

The recommended development alternative for these ponds is enhancement of the aquatic resources present. With the proposed enhancements in place these ponds can be developed into a stable, lacustrine habitat. The resulting habitat at LHL #1 pond can be used for ecological experiments, education, wildlife habitat, or nature observation. Additionally, the enhanced LHL #1 pond can add to the aesthetic value of the Cluster Site. Because of its small surface area the most appropriate end use for LHL #2 pond may be as an aesthetic or nature observation resource. The resulting habitat may be too small to use as an ecological resource, except as an associated component to development of an adjacent terrestrial resource.

The following enhancement activities are generally common to each of the ponds:

- Preparation of basin—Location and depth to waste must be considered before increasing the size of these ponds or before connecting the ponds.
- Introduce structure to increase physical complexity—The size of the ponds will allow some diversity of habitat. Different habitats can be placed far enough apart to minimize their interaction.
- At LHL #1 pond, the common reed grass will need to be replaced by appropriate vegetation. The west bank of LHL #2 pond is beachlike. It may be necessary to increase the height and slope of this bank prior to revegetation.
- Connect with nearby water resources—LHL #1 pond could be connected with LHL #2 pond to create a larger, more stable aquatic habitat. An engineer would have to conduct a review, and a cost estimate would have to be performed to see if this action would be feasible and cost effective.
- Integrate into terrestrial plan—The ponds can be used as a water source to sustain wetland habitats, such as wet meadows. The ponds can also serve as transition zone or barrier between incompatible terrestrial habitat types.

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Ecologically appropriate plants must be selected for the ponds. Selection of plant species will be governed by different criteria if the ponds are used for aesthetic purposes alone. This activity will only proceed if LHL #2 pond is not joined with LHL #1 pond.

- Other factors—LHL #1 pond is situated close to the Norfolk & Western railroad tracks. Measures must be taken to protect this pond from environmental impact from the railroad tracks. Runoff and flows from chemical spills or discharges are the most likely possibilities. A small berm can be constructed to direct runoff from the tracks away from the pond. No leachate collection system is present on Paxton I; the potential for contaminants to reach these surface waters through groundwater discharge should be controlled. Additional chemical data for surface water and sediment should be collected.

6.2.2.4 Alburn Incinerator

Site Description

Terrestrial

This site covers approximately 8 acres and is entirely fenced. The vegetation ranges from sparse to thick stands of weeds. There are several unnatural hillocks and depressions that contribute to pooling of water. A two-foot thick cap of clay is said to have been placed on the site, but the location or extent is unknown.

Aquatic

The small pond present at this site is approximately 0.5 acre in size. Signs of possible contamination were observed in and around the pond, including several sources of percolation from below the surface, small pools with oily sheens, and brown stains on the soil. The pond is stagnant with large algal mats on the surface and the bottom. The east side of the pond has a low, gently sloped bank. The other sides of the pond are flat and the

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demarcation where the pond begins is unclear. Several defoliated patches were observed around the pond. This pond is described in Subsection 3.5.2.

Reclamation Alternative/ End Use

Terrestrial

The end use and treatment of this site depends on results of further investigation to characterize contamination which apparently still exists. After the fencing and the abandoned building and debris are removed, the areas should be graded and the small ponds filled. One alternative is for topsoil to be installed and vegetation planted. The vegetation type should be chosen based upon the end use decisions. Another alternative is for the area to be filled and used as a parking lot/staging area.

The proposed reclamation plan includes:

- Remove buildings, incinerator, and other debris.
- Fill areas of ponded/standing water.
- Develop parcel as parking lot/staging area.

This area is approximately in the middle of the Cluster Site. Therefore, the location is a good one for the development of a parking lot/staging area. This can be as simple as a gravel parking lot with portable toilet facilities to a paved lot with running water and interpretive signs or a nature center. These alternatives can be further developed depending on the need for and efficacy of contaminant management.

Aquatic

The conditions observed during the investigations conducted at this site indicate that the aquatic resources present are not suitable for enhancement or reclamation. The pond does

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not have much ecological value in its current condition. Development of this aquatic resource could be problematic due to concerns of possible contamination and because of the physical nature (shallow depth) of the pond. Additionally, the pond is too isolated to join with any other body of water. The only other development alternative would be to increase the acreage.

The recommended development alternative for the aquatic resources present at this site is to fill them and use the area for terrestrial habitat or for non-ecological facilities as identified above.

6.2.2.5 U.S. Drum II

Site Description

Terrestrial

This site is a flat, grass-covered, 5.6 acres of open field. A concrete platform is in the northeast corner. After removal activities in 1985, the area was leveled, capped, covered with topsoil, and seeded. The east portion of this site is in relatively good condition. Soil conditions are generally mesic and a dense healthy growth of meadow vegetation is established except for a small stand of common reed grass in a slight depression that apparently captures some seasonal standing water. The western portion however, has a different grade and supports thick stands of common reed grass. The east and west sections are divided by an access road. The southern edge is bordered by a large slag stockpile.

Aquatic

No apparent aquatic resources exist at this site.

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Reclamation Alternative/End Uses

Terrestrial

Remove the concrete platform and the slag pile. Remove the access road and blend the grade between the east and west areas. As an experiment, the common reed grass in the eastern and western portions should be tilled in for 2-3 years to enrich the soil with organic material and for control. If the experimental results suggest that tilling in fails to control the common reed grass, an alternative could be to apply an approved, readily decomposed herbicide. The use of test plots as described in the reclamation approach for Paxton I (Subsection 6.2.2.3),could be applied to the treatment of common reed grass here. The eastern portion can be planted with a mix of mesic prairie species and a prairie maintenance regime initiated. The extent of contamination in the western portion should also be investigated.

The proposed reclamation plan includes:

- Remove concrete platform, access road, and gravel piles.
- For western portion, plow in existing vegetation for a 2 to 3 year period to use the phytomass of the ruderals (i.e. plants that grow in wastes), such as common reed grass, build up organic matter and condition soil. Plowing under common reed grass will not control it, and plowing can help expand it. After the second or third year of plowing, herbicides will be needed to help eradicate this species. Prairie species will be planted into the conditioned soil after one or more herbicide treatments.
- Drill in and/or broadcast seed native mesic prairie species throughout eastern and western portions.
- Provide for long-term annual maintenance of prairie through burning and mowing.

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The best use for this parcel would be for nature trails, educational uses, and wildlife observation.

6.2.2.6 Paxton Lagoons

Site Description

Terrestrial

This site is a former illegal dump that has been remediated and the entire perimeter is fenced. A 4.5 foot cap was installed over the entire site, which includes a geomembrane liner, sand, clay, and topsoil. The site was seeded with a conventional grass mixture. The site has been bermed and gently sloped to direct surface runoff to a retention basin on the southern most boundary and does not maintain permanent water. This basin flows to a drainage ditch along 122nd Street.

Aquatic

No apparent aquatic resources exist at this site.

Reclamation Alternative/End Uses

Terrestrial

This parcel is in relatively good condition. To blend it with the rest of the site, the fence should be removed. If the end use decision is natural open space then mesic prairie species should be planted and a prairie maintenance regime initiated.

The proposed reclamation plan includes:

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- Drill in and/or broadcast seed native mesic prairie species.
- Provide for long-term annual maintenance of prairie through burning and mowing.

This parcel can be used for nature observation, wildlife habitat, or open space.

6.2.2.7 Unnamed Parcel

Site Description

Terrestrial

This parcel includes all land south of 119th Street that is not a part of the other sites. The property within this parcel has been subdivided into residential lots. The owners and history of these lots is currently undefined. There are several unnatural hillocks and soil stockpiles scattered throughout this site. The vegetation ranges from sparse to thick stands of common reed grass in wet areas to adventive species dominating drier flats. A staging area for heavy equipment is west of the entrance road off 122nd Street. A car junkyard is east of the entrance gatehouse.

Aquatic

This site contains three small ponds. These ponds currently provide limited aquatic habitat, primarily due to encroachment of common reed grass. However, the ponds have considerable ecological potential if restored and enhanced. The ponds currently support a macroinvertebrate community as diverse as that of the larger ponds within the Cluster Site. These ponds are described in Subsection 3.5.2.

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Reclamation Alternative/ End Uses

Terrestrial

The abandoned buildings, debris, and junkyard should be removed and the hillocks and stockpiles should be graded with the site topography. The waste disposal history and the extent of contamination on this property should be investigated. Similar to the recommended experimental treatments of common reed grass at Paxton I (Subsection 6.2.2.3) and U.S. Drum II, this weedy adventive species must be dealt with in wet areas. Test plots for evaluating the efficacy of tilling or herbicide use could be established.

The gradation of drier soils to wetter soils will support a continuum of mesic prairie to wetland vegetation. For those areas where soils are currently adequate and contamination proves not to be an impediment, the establishment of a native landscape by seeding and maintenance can be implemented. For areas where soil conditions are problematic, either due to physical limitations or if significant contamination is discovered, then a suite of experimental test plots similar to those described for Paxton I can be implemented. The appropriate vegetation for the end use plan should be installed and the proper maintenance procedure initiated. If natural open space is the choice then mesic prairie species should be phased in.

The proposed reclamation plan includes:

- Remove buildings and debris.
- Grade hillocks to blend with site topography.
- Build up organic matter and oxygen in soil cover by tilling in biosolids (e.g., sewage sludge) for a 2 to 3 year period.

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- For western portion, plow in existing vegetation for a 2 to 3 year period to use the phytomass of the ruderals (i.e. plants that grow in wastes), such as common reed grass, build up organic matter and condition soil. Plowing under common reed grass will not control it, and plowing can help expand it. After the second or third year of plowing, herbicides will be needed to help eradicate this species. Prairie species will be planted into the conditioned soil after one or more herbicide treatments

- Drill in wet to mesic prairie mix after soil tilth has been established

- Provide for long-term annual maintenance of prairie through burning and mowing.

The proposed end use of the property is nature observation, wildlife habitat, and open space.

Aquatic

Reclamation alternatives for the ponds on this site must be evaluated separately because the ponds are too far apart to be developed as a single resource. The following enhancement activities are generally common to each of the ponds. These activities include:

- Preparation of basin—There are no extraordinary considerations for this site.

- Introduce structure to increase physical complexity—There are no extraordinary considerations for this site.

- Stabilize and revegetate banks—Common reed grass will be replaced by appropriate vegetation.

- Integrate into terrestrial plan—The ponds can be used as a water source to sustain wetland habitats, such as fens, or wet meadows. The ponds can also serve as transition zone or barrier between incompatible terrestrial habitat types. Ecologically appropriate plants must be selected for the ponds. Selection of plants species will be governed by different criteria if the ponds are used for aesthetic purposes alone.

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- Other factors—The nature of any potential contamination should be determined by collecting chemical data for surface water and sediment. If significant contamination is present, the potential impacts to the pond and its biota should be assessed and remediated as necessary.

Pond 1—The recommended development alternative for this pond is enhancement of the aquatic resources present. With the proposed enhancements in place this pond can be developed into a stable, lacustrine habitat. The resulting habitat can be used for ecological experiments, education, or nature observation opportunities if the surface area is large enough. Otherwise, the pond can be used as an associated component of development of an adjacent terrestrial resource or to enhance the aesthetic value of the project area.

Pond 2—The recommended development alternative for this pond is enhancement of the aquatic resources present. With the proposed enhancements in place this pond can be developed into a stable, lacustrine habitat. The resulting habitat can be used for ecological experiments, education, or nature observation opportunities. Additionally, the enhanced pond can add to the aesthetic value of the project area.

Pond 3—The recommended development alternative for this pond is enhancement of the aquatic resources present. With the proposed enhancements in place this pond can be developed into a stable, lacustrine habitat. The most appropriate end use for this pond may be as an aesthetic or nature observation resource, because of its small surface area. The resulting habitat may be too small to use as an ecological resource, except as an associated component of development of an adjacent terrestrial resource.

Pond 3 is situated close to the Norfolk & Western railroad tracks. Measures must be taken to protect the pond from environmental insult from the railroad tracks. Runoff and flows from chemical spills or discharges are the most likely possibilities. A small berm can be constructed to direct runoff from the tracks away from the pond.

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6.2.2.8 Gun Club

Site Description

Terrestrial

The Gun Club encompasses approximately 40 to 60 acres. A large artificial pond is on the northeast corner of the parcel. The Gun Club building, outhouse, small dock and two skeet launching sheds are at the northern end of this pond. There appears to be unnatural grading, particularly in the west, which is due to a history of random filling. The topography is obscured by complete dominance of a stand of common reed grass.

Aquatic

There are two ponds on this site. These two ponds will require the least amount of effort to enhance because they are already semi-natural. The two ponds are separated by a thin strip of land (less than 50 ft wide) that could be easily eliminated or breached to join the two ponds. These ponds are described in Subsection 3.5.2.

Reclamation Alternative/End Uses

Terrestrial

The Gun Club is recognized as a low priority reclamation site. However, if it is included in the plan, the process will be such that the sensitivity of the black-crowned night heron population and vegetation structural needs for successful nesting would be given careful consideration. Any landscape alteration would be initially limited, phased in, and closely coordinated with IDNR and the USFWS. For example, it is desirable for many other species to ecologically stabilize the area by increasing vegetative diversity and quality; however, implementation can be phased such that the site would always have a substantial

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black-crowned night heron structure in place (i.e. only 1/4 of the common reed grass replaced by other tall grasses and cattails before reclaiming the next 1/4). The grade should be blended with the site topography. The dense stands of common reed grass should be eradicated, controlled, and replaced with a native wetland and prairie landscape that provides similar structure and habitat. Soil conditions in this area are unknown and a similar experimental regime as suggested for the Unnamed Parcel (Subsection 6.2.2.7)would be appropriate. When the soil conditions are confirmed acceptable, a continuum of wetland to upland communities can be planted and a maintenance regime initiated. Deeper rooted species (i.e., trees, shrubs) may potentially be planted on this site since the area is not capped.

The proposed reclamation plan includes:

- Grade hillocks in a phased approach over several years so that portions of the site remain available as habitat.
- Confirm adequacy of soils to support native vegetation.
- Amend or condition soils, if necessary.
- Drill in and/or broadcast seed with wet to mesic prairie plant mix. Planting trees and shrubs may also be considered for this site.
- Provide for long-term annual maintenance of prairie through burning and mowing.

This site is an important ecological area and should be used only for wildlife observation and educational purposes.

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Aquatic

The two ponds on this site are closely associated and should be evaluated as a single aquatic resource. Pond 1 and Pond 2 should be combined by breaching or removing the thin strip of land that separates them. Based on the historical use of the Gun Club, a determination should be made as to whether there is any accumulation of lead shot in the ponds. If significant amounts of lead shot or other contaminants are present, the potential impacts to the ponds and their biota must be assessed and remediated, if necessary.

The recommended development alternative for these ponds is enhancement of the aquatic resources present. Enhancement of the ponds should be designed to take the development of both ponds into consideration. With the proposed enhancements in place these ponds can be developed into a stable, lacustrine or lagoonal habitat. Development of these ponds may be more suitable for use in ecological and educational applications, because 122nd Street is a practical separation. This site could be easily isolated from the general public to safeguard the integrity of any ongoing experiments or projects.

Additional enhancement activities for Pond 1 include:

- Preparation of basin—This pond should require very little preparation. It should not be necessary to eliminate any vegetation.
- Introduce structure to increase physical complexity—The size of the joined pond will allow a greater diversity of habitat. Different habitats can be placed far enough apart to minimize their interaction.
- Stabilize and revegetate banks—The banks appear stable. Revegetation should only be necessary to replace areas damaged during construction activities.

Additional enhancement activities for Pond 2 include:

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- Preparation of basin—Common reed grass surrounding the pond must be removed.

- Introduce structure to increase physical complexity—None required.

- Stabilize and revegetate banks—The banks are in good condition. Minimal stabilization should be required. Revegetation of the banks with appropriate vegetation will be required to replace the common reed grass that have been eliminated.

6.3 ANALYSIS OF RECLAMATION ALTERNATIVES

In analyzing reclamation alternatives, technical feasibility considerations must also include the careful study of any problems that may prevent a reclamation alternative from mitigating site problems. Therefore, the site characteristics from the ESIs were kept in mind as the technical feasibility of the alternatives were studied. Costs associated with implementation of the alternatives are not provided at this time. Any cost estimate would be premature due to the extensive size of the Cluster Site and data gaps that need to be addressed. Specific items considered include:

- Reliability (operation over time).
- Safety, operation and maintenance.
- Ease of alternative implementation.
- Time for implementation.

The Lake Calumet Cluster Site contains a diverse set of sites and conditions. A major goal of this reclamation effort is to blend these areas into a unified site design whose ecological processes are integrated. The proposed end use for the Cluster site as a whole is nature observation, wildlife habitat, and open space. A preliminary site design is presented in Figure 6-1.

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The terrestrial reclamation alternatives address the following generalized site conditions and circumstances:

- Residual contamination will be addressed prior to or during implementation of reclamation activities. PAHs and heavy metals were measured at elevated levels in soil. By establishing a vigorous vegetative cover on the sites, exposure to residual contamination can be reduced (e.g., by limiting dust formation and by building up the soil cover through development of a prairie soil). Additional sampling should be considered for Alburn Incinerator, Paxton I, and the Unnamed Parcel, which are sites where few soil samples have been collected or where existing data suggests more extensive contamination.

- Soil that is very poor in organic material. Steel/iron slag and road and sewer construction debris have historically been used as fill on the Cluster Site. These materials are low in organic matter. Tilling in existing vegetation and amending with biosolids will build up the organic matter content of these fill materials, producing a higher quality growth medium.

- Sites with different land use histories. All of the sites have undergone some degree of remediation. Sites that have been capped and seeded (i.e., U.S. Drum II, Land and Lakes #3, Paxton Lagoons) will not require soil conditioning prior to seeding in native plant mixtures. At U.S. Drum II and Paxton Lagoons, reclamation activities could be implemented as soon as the end use of the property is determined. At Land and Lakes #3, using a native plant mix as the final vegetative cover could be implemented as part of the final closure plan. The remaining sites have not been completely remediated (e.g., lack of final cover on Paxton II) or have other problems (e.g., poor soil quality, common reed grass) which need to be addressed prior to or during reclamation. These characteristics will lengthen and increase the complexity of the reclamation process.

- Compacted soil that increases surface water runoff. As previously discussed, a variety of fill materials have been used on these sites. Heavy equipment operation is also common on Paxton II landfill. These factors contribute to increased soil compaction. The pore space in compacted soil is low, limiting water movement into and through the soil profile. By improving the soil through tilling in organic materials and building up the vegetative cover, pore space can be increased, resulting in increased water infiltration rather than runoff.

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- Very steep slopes that are prone to erosion. Paxton II is an above-ground landfill with steep slopes which are typically prone to erosion. Land and Lakes #3 was constructed with slopes that are in compliance with IEPA guidelines. Native prairie vegetation is typically deep rooted and forms a dense root system, properties which will aid in eliminating erosion. This vegetation is not anticipated to breach the integrity of the existing cap. When the root system reaches the impermeable clay layer, the roots are expected to grow horizontally.

- Thick stands dominated by weedy plant material. Common reed grass is the dominant species in the wetter portions of the sites, and in many areas has formed monocultures. Other weed species dominate throughout the remainder of the sites. The existing weedy plant material can be tilled into the soil to aid improving soil tilth. Native prairie species will eventually out compete weedy, non-native species, resulting in a higher quality ecosystem.

- Areas that do not support vegetation. Augmentation of the existing fill material will be required in areas that do not support vegetation. Addition of biosolids could be used to improve soil tilth. Once the organic matter content and soil aeration is improved, vegetation can be established in these areas.

- On-site plant material for reclamation is nonexistent. Years of filling and industrial use have resulted in a landscape that does not support native prairie species. Seed and plants will need to be imported from off-site sources. With appropriate, long-term management, prairie species will reproduce and out compete the weedy species that currently exist at the sites. Through establishment of native prairie species, the ecology of the sites will be greatly improved. In addition, prairie species are better adapted to capturing rainfall and building up the soil layer than the currently existing vegetation.

- Sensitivity to environmentally important ambient wetlands. Big Marsh and Indian Ridge Marsh are directly adjacent to the Cluster Site. By improving the ecology on the Cluster Site, potential future impacts on these sensitive wetland systems can be avoided. Establishing a dense vegetative cover will greatly reduce the potential for erosion, and will also slow infiltration into the soil and the percolation of water and contaminants through the soil profile.

- Abandoned material from previous industrial use. A variety of debris such as abandoned vehicles, concrete slabs, and buildings need to be removed from the sites at the beginning of reclamation activities. In addition, existing

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hillocks (which are probably cover material that was never used) need to be graded into the existing topography.

- Increased traffic in the area. The impact of the final end use of the properties on traffic flow in the area needs to be anticipated. The area is primarily industrial, with heavy truck traffic on 122nd Street and Stony Island Avenue. An alternative access road or widening and improvement of existing roads should be considered in the reclamation plan. Establishing a dense vegetative cover on the sites will help alleviate flooding problems in the area. The vegetation will capture rainfall and keep it on site, greatly reducing water flow from the sites directly onto the adjacent streets.

There are several conditions that are present at all of the ponds within the Cluster Site. These conditions must be altered before the ponds can be established and maintained as stable, high quality aquatic habitat. The undesirable conditions are discussed below:

- Contamination that may be of concern to ecological resources has been recorded in sediments of a number of water bodies in the area. Better definition of the extent and level of contamination is identified as a data gap, especially for the ponds that have not been sampled. When further studies are performed to fill this data gap, the recommended reclamation and end use alternative may need to be modified.

- Contaminants in sediments may impact benthic organisms. Some pesticides and PCBs have the potential to biomagnify in the aquatic food chain. Removal or capping contaminants will improve substrate quality, thus aid in development of a stable, higher quality benthic community. Prior to any remedial activities, benthic community analyses or toxicity testing should be considered as a means to quantify whether sediment contamination has actually impacted community health versus impacts from poor quality habitat.

- Runoff and erosion are introducing sediment into the ponds. Sediment deposition varies from pond to pond. Excessive amounts of sediment can negatively impact fish reproduction and discourage colonization of many intolerant (i.e., sensitive) macroinvertebrate species. Bank stabilization will help to control erosion and sedimentation.

- The physical habitat in the ponds within the project area is homogeneous in nature. Habitat diversity will increase with the complexity of the physical

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environment. Measures to increase the complexity of the physical environment include introduction of large rocks, submerged logs, etc.; varying the substrate material in different parts of a pond; and varying the slope and depth of different parts of a pond. More species can utilize the same area, because each species will exploit a different type of habitat. Habitat diversity will also increase and maintain the quality of the biotic community because more desirable intolerant species will out-compete tolerant species in certain types of habitats.

- Expansive growth of common reed grass along the banks of the ponds is a serious problem for development of the aquatic resources (this condition is not present at Gun Club Pond 1, LHL #2 pond, and Paxton II pond). Stands of common reed grass are encroaching on the aquatic habitat and slowly converting them to the type of wetlands known as marshes. The shallow depths found in several of the ponds allows this plant to prosper, although open water is still present. Common reed grass may be restricted by deepening ponds and increasing bottom slopes near the shoreline. Reclamation of the adjacent terrestrial areas would reduce or eliminate this problem by replacing common reed grass with less intrusive plant species.

- Potential discharge of groundwater contaminants to the on-site ponds and wetlands, and to off-surface water and wetlands should be controlled. This could be accomplished by establishing a leachate collection system for Paxton I and II and extending the cap (e.g., with soil, asphalt, concrete) at Alburn Incinerator to restrict infiltration of precipitation, and thus restrict leaching of subsurface contaminants to groundwater. Prior to implementation of alternatives, evaluate water quality in the ponds.

The terrestrial and aquatic reclamation alternatives also take into account the anticipated needs of the local community and the larger Chicago regional community, including:

- Passive recreation—nature trails, scenic observation points.

- Wildlife habitat—increased diversity of habitats attracting and supporting wildlife.

- Economic—increased desirability for businesses and people to locate in the area.

- Health—effective remediation of environmental contamination.

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- Attenuation of chronic flooding in the area.

On a broader regional scale, another important practical matter to consider when developing this plan is the increased traffic in the area. This plan could provide a good mechanism to initiate a cooperative effort with the local industrial uses to improve and widen existing roadways. The southern and western borders of the Cluster Site could provide the extra space needed for road widening.

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SECTION 7
CONCLUSIONS AND RECOMMENDATIONS

7.1 SUMMARY AND CONCLUSIONS

In April 1996, several community groups approached the U.S. EPA through the Chicago Legal Clinic, requesting that eight disposal sites in the Indian Ridge Marsh area be clustered together for two purposes: ranking as a single cluster site by the HRS for potential listing on the National Priorities List, and for remediation and long-term responses. The community groups concerns about these sites included the potential impact on human health from prior disposal of hazardous materials at the sites, as well as the potential impact of contamination on the sensitive ecological resources in the area.

The U.S. EPA has deferred decisions to undertake formal superfund action under CERCLA in favor of an alternative approach. The U.S. EPA has been working as a facilitator in conjunction with the community groups to initiate the Phase I ERS as the first step in the evaluation of potential health and ecological impact in the Lake Calumet area. The ERS is the first step in the planning process that will further promote the coalition of local interests and will pursue the voluntary implementation of a ecological reclamation plan for the area.

The objective of this study was to determine the feasibility of developing an ecological reclamation plan for the Lake Calumet Cluster Site. The proposed end use of the site is wildlife habitat/nature observation/open space. The goal of the Ecological Restoration Plan is to essentially develop a new landscape working with the physical conditions and constraints that the existing landscape provides. It is also a goal of the reclamation plan to manage the Cluster Site as a component of the local ecosystem, not as individual sites. In general, where the site is upland and dry, development of native upland vegetation is

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proposed; where the hydrology is wet, wetlands or expansion/linkage of the surface water resources is proposed; and in transitional areas, mesic vegetation is proposed so that the landscape as a whole follows a continuum of dry to wet, and provides a link to adjoining natural areas. The final reclamation plan must be tempered and moderated by the recognition that if contamination exists to such a degree that some type of remediation is necessary, the physical conditions of those portions of the site might be altered and the ultimate landscape cover will accordingly be adjusted. The selected reclamation plan will also eliminate, reduce, or control risks to human health and the environment.

The primary focus of the ecological reclamation study was on five contiguous sites (i.e., Paxton Landfill, Land and Lakes #3, Paxton Lagoons, Alburn Incinerator, and U.S. Drum II) along the north side of 122nd Street. Community groups are concerned about the contamination at these sites and the potential impact of these sites on human health, as well as their potential impact on the sensitive ecological resources in the area. The Gun Club south of 122nd Street was also evaluated because of a past release that occurred on this property and the sensitive ecological resources on this property. While Land and Lakes #3 is a permitted landfill, this site was retained in the study because its physical location lends it to being integrated into a reclamation plan for the Cluster Site as a whole. Land and Lakes Company has agreed to participate in this study so that its State-approved closure and post-closure plans for its landfills can be modified to be consistent with the end-use plan for the area, to the extent practicable and possible. It is a long-term goal of this project that adjacent businesses and property owners may voluntarily join in expanding the Ecological Reclamation Plan to include their properties.

As part of this ecological reclamation study, the history of the sites was investigated, the geology, hydrogeology, land use, and ecology of the sites were characterized, the extent of contamination was delineated, contaminant fate processes were described, and reclamation alternatives were developed. The sites in question have a long history of waste disposal,

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both permitted and unpermitted. The sites have been filled with a variety of materials, including steel/iron slag and road construction spoil. Groundwater in the area is shallow. There are many natural areas, including Lake Calumet, Big Marsh, Indian Ridge Marsh, and Dead Stick Pond, which provide habitat for a variety of wildlife, including state-listed bird species.

In evaluating contamination at these sites, data obtained from ESIs at the individual sites was compared to available human health and ecological screening values. No additional sample data was collected from the sites. Based on the available soil and sediment data, the Alburn Incinerator site is the most contaminated parcel. This site is capped, though the extent of the cap has not been surveyed. Groundwater contamination is also present at the Cluster Site (though extent of shallow groundwater contamination has not been defined) and contaminants may eventually discharge to on-site and off-site surface water features. The primary contaminants are PAHs and heavy metals. It should be noted that these constituents were also measured in local off-site samples, suggesting that vehicular traffic, industrial land use, and slag disposal may also be contributing to contamination in the area of the Cluster Site.

Both terrestrial and aquatic reclamation alternatives were developed for the Cluster Site. A spectrum of dry prairie to wetlands consisting of species native to the Lake Calumet region is the proposed reclamation alternative for the terrestrial landscape. It is envisioned that reclamation will be an ongoing long-term process at the sites which may eventually broaden to include other properties in the Lake Calumet region. A short-term goal will be to improve soil conditions to allow for establishment of native grasses and forbs, whose diversity will be increased over the long term as the quality of the site improves. Elements of the terrestrial reclamation plan are experimental, and should be first attempted on a test plot basis. A commitment to long-term management, focused primarily on burning, is necessary for the success of the terrestrial reclamation. Native vegetation in this biome has

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evolved with fire; therefore, fire has become a component of a successful system. Without it, old field vegetation will develop. By establishing a vigorous vegetative cover on the Cluster Site, exposure to residual contamination can be restricted. In addition, the native prairie species will build up the soil cover on the sites, will capture precipitation, and will reduce runoff to surface water resources as well as help alleviate flooding in the area. End uses of the Cluster Site are anticipated to include wildlife habitat, nature observation, and open space.

Several small ponds are scattered throughout the Cluster Site. Some degree of enhancement is the recommended reclamation alternative for most of the ponds. By enhancing the ponds, a greater diversity of aquatic species can become established, and over the long-term, stable, higher quality aquatic communities can be attained. None of the ponds are anticipated to support a sport fishery. Because of the poor quality of the aquatic habitat and the potential for more extensive contamination, it is recommended that the pond at the Alburn Incinerator be filled to either increase the terrestrial habitat on this property, or to create a parking lot or other non-ecological facility. The larger ponds can be used for various purposes, such as aesthetics, ecological experiments, wildlife habitat, and nature observation.

7.2 RECOMMENDATIONS

Based on the information presented in this Phase I ERS report, ecological reclamation may be a feasible alternative for the Cluster Site. If implemented, Phase II of this study would address data gaps and focus on the ecological reclamation design. As part of Phase II activities, several topics would require further examination including data gaps, funding sources, and public input. Costs were not explored in the Phase I evaluation because it is anticipated that this project will be gradual, and may be experimental with work implemented over a number of years. Preliminary costs should also be estimated during

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Phase II, primarily for the initial reclamation activities (e.g., debris removal, sampling, aquatic community analyses, experimental program). The following subsections present the primary concerns that need to be considered under each topic (i.e., data gaps, funding, public input).

7.2.1 Data Gaps and Recommended Action Items

The following recommendations are made to address data gaps and to ensure that the proposed ecological reclamation plan will meet the objective of eliminating, reducing, or controlling risks to the human health and the environment. Also listed are activities that need to be performed as part of any reclamation activities for the Cluster Site.

Sampling:

- Monitor aquatic biota in all ponds (e.g., through fish and macrobenthos community analyses) to ensure that residual sediment/surface water contamination is not impacting aquatic communities. Exceeding an ecological benchmark does not necessarily indicate impairment. Community analyses are widely used as a means to evaluate impacts to aquatic systems. Monitoring is proposed as an alternative to remediation due to the potential for adverse effects on habitat and the remobilization of contaminants caused by removal or remediation of sediments.

- Gather existing data to address fish and water-fowl consumption pathways. Fishing and possibly hunting (though illegal) occur in Lake Calumet, the Big Marsh, and other nearby areas. The potential risk from consumption of contaminated fish and wild game needs to be addressed and the contribution of the Cluster Site to fish and wildlife contamination needs to be explored. Various state and federal agencies have conducted studies on these pathways, and this available data should be reviewed.

- Perform an extent of contamination study at Alburn Incinerator to determine if the cap needs to be expanded and/or replaced. Alternatively, cap the

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entire property with an engineered barrier (e.g, compacted clay, concrete, asphalt) to restrict exposure.

- Perform extent of contamination study on the Unnamed Parcel. Little information is known about the history of the Unnamed Parcel, especially whether waste disposal has occurred. An extent of contamination study is proposed to determine the potential for direct exposure to contamination as well as to determine whether wastes have been buried on the property. Both a literature search and sampling should be conducted.

- Analyze chemical concentrations in sediment and surface water in all ponds to determine extent of potential impact to aquatic resources. A minimum of one composite sample per pond should be collected. Samples should be collected concurrently with aquatic community analyses, so that correlations between contamination and community viability can be drawn.

- Perform a focused risk assessment using new data and assuming a passive recreational end use of the Cluster Site. A risk assessment will confirm whether there are specific locations that need further remediation. Risk assessment methods can also be used to develop Tier III remediation objections for the site.

- Test shallow groundwater. Limited groundwater data has been collected throughout the Cluster Site, especially at the U.S. Drum II, Alburn Incinerator, Unnamed Parcel, and LHL #2 Landfill. There is potential for contaminants in shallow groundwater to migrate to Indian Ridge Marsh, Heron Pond, and other ecologically-sensitive areas. Shallow groundwater testing can be used to determine if contaminant migration is occurring.

Reclamation Activities:

- To protect ecological resources, improve leachate collection system at Paxton II and develop system at Paxton I. To protect both human and ecological resources, install bunkered gas collection systems at Paxton I and Paxton II. A bunkered system is preferred to allow for burning as an annual maintenance activity. A leachate collection system will restrict contaminants in wastes from entering the shallow groundwater. A gas collection system will minimize the threat of landfill gas release.

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- Implement deed restrictions on all properties to ensure long-term wildlife habitat/nature observation/open space use of properties.

- Remove all buildings, drums, cars, and miscellaneous debris from the properties and improve the access road.

- Determine exact size and depth of ponds. Perform a topographical survey. It is crucial to the design of the ecological reclamation plan that the properties be surveyed, the location of caps be determined, and the extent of contamination be delineated. A topographical survey should be performed for the entire site. Geographic Information System mapping can also be used to locate any additional sample locations onto a base map for the Cluster Site.

- Determine depth and extent of the cap at Paxton I, LHL #1, and LHL #2 to ensure that reclamation activities (e.g. disking) will not disturb wastes.

- Perform agronomic testing on all sites to evaluate suitability of cover material as a growth medium.

- Prohibit planting of species that could breach the caps, or take cap integrity into consideration when planting deep-rooted species.

- Establish test plots. Test plots can be established to determine the effectiveness of the techniques proposed for improving soil conditions, as an alternative to importing clay and topsoil. Techniques that could be studied include: treat with biosolids; seed with a few variations of perennial seed mix; plow under existing vegetation to incorporate the current "weedy"growth into the soil; selective herbicide application; plant with an annual cover crop that would be plowed in; and leave as is to serve as a control. Test plots can also be used to research the potential for contaminant transport in particulates with respect to the burning of dried prairie vegetation.

7.2.2 Funding

Alternative funding sources for implementing the ecological reclamation alternatives should also be explored as part of Phase II activities. Ecological reclamation of these sites is a long-term process that could potentially last for decades as the land returns to a more natural state and biodiversity is increased and enhanced. This project is a unique evaluation of an alternative way to address contamination by grouping hazardous wastes sites, rather

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than conducting individual site evaluations. Thus, funding for this project could be obtained from various sources. For example, research studies on phytoremediation, and wetland creation could be conducted on these sites.

Financial resources to be explored may include:

- Federal government.
- State government.
- Local government.
- Foundations.
- Private sector (e.g., industry groups, community groups, environmental groups).
- Research grants.
- In-kind Services and materials.

7.2.3 Public Input

The wants and needs of the local interests (local governments, business organizations, and individuals) and the greater Chicagoland area should also be considered in the development of the Ecological Reclamation Plan for the Cluster Site. For example, reclamation of these sites will not be an "overnight" process, though the time required for reclamation will differ depending on desired end use (e.g., recreational fields versus native prairie landscape). Public input is desired for the following:

- End use of the properties.
- Property access.
- Traffic concerns.

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SECTION 8

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APPENDIX A

THREATENED AND ENDANGERED SPECIES

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Chicago Illinois Field Office
1000 Hart Road – Suite 180
Barrington, Illinois 60010
708/381-2253

RECEIVED
OCT 14 1997

IN REPLY REFER TO:

FWS/AES-CIFO

October 9, 1997

Tonya Balla
Roy F. Weston, Inc.
3 Hawthorn Parkway, Suite 400
Vernon Hills, IL 60061-1450

Dear Ms. Balla:

This letter is in reply to your letter dated September 5, 1997 requesting threatened and endangered species information for an Environmental Assessment being prepared as part of the Ecological Restoration Study of the Lake Calumet Cluster Site in Chicago, Illinois.

Based on the information provided in the submittal, we do not believe that any federally endangered or threatened species occur in the vicinity of the project site. Based on the information provided, it does not appear that the proposed activity at this site is likely to jeopardize the continued existence or adversely modify critical habitat of such species. This precludes the need for further action on this project site as required under the Endangered Species Act of 1973, as amended. Should project modifications or new information indicate that endangered or threatened species may be affected and the proposed project is authorized, funded, or carried out by a federal agency, then consultation with the Service should be initiated by the federal action agency.

Two species of concern, the black tern and common tern, are known to have occurred in marshes in the vicinity of the Chicago Cluster Site. As these two species are also state-endangered in Illinois and the Illinois Department of Natural Resources conducts annual breeding bird surveys in this area, they should be contacted for recent records. Any impacts to marshes that support these federal species of concern or other state-listed species should be avoided.

If you have any further questions, please contact Mr. Jeff Mengler at 847/381-2253 x226.

Sincerely,

John D. Rogner

John D. Rogner
Acting Field Supervisor

cc: INDR, Shank

ILLINOIS
DEPARTMENT OF
NATURAL RESOURCES

524 South Second Street, Springfield 62701-1787 Jim Edgar, Governor ● Brent Manning, Director

September 24, 1997

RECEIVED
SEP 29 1997

Tonya Balla
Project Engineer
Roy R. Weston, Inc.
Suite 400
3 Hawthorn Parkway
Vernon Hills, Illinois 60061-1450

Re: Natural Heritage Database Search

Dear Ms. Balla:

I have reviewed the Natural Heritage Database for the presence of threatened and endangered species, Illinois Natural Area Inventory (INAI) sites, and dedicated Illinois Nature Preserves within the vicinity of the project site. Following are the results of that review.

Lake Calumet INAI site is located in Township 27N, Range 14E, Sections 13, 14, 23, 24, 25, and 26. This site supports numerous state listed bird species and one state listed plant species. Three rookeries are also known to occur at the Lake Calumet site. Here is a list of the species known to occur at the site.

Upland Sandpiper (*Bartramia longicauda*)
Wilson's Phalarope (*Phalropus tricolor*)
Pied-billed Grebe (*Podilymbus podiceps*)
King Rail (*Rallus elegans*)
Yellow-crowned Night Heron (*Nyctanassa violacea*)
Great Egret (*Casmerodius albus*)
Yellow-headed Blackbird (*Xanthocephalus xanthocephalus*)
Black-crowned Night Heron (*Nycticorax nycticorax*)
Common Moorhen (*Gallinula chloropus*)
Least Bittern (*Ixobrychus exilis*)
Snowy Egret (*Egretta thula*)
Little Blue Heron (*Egretta caerulea*)
Black Tern (*Chlidonias niger*)
White Lady's Slipper (*Cyprepidium candidum*)

Rookery located in Township 37N, Range 14E, Section 24
Rookery located in Township 37N, Range 14E, Section 25
Rookery located in Township 37N, Range 14E, Section 13

Please be aware that the Natural Heritage Database cannot provide a **conclusive** statement on the presence, absence, or condition of significant features in any part of Illinois. The reports only summarize the existing information regarding the natural features or location in question known to the Division of Natural Heritage at the time of the inquiry. This response should not be regarded as a final statement on the site being considered, nor should it be a substitute for field surveys required for environmental assessments.

Though we cannot charge you for the request, we do urge you to support the Database with a donation to the Illinois Wildlife Preservation Fund. Your request costs approximately $50 in staff time and resources to complete. Donations can be made to:

Illinois Wildlife Preservation Fund
Illinois Department of Natural Resources
Division of Natural Heritage
524 South Second Street
Springfield, Illinois 62701-1787

If you need additional information or have any questions, please do not hesitate to contact me at 217-785-5500.

Sincerely,

Heather C. Hostetler

Heather C. Hostetler
Environmental Database Specialist
Division of Natural Resource Review & Coordination

APPENDIX B

DATA COMPARISONS TO HUMAN HEALTH BASED REMEDIATION OBJECTIVES

Table 3-1
Comparison of Soil Data to IEPA Tier I Soil Remediation Objectives
Paxton Landfill
Lake Calumet Cluster Site
Chicago, Illinois

Source	ESI	ESI	ESI	ESI	IEPA Background Concentration	IEPA Tier I Concentration			
Sample ID	SS01	SS02	SS04	SS05		Commercial/Industrial		Construction Worker	
Depth (inches)	0-6	0-6	0-6	0-6		Ingestion	Inhalation	Ingestion	Inhalation
Notes	North-central portion of fences in equipment and scrap area.	Southwestern corner of fenced in equipment and scrap area.	Southwest of fenced in scrap area.	25 feet north of ditch along north-central section of Paxton II. Background.					
Semivolatile Organic Compounds (ug/kg)									
Naphthalene	750 u	110	45	130	--	82000000	--	8200000	--
2-Methylnaphthalene	160	97	68	83	--	82000000	--	8200000	--
Acenaphthylene	68	28	390u	57	--	61000000	--	61000000	--
Acenaphthene	200	49	35	74	--	120000000	--	120000000	--
Dibenzofuran	240	91	50	63	--	8200000 a	--	--	--
Fluorene	170	52	390 u	71	--	82000000	--	82000000	--
Phenanthrene	1900	690	380	770	--	61000000	--	61000000	--
Anthracene	410	120	37	130	--	610000000	--	610000000	--
Carbazole	200	420 u	390 u	98	--	290000	--	6200000	--
Fluoranthene	3100	940	450	1200	--	82000000	--	82000000	--
Pyrene	3400	1000	550	2100	--	61000000	--	61000000	--
Butylbenzyl phthalate	750 u	120	390u	370u	--	410000000	930000	410000000	930000
Benzo(a)anthracene	2200	720	390	780	--	8000	--	170000	--
Chyrsene	1700	600	290	740	--	780000	--	17000000	--
Benzo(b)fluoranthene	3800	1500	750	1500	--	8000	--	170000	--
Benzo(a)pyrene	1500	490	220	590	--	800	--	17000	--
Indeno(1,2,3-cd)pyrene	890	180	61	970	--	8000	--	170000	--
Dibenzo(a,h)anthracene	250	220	390u	320	--	800	--	17000	--
Benzo(g,h,i)perylene	850	480	180	1200	--	61000000	--	61000000	--
Pesticides/PCBs (ug/kg)									
Aroclor-1260	150u	65	29u	150u	--	1000	--	1000	--
Inorganics (mg/kg)									
Aluminum	9170	8360	10200	10300	9500	1000000 a	--	--	--
Antimony	3.8u	4.9u	3.9u	3.7u	4	820	--	82	--
Arsenic	9.4	5.5	6.8	6.7	7.2	3	1200	61	25000
Barium	69.5	71.4	66	125	110	140000	910000	14000	870000

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Table B-1
Comparison of Soil Data to IEPA Tier I Soil Remediation Objectives
Paxton Landfill
Lake Calumet Cluster Site
Chicago, Illinois
(Continued)

Source	ESI	ESI	ESI	ESI	IEPA Background Concentration	IEPA Tier I Concentration			
Sample ID	SS01	SS02	SS04	SS05		Commercial/Industrial		Construction Worker	
Depth (inches)	0-6	0-6	0-6	0-6		Ingestion	Inhalation	Ingestion	Inhalation
Notes	North-central portion of fences in equipment and scrap area.	Southwestern corner of fenced in equipment and scrap area.	Southwest of fenced in scrap area.	25 feet north of ditch along north-central section of Paxton II. Background.					
Beryllium	0.34	0.39	0.88	0.53	0.59	1	2100	29	44000
Cadmium	0.84u	1.1u	0.88u	0.91	0.6	2000	2800	200	59000
Calcium	88800	116000	48900	158000	9300	--	--	--	--
Chromium VI = 1/6th of total	190	131	4.42	116	16.2	10000	420	4100	8800
Chromium III = 5/6th of total	950	655	22.1	580	--	--	--	--	--
Cobalt	14.9	9.8	12.4	7.8	8.9	120000	--	12000	--
Copper	191	84.5	40.5	50.2	19.6	82000	--	8200	--
Iron	128000	90900	22800	57300	15900	610000 a	--	--	--
Lead	801	162	81	268	36	400	--	400	--
Magnesium	42800	25500	23300	15300	4820	--	--	--	--
Manganese	10200	14800	715	26900	636	96000	91000	9600	8700
Mercury	0.11u	0.15	0.12u	0.1u	0.06	610	540000	61	52000
Nickel	138	36	27.5	19.6	18	41000	21000	4100	440000
Potassium	392	826	2520	1310	1268	--	--	--	--
Selenium	0.37u	0.48u	0.44	0.73u	0.48	10000	--	1000	--
Silver	0.39	0.51u	0.41u	0.38u	0.55	10000	--	1000	--
Sodium	261	652	613	739	130	--	--	--	--
Thallium	0.99u	2	1u	5.8	0.32	160	--	160	--
Vanadium	156	222	21.6	187	25.2	14000	--	1400	--
Zinc	123	114	107	473	95	610000	--	61000	--
Cyanide	1.9	0.83	0.59u	15.8	0.51	41000	--	4100	--

Shaded value indicates remediation objective was exceeded.
-- = Not available.
u = Not detected; numerical value is the sample quantitation limit.
a = U.S. EPA Region III Risk-based concentration (U.S. EPA, 1996).

For chemicals lacking remediation objectives, the following proxy chemicals were used:

Chemical	Proxy
2-Methylnaphthalene	Naphthalene
Acenaphthylene	Pyrene
Phenanthrene	Pyrene
Benzo(g,h,i)perylene	Pyrene

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Tab. -2

Comparison of Soil Data to IEPA Tier I Concentrations
Land and Lakes #3
Lake Calumet Cluster Site
Chicago, Illinois

Source	ESI	ESI	ESI	ESI	ESI	ESI	IEPA Background Concentration	IEPA Tier I Remediation Objective			
Sample ID	SS01	SS02	SS03	SS04	SS05	SS06		Commercial/Industrial		Construction Worker	
Depth (feet)	1 -2	1 - 1.5	1 - 2	1 - 1.5	0.5 - 1	<2		Ingestion	Inhalation	Ingestion	Inhalation
Notes	Northwest portion of site, about 12 ft south and 15 ft east of the culvert inlet, which drains to Lake Calumet.	Northwestern corner of the landfilled area, about 120 ft south of the northern site boundary.	Southern portion of the site, about 300 ft west of MW-GA4S.	Near the southwestern corner of the landfilled area, just north of LRS parking lot.	Offsite, about 40 ft west of Stony Island Ave, and about 200 ft south of the northern site boundary.	Offsite, about 40 ft south of 122nd St and about 200 ft east of the eastern site boundary.					
Volatile Organic Compounds (ug/kg)											
Toluene	14 u	13 u	13 u	14 u	12 u	4	--	410000000	650000	410000000	42000
Semivolatile Organic Compounds (ug/kg)											
Phenol	120	130	430 u	180	1200 u	1400u	--	1.00E+09	--	120000000	--
1,4-Dichlorobenzene	52	880u	430u	310	1200u	1400u	--	17000000	--	340000	--
4-Methylphenol	130	120	430u	2700u	1200u	1400u	--	10000000 a	--	--	--
1,2,4-Trichlorobenzene	900u	880u	430u	290	1200u	1400u	--	20000000	3200000	2000000	920000
Naphthalene	240	390	84	270	110	540	--	82000000	--	8200000	--
4-Chloroaniline	140	880u	430u	1500	240	1400u	--	8200000	--	820000	--
2-Methylnaphthalene	150	270	140	2700u	96	290	--	82000000	--	8200000	--
Acenaphthylene	160	120	430u	200	260	490	--	61000000	--	61000000	--
Acenaphthene	200	490	39	2700u	180	290	--	120000000	--	120000000	--
Dibenzofuran	150	340	51	2700u	120	270	--	8200000 a	--	--	--
Fluorene	230	570	55	150	240	400	--	82000000	--	82000000	--
Phenanthrene	1600	3900	370	500	2500	4200	--	61000000	--	61000000	--
Anthracene	410	840	50	2700u	560	760	--	610000000	--	610000000	--
Carbazole	170	420	32	2700u	290	410	--	290000	--	6200000	--
Fluoranthene	2200	6200	350	760	4800	5200	--	82000000	--	82000000	--
Pyrene	2100	5700	360	1200	6100	6000	--	61000000	--	61000000	--
Benzo(a)anthracene	1500	3100	270	530	2800	3100	--	8000	--	170000	--
Chyrsene	1300	3000	250	660	3100	3300	--	780000	--	17000000	--
bis(2-ethylhexyl)phthalate	1700	1600	430u	130000	1200u	1400u	--	410000	31000000	4100000	31000000
Di-n-octylphthalate	900u	880u	430u	160	1200u	1400u		41000000	10000000	4100000	10000000
Benzo(b)fluoranthene	1900	3500	430u	2700u	2800	3300	--	8000	--	170000	--
Benzo(k)fluoranthene	1600	4000	230	900	3800	3900	--	78000	--	1700000	--
Benzo(a)pyrene	1200	2800	230	2700u	2700	2800	--	800	--	17000	--
Indeno(1,2,3-cd)pyrene	320	770	87	390	1200	1000	--	8000	--	170000	--
Dibenz(a,h)anthracene	900u	470	36	2700u	450	740	--	800	--	17000	--
Benzo(g,h,i)perylene	110	280	32	400	480	410	--	61000000	--	61000000	--

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Table B-2
Comparison of Soil Data to IEPA Tier I Concentrations
Land and Lakes #3
Lake Calumet Cluster Site
Chicago, Illinois
(Continued)

Source	ESI	ESI	ESI	ESI	ESI	ESI	IEPA Background Concentration	IEPA Tier I Remediation Objective			
								Commercial/Industrial		Construction Worker	
Sample ID	SS01	SS02	SS03	SS04	SS05	SS06		Ingestion	Inhalation	Ingestion	Inhalation
Depth (feet)	1 -2	1 - 1.5	1 - 2	1 - 1.5	0.5 - 1	<2					
Notes	Northwest portion of site, about 12 ft south and 15 ft east of the culvert inlet, which drains to Lake Calumet.	Northwestern corner of the landfilled area, about 120 ft south of the northern site boundary.	Southern portion of the site, about 300 ft west of MW-GA4S.	Near the southwestern corner of the landfilled area, just north of LRS parking lot.	Offsite, about 40 ft west of Stony Island Ave, and about 200 ft south of the northern site boundary.	Offsite, about 40 ft south of 122nd St and about 200 ft east of the eastern site boundary.					
Pesticides/PCBs (ug/kg)											
delta-BHC	2.3u	2.3u	2.2u	7.8	2.1u	2.4u	--	900	1500	20000	2100
gamma-BHC	2.3u	2.3u	2.2u	8.2	2.1u	2.4u	--	4000	--	96000	--
Aldrin	2.9u	2.3	2.2u	5.9	3.1u	3.5	--	300	6600	6100	9300
Heptachlor epoxide	2.3u	2.3u	2.2u	12	2.1u	2.4u	--	600	9200	2700	13000
Dieldrin	7.3	4.4u	4.3u	28	4u	4.6u	--	400	2200	7800	3100
Endrin	4.5u	4.4u	4.3u	4.6u	4.2	4.6u	--	610000	--	61000	--
Endosulfan sulfate	4.5u	6.1	4.3u	4.6u	4u	4.6u	--	12000000	--	1200000	--
Methoxychlor	23u	23u	22u	24u	65	24u	--	10000000	--	1000000	--
4,4-DDE	5.6	4.4u	4.3u	24	4.4	8	--	17000	--	370000	--
4,4-DDD	4.9	5.5	4.3u	25	4.6	4.6u	--	24000	--	520000	--
4,4-DDT	4.5u	4.4u	4.3u	4.6u	18	21	--	17000	1500000	100000	2100000
Endrin ketone	4.5u	4.4u	4.3u	4.6u	4u	7.5	--	610000	--	61000	--
alpha-Chlordane	5.6	2.3u	2.2u	2.4u	2.1u	2.4u	--	4000	38000	12000	53000
gamma-Chlordane	5.1	2.3u	2.2u	2.4u	2.1u	2.4u	--	4000	38000	12000	53000
Aroclor-1242	180	44u	490	46u	40u	46u	--	1000	--	1000	--
Aroclor-1254	140	59	43u	610	40u	46u	--	1000	--	1000	--
Inorganics (mg/kg)											
Aluminum	9400	12600	9830	12000	8010	9530	9500	1000000 a	--	--	--
Antimony	6.2	r	r	r	5.9	r	4	820	--	82	--
Arsenic	9.1	7	8.6	20.7	6.7	17.3	7.2	3	1200	61	25000
Barium	82.2	89.7	54.7	610	75.1	114	110	140000	910000	14000	870000
Beryllium	0.61	1	0.65	0.71	0.74	0.98	0.59	1	2100	29	44000
Cadmium	2.4	1.2u	0.91u	24.7	1.2	2.8	0.6	2000	2800	200	59000
Calcium	71100	70300	56400	51500	74700	64900	9300	--	--	--	--
Chromium	113	35.5	24.7	248	37.6	74.5	16.2	10000	420	4100	8800
Cobalt	10.3	10.8	12.8	13.4	9	9.8	8.9	120000	--	12000	--
Copper	49.8	53.2	36.5	163	36.3	73.4	19.6	82000	--	8200	--
Iron	22100	21300	24100	28900	19700	57500	15900	610000 a	--	--	--
Lead	70.3	57.7	47.1	463	153	215	36	400	--	400	--
Magnesium	33800	29900	29100	24100	23300	20900	4820	--	--	--	--

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Table _
Comparison of Soil Data to IEPA Tier I Soil Remediation Objectives
Alburn Incinerator
Lake Calumet Cluster Site
Chicago, Illinois

Source	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	IEPA Background Concentration	IEPA Tier I Concentration Residential		IEPA Tier I Concentration Commercial/Industrial		IEPA Tier I Concentration Construction Worker	
Sample ID	SS01	SS02	SS03	SS04	SS05	SS06	SS07	SS08	SS09	SS10		Ingestion	Inhalation	Ingestion	Inhalation	Ingestion	Inhalation
Depth (inches)	10 - 12	14 - 16	15 - 18	10 - 15	14 - 16	10 - 14	6 - 8	6 - 8	8 - 10	8 - 10							
Notes	50 ft southeast of site's northwestern corner.	20 ft west of the onsite office building.	120 ft south and 20 ft west of the northeastern corner of the site.	150 ft north and 25 ft east of the southwestern site corner (20 ft east of monitoring well P4).	Southeastern quadrant; about 20 ft southwest of monitoring well P3.	Southeastern quadrant; about 45 ft southeast of monitoring well P5.	Offsite, about 80 ft south of the site's southeastern corner.	Offsite, about 30 ft south and 40 ft east of the site's northeastern corner.	Offsite, about 270 ft south and 10 ft east of the site's northeastern corner.	About 150 yard east of the Paxton Landfill guardhouse.							
Volatile Organic Compounds (ug/kg)																	
Chloroethane	12u	12u	12u	12u	13u	14	14u	14u	12u	12u	–	31000000 a	–	820000000 a	–	–	–
Acetone	35	71	15	12u	13	450	41	9	12u	12u	–	7800000	100000000	200000000	100000000	200000000	100000000
1,1-Dichloroethane	12u	12u	12u	12u	13u	26	14u	14u	12u	12u	–	7800000	1300000	200000000	1700000	200000000	130000
2-Butanone	12u	14	12u	12u	13u	1200	15	14u	12u	12u	–	47000000 a	–	000000000	–	–	–
1,2-Dichloropropane	12u	12u	12u	12u	13u	3	14u	14u	12u	12u	–	9000	15000	84000	23000	1800000	500
Benzene	12u	2	3	12u	2	44	14u	14u	12u	12u	–	22000	800	200000	1500	4300000	2100
4-Methyl-2-pentanone	12u	12u	12u	12u	13u	250	9	9	12u	12u	–	6300000 a	–	160000000 a	–	–	–
2-Hexanone	12u	12u	12u	12u	13u	14	14u	14u	12u	12u	–	–	–	–	–	–	–
Toluene	12u	3	12u	12u	13u	290	4	14u	12u	12u	–	16000000	650000	410000000	650000	410000000	42000
Chlorobenzene	12u	12u	12u	12u	13u	3	14u	14u	12u	12u	–	1600000	130000	41000000	210000	4100000	1300
Ethylbenzene	3	86	3	12u	13u	20	14u	3	12u	12u	–	7800000	400000	200000000	400000	20000000	58000
Xylene (total)	12u	17	2	12u	13u	53	14u	9	12u	12u	–	160000000	410000	1.00E+09	410000	410000000	410000
Semivolatile Organic Compounds (ug/kg)																	
Phenol	55	2000u	1200u	1200u	430u	5100u	1400u	2300u	410u	410u	–	47000000	–	1.00E+09	–	120000000	–
4-Methylphenol	54	2000u	1200u	1200u	430u	1400	1400u	2300u	410u	410u	–	390000 a	–	10000000 a	–	–	–
Isophorone	410u	2000u	1200u	1200u	430u	2000	1400u	2300u	400	410u	–	15600000	4600000	410000000	4600000	410000000	4600000
Naphthalene	160	1700	250	240	48	750	1400u	680	410u	57	–	3100000	–	82000000	–	8200000	–
2-Methylnaphthalene	120	1300	160	1200u	45	5100u	1400u	620	410u	410u	–	3100000	–	82000000	–	8200000	–
Acenaphthylene	110	430	1200u	690	430u	5100u	1400u	2300u	410u	410u	–	2300000		61000000	–	61000000	–
Acenaphthene	48	400	1200u	1200u	430u	5100u	1400u	350	410u	410u	–	4700000	–	120000000		120000000	
Dibenzofuran	51	2000u	140	1200u	46	5100u	1400u	270	410u	410u	–	310000 a	–	8200000 a	–	–	–
Fluorene	58	990	130	1200u	430u	5100u	1400u	490	410u	410u	–	3100000	–	82000000	–	82000000	–
Phenanthrene	360	2800	860	610	170	830	320	1900	49	130	–	2300000	–	61000000	–	61000000	–
Anthracene	220	510	390	450	430u	5100u	150	590	410u	45	–	23000000	–	610000000	–	610000000	
Carbazole	410u	2000u	250	200	430u	5100u	1400u	400	410u	410u	–	32000	–	290000	–	6200000	–
Di-n-butylphthalate	410u	410	230	1200u	46	1300	170	2300u	73	54	–	7800000	2300000	200000000	2300000	200000000	2300000
Fluoranthene	440	2500	810	5700	200	3200	450	1900	410u	230	–	3100000	–	82000000	–	82000000	–
Pyrene	770	2500	570	4500	110	1100	320	1300	410u	130	–	2300000	–	61000000	–	61000000	–
Butylbenzylphthalate	410	630	1200u	1200u	54	3200	170	330	83	79	–	16000000	930000	410000000	930000	410000000	930000
Benzo(a)anthracene	370	1300	500	4100	120	750	350	1000	410u	150	–	900	–	8000	–	170000	–
Chrysene	570	1500	430	3800	130	820	320	780	410u	110	–	88000	–	780000	–	17000000	–
bis(2-ethylhexyl)phthalate	2000	5500	320	140	66	17000	420	1300	50	46	–	46000	31000000	410000	31000000	4100000	31000000
Benzo(b)fluoranthene	980	1900	610	6500	190	2000	630	1100	410u	180	–	900	–	8000	–	170000	–
Benzo(k)fluoranthene	980	1900	610	6500	190	2000	630	1100	410u	180	–	9000	–	78000	–	1700000	–
Benzo(a)pyrene	500	1200	350	3200	72	1100	340	650	410u	94	–	90	–	800	–	17000	–
Indeno(1,2,3-cd)pyrene	400	730	280	2000	91	960	340	450	410u	95	–	900	–	8000	–	170000	–
Dibenz(a,h)anthracene	110	260	1200u	760	430u	5100u	1400u	2300u	410u	410u	–	90	–	800	–	17000	–
Benzo(g,h,i)perylene	340	610	210	1100	84	640	300	310	410u	66	–	2300000	–	61000000	–	61000000	–
Pesticides/PCBs (ug/kg)																	
alpha-BHC	2.1u	2u	4.7	0.6	2.2u	5.2	R	R	2.1u	2.1u	–	100	800	900	1500	20000	2100
delta-BHC	0.71	5.5	16	0.63	2.2u	8.7	R	R	0.26	0.44	–	130	800	900	1500	20000	2100
gamma-BHC	2.1u	[illegible]	10u	2.1u	2.2u	13u	R	R	1.2	2.1u	–	500	–	4000	–	96000	–
Heptachlor	2.1u	0.34	10u	0.45	2.2u	13u	R	R	2.1u	2.1u	–	100	100	1000	11000	28000	16000
Aldrin	3.7	[illegible]	7.3	2.9	2.1	13u	8	5	2.1u	0.35	–	40	–	300	6600	6100	9300
Heptachlor epoxide	2.1u	[illegible]u	14	2.3	0.51	30	4.4	2.3	2.1u	0.18	–	70	5000	600	9200	2700	13000
Dieldrin	5.7	8.1	12	4u	0.93	180	2.3	7.3	1.7	0.91	–	40	1000	400	2200	7800	3100
Endrin	12	3.9u	20u	3.5	4.3u	25u	1.9	R	4.1u	4.1u	–	23000	–	610000	–	61000	–
Endosulfan II	4.1u	3.9u	20u	4u	4.3u	1.8	R	R	4.1u	4.1u	–	470000	–	12000000	–	1200000	–
Endosulfan sulfate	4.1u	3.9u	20u	0.18	3.7	6.3	20	49	1.5	0.18	–	470000	–	12000000	–	1200000	–

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Table B-2
Comparison of Soil Data to IEPA Tier I Concentrations
Land and Lakes #3
Lake Calumet Cluster Site
Chicago, Illinois
(Continued)

Source	ESI	ESI	ESI	ESI	ESI	ESI	IEPA Background Concentration	IEPA Tier I Remediation Objective			
Sample ID	SS01	SS02	SS03	SS04	SS05	SS06		Commercial/Industrial		Construction Worker	
Depth (feet)	1 -2	1 - 1.5	1 - 2	1 - 1.5	0.5 - 1	<2		Ingestion	Inhalation	Ingestion	Inhalation
Notes	Northwest portion of site, about 12 ft south and 15 ft east of the culvert inlet, which drains to Lake Calumet.	Northwestern corner of the landfilled area, about 120 ft south of the northern site boundary.	Southern portion of the site, about 300 ft west of MW-GA4S.	Near the southwestern corner of the landfilled area, just north of LRS parking lot.	Offsite, about 40 ft west of Stony Island Ave, and about 200 ft south of the northern site boundary.	Offsite, about 40 ft south of 122nd St and about 200 ft east of the eastern site boundary.					
Manganese	1740	672	522	589	614	1230	636	96000	91000	9600	8700
Mercury	0.16	0.11	0.08	1	0.15	0.32	0.06	610	540000	61	52000
Nickel	30.9	39	37.9	44.1	24.5	50.4	18	41000	21000	4100	440000
Potassium	3000	3830	2670	3160	2380	2560	1268	--	--	--	--
Selenium	0.68	0.51	0.31	3.2	0.57	0.87	0.48	10000	--	1000	--
Silver	1.1u	1.1u	0.87u	5	0.94u	1.1u	0.55	10000	--	1000	--
Sodium	266	1100	251	174	369	549	130		--		--
Thallium	0.71	0.59	0.82	0.68	0.56	0.96	0.32	160	--	160	--
Vanadium	43.4	25.9	20.1	35.2	25.4	36.9	25.2	14000	--	1400	--
Zinc	164	116	246	711	240	472	95	610000	--	61000	--
Cyanide	0.89	0.63u	0.67u	22.2	0.62u	0.95	0.51	41000	--	4100	--

Shaded value indicates remediation objective was exceeded.
-- = Not available.
u = Not detected; numerical value presented is sample quantitation limit.
a = U.S. EPA Region III Risk-based concentration (U.S. EPA, 1997).
For chemicals lacking remediation objectives, the following proxy chemicals were used:

Chemical	Proxy
2-Methylnaphthalene	Naphthalene
Acenaphthylene	Pyrene
Phenanthrene	Pyrene
Benzo(g,h,i)perylene	Pyrene
delta-BHC	alpha-BHC
endosulfan sulfate	endosulfan
endrin ketone	endrin

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Tab

Comparison of Soil Data to IEPA Tier I Soil Remediation Objectives
Album Incinerator
Lake Calumet Cluster Site
Chicago, Illinois
(Continued)

Source	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	IEPA Background Concentration	IEPA Tier I Concentration Residential		IEPA Tier I Concentration Commercial/Industrial		IEPA Tier I Concentration Construction Worker	
Sample ID	SS01	SS02	SS03	SS04	SS05	SS06	SS07	SS08	SS09	SS10							
Depth (inches)	10 - 12	14 - 16	15 - 18	10 - 15	14 - 18	10 - 14	6 - 8	6 - 8	6 - 10	8 - 10		Ingestion	Inhalation	Ingestion	Inhalation	Ingestion	Inhalation
Notes	50 ft southeast of site's northwestern corner.	20 ft west of the onsite office building.	120 ft south and 20 ft west of the northeastern corner of the site.	150 ft north and 25 ft east of the southwestern site corner (20 ft east of monitoring well P4).	Southeastern quadrant; about 20 ft southwest of monitoring well P3.	Southeastern quadrant; about 45 ft southeast of monitoring well P5.	Offsite, about 80 ft south of the site's southeastern corner.	Offsite, about 30 ft south and 40 ft east of the site's northeastern corner.	Offsite, about 270 ft south and 10 ft east of the site's northeastern corner.	About 150 yard east of the Paxton Landfill guardhouse.							
Methoxychlor	9.6	20u	100u	91	110	38	23u	90	21u	1.1u	--	390000	--	10000000	--	1000000	--
4,4-DDE	1.1	3.9	2.1	4u	0.27	22	2	5.5	1	0.25	--	2000	--	17000	--	370000	--
4,4-DDD	0.9	23	20u	5.6	4.3u	68	R	1.2	0.76	1.1	--	3000	--	24000	--	520000	--
4,4-DDT	6.8	12	5.3	4u	4.3u	25u	9.2	1.5	0.83	0.12u	--	2000	--	17000	1500000	100000	2100000
Endrin ketone	4.1u	3.9u	20u	12	4.4	25u	4.5u	r	0.9	4.1u	--	23000	--	610000	--	61000	--
Endrin aldehyde	1.2	3.9u	3.5	4u	4.3u	25u	1.7	1.2	1	4.1u	--	23000	--	610000	--	61000	--
alpha-Chlordane	11	51	8.2	4.1	0.66	26	R	7.1	1.7	0.43	--	500	20000	4000	38000	12000	53000
gamma-Chlordane	3	2u	2.9	1.8	0.44u	33	R	2.4	0.76	0.46u	--	500	20000	4000	38000	12000	53000
Aroclor-1260	41u	500	170	40u	43u	250u	340	R	31	41u	--	1000	--	740	--	--	--
Dioxins (ug/kg)																	
1,2,3,4,6,7,8-HpCDD	NA	0.51	0u	0u	0u	NA	NA	NA	NA	0u	--	0.04	--	4	--	--	--
OCDD	NA	3.5	1.3	1.1	0.66	NA	NA	NA	NA	0.29	--	0.4	--	40	--	--	--
Inorganics (mg/kg)																	
Aluminum	11000	14900	18300	23900	35.5u	4090	15200	14100	10200	4890	9500	78000 a	--	1000000 a	--	--	--
Antimony	5.6	3	2.6u	5.5	2.9u	34.7	2.9u	2.9u	2.7u	2.9	4	31	--	820	--	82	--
Arsenic	6.1	6.2	11.3	9.9	7.5	1.2	6.2	6.3	7.7	4.2	7.2	0.4	750	3	1200	61	25000
Barium	218	295	329	485	166	1110	238	162	55.6	35.7	110	5500	690000	140000	910000	14000	870000
Beryllium	1.4	2.8	2.9	4.2	2	0.34	2.4	2.4	0.6	0.3	0.59	0.1	1300	1	2100	29	44000
Cadmium	1.2	1.2	1.3u	1.3u	1.3u	10.3	13.3	1.3u	1.2u	1.2u	0.6	78	1800	2000	2800	200	59000
Calcium	119000	146000	139000	89600	146000	59100	84300	104000	5900	59000	9300	--	--	--	--	--	--
Chromium	1.9u	177	407	53.6	440	475	187	143	21.1	16.2	16.2	390	270	10000	420	4100	8800
Cobalt	5.9	10.5	8.2	3.6	46.9	12.8	7.2	6.3	9.7	5.2	19.6	4700	--	120000	--	12000	--
Copper	93.3	2.3u	2.6u	50.5	2.7u	112	116	45.1	30.5	20.3	19.6	2900	--	82000	--	8200	--
Iron	47000	46000	40700	26800	204000	29700	43400	52100	20900	12400	15900	23000 a	--	610000 a	--	--	--
Lead	196	181	158	416	170	1320	156	124	28.7	38.2	36	400	--	400	--	400	--
Magnesium	21800	24700	33000	18200	5.1u	12400	18000	28700	26500	27300	4820	--	--	--	--	--	--
Manganese	11600	7940	11000	3060	18300	6450	2340	4520	539	450	636	3700	69000	96000	91000	9600	8700
Mercury	0.69	0.73	0.87	0.13u	0.13u	0.52	0.35	0.13u	0.12u	0.12u	0.06	23	10	610	540000	61	52000
Nickel	9.6u	14.5	10.2u	10u	10.7u	12.4u	76.2	21.2	29.8	15.5	18	1600	13000	41000	21000	4100	440000
Potassium	1470	1440	2520	3600	683	641	2250	2210	2660	1200	1268	--	--	--	--	--	--
Selenium	0.46u	0.47u	0.51u	0.5u	0.53u	0.62u	0.53u	0.54u	0.49u	0.49u	0.48	390	--	10000	--	1000	--
Silver	0.72u	0.7u	0.77u	0.75u	0.8u	0.93u	0.79u	0.8u	0.74u	0.73u	0.55	390	--	10000	--	1000	--
Sodium	2280	2140	3370	3370	2610	3510	2510	3300	3230	2940	130	--	--	--	--	--	--
Thallium	0.72u	0.7u	0.77u	0.75u	0.8u	0.93u	0.79u	0.8u	0.74u	0.73u	0.32	6.3	--	160	--	160	--
Vanadium	109	68.6	80.4	34.7	1.3u	70.7	25.2	55.7	21.2	14.6	25.2	550	--	14000	--	1400	--
Zinc	402	1430	598	420	1.9	609	396	199	176	77.2	95	23000	--	610000	--	61000	--
Cyanide	1.6	1.6	1.3	0.82	0.67u	6.8	4.8	0.94	0.62u	0.88	0.51	1600	--	41000	--	4100	--

Shading indicates remediation objective was exceeded.
NA = Not analyzed
R = unusable data.
-- = Not available.
u = Not detected; numerical value is the sample quantitation limit.
a = U.S. EPA Region III Risk-based concentration (U.S. EPA, 1996).
For dioxins, 2,3,7,8-TCDD toxicity equivalency factors were applied; 0.01 for HpCDD and 0.001 for OCDD (U.S. EPA, 1989).

For chemicals lacking remediation objectives, the following proxy chemicals were used:

Chemical	Proxy
2-Methylnaphthalene	Naphthalene
Acenaphthylene	Pyrene
Phenanthrene	Pyrene
Benzo(g,h,i)perylene	Pyrene
delta-BHC	alpha-BHC

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Table B-4
Comparison of Soil Data to IEPA Tier I Soil Remediation Objectives
U.S. Drum II
Lake Calumet Cluster Site
Chicago, Illinois

Source	ESI	ESI	ESI	ESI	ESI	ESI	ESI	IEPA Background Concentration	IEPA Tier I Concentration			
Sample ID	SS01	SS02	SS03	SS04	SS05	SS06	SS07		Commercial/Industrial		Construction Worker	
Depth (inches)	10 - 12	10 - 12	14 - 16	14 - 16	8 - 10	9 - 12	9 - 12		Ingestion	Inhalation	Ingestion	Inhalation
Notes	Approx 30 ft west of the northwest corner of the concrete platform.	Approx 10 ft southeast of the southeastern corner of the concrete platform.	In the southwest site quadrant, approx. 450 ft south and 25 ft west of the southwestern corner of the concrete platform.	In the southeastern site quadrant, approx. 550 ft south of the site's northeastern corner and about 25 ft west of the site's eastern fenceline.	Offsite, north of 119th St, approx. 200 ft norht an d50 ft west of Paxton Landfill's nested monitoring wells located near the northeastern site corner; background.	Offsite, about 300 ft north of 122nd St and about 300 ft east of Paxton Landfill's 122nd St entrace gate.	Offsite, about 300 ft south of 119th St and 100 ft west o fthe access road located along the site's western border. Composite of three samples collected about 50 ft apart.					
Volatile Organic Compounds (ug/kg)												
Methylene chloride	13u	100	12u	13u	16u	4	15u	--	760000	24000	1200000	34000
Acetone	6	450	6	7	24	7	15u	--	200000000	100000000	200000000	100000000
Chloroform	13u	4200	12u	13u	16u	3	15u	--	940000	540	2000000	760
1,2-Dichloroethane	13u	6800	12u	13u	16u	4	15u	--	63000	700	1400000	990
2-Butanone	13u	83	12u	13u	16u	12u	15u	--	1000000000	--	--	--
1,1,1-Trichloroethane	13u	500	12u	13u	16u	12u	15u	--	--	1200000	--	1200000
Trichloroethene	13u	1800	12u	13u	16u	12u	15u	--	520000	8900	1200000	12000
Benzene	13u	1700	12u	13u	16u	12u	15u	--	200000	1500	4300000	2100
Tetrachloroethene	5	1500	12u	6	16u	12u	15u	--	110000	20000	2400000	28000
Toluene	13u	33000	12u	13u	16u	12u	15u	--	410000000	650000	410000000	42000
Ethylbenzene	13u	62000	12u	13u	16u	12u	15u	--	200000000	400000	20000000	58000
Xylene (total)	13u	310000	12u	13u	16u	12u	15u	--	1.00E+09	410000	410000000	410000
Semivolatile Organic Compounds (ug/kg)												
Naphthalene	440u	9600	120	420u	230	400u	41	--	82000000	--	8200000	--
Hexachlorobutadiene	190	13000	400u	420u	1000u	400u	490u	--	73000 a	--	--	--
2-Methylnaphthalene	440u	1800	54	420u	540	400u	490u	--	82000000	--	8200000	--
Acenaphthene	440u	r	150	420u	1000u	400u	490u	--	120000000	--	120000000	--
Dibenzofuran	440u	r	120	420u	140	400u	490u	--	8200000 a	--	--	--
Fluorene	440u	r	260	420u	1000u	400u	490u	--	82000000	--	82000000	--
Phenanthrene	440u	r	2000	36	710	400u	51	--	61000000	--	61000000	--
Anthracene	440u	r	240	420u	41	400u	490u	--	610000000	--	610000000	--
Carbazole	440u	r	320	420u	1000u	400u	490u	--	290000	--	6200000	--
Fluoranthene	47	2200	2700	660	310	400u	120	--	82000000	--	82000000	--
Pyrene	440u	r	2000	74	270	400u	100	--	61000000	--	61000000	--

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Table 4
Comparison of Soil Data to IEPA Tier I Soil Remediation Objectives
U.S. Drum II
Lake Calumet Cluster Site
Chicago, Illinois
(Continued)

Source	ESI	ESI	ESI	ESI	ESI	ESI	ESI	IEPA Background Concentration	IEPA Tier I Concentration			
									Commercial/Industrial		Construction Worker	
Sample ID	SS01	SS02	SS03	SS04	SS05	SS06	SS07		Ingestion	Inhalation	Ingestion	Inhalation
Depth (inches)	10 - 12	10 - 12	14 - 16	14 - 16	8 - 10	9 - 12	9 - 12					
Notes	Approx 30 ft west of the northwest corner of the concrete platform.	Approx 10 ft southeast of the southeastern corner of the concrete platform.	In the southwest site quadrant, approx. 450 ft south and 25 ft west of the southwestern corner of the concrete platform.	In the southeastern site quadrant, approx. 550 ft south of the site's northeastern corner and about 25 ft west of the site's eastern fenceline.	Offsite, north of 119th St, approx. 200 ft norht an d50 ft west of Paxton Landfill's nested monitoring wells located near the northeastern site corner; background.	Offsite, about 300 ft north of 122nd St and about 300 ft east of Paxton Landfill's 122nd St entrace gate.	Offsite, about 300 ft south of 119th St and 100 ft west o fthe access road located along the site's western border. Composite of three samples collected about 50 ft apart.					
Benzo(a)anthracene	440u	r	1200	52	200	400u	130	--	8000	--	170000	--
Chyrsene	440u	r	960	41	170	400u	110	--	780000	--	17000000	--
Benzo(b)fluoranthene	440u	r	1300	65	220	400u	260	--	8000	--	170000	--
Benzo(a)pyrene	440u	r	700	35	120	400u	150	--	800	--	17000	--
Indeno(1,2,3-cd)pyrene	440u	r	580	30	80	400u	150	--	8000	--	170000	--
Benzo(g,h,i)perylene	440u	r	190	420u	39	400u	63	--	61000000	--	61000000	--
Pesticides/PCBs (ug/kg)												
4,4-DDE	4.4u	4.2u	0.92	4.6	5.2u	4u	15	--	17000	--	370000	--
4,4-DDD	4.4u	4.2u	4u	4.3u	5.2u	4u	42	--	24000	--	520000	
4,4-DDT	4.4u	4.2u	4u	4.3u	5.2u	4u	8.4	--	17000	1500000	100000	2100000
Endrin ketone	4.4u	4.2u	0.96	0.8	5.2u	4u	4.9u	--	610000	--	61000	--
Aroclor-1248	540	42u	40u	43u	52u	40u	49u	--	1000	--	1000	--
Inorganics (mg/kg)												
Aluminum	10800	13700	9380	10200	4190	9650	10400	9500	1000000 a	--	--	--
Antimony	64	329	r	r	r	r	r	4	820	--	82	--
Arsenic	3	1.2	6.1	7.5	9.7	6	9.7	7.2	3	1200	61	25000
Barium	102	391	77.4	116	111	53.2	132	110	140000	910000	14000	870000
Beryllium	0.73	1.7	0.68	0.81	0.96	0.56	0.73	0.59	1	2100	29	44000
Cadmium	1.1	4.9	0.87u	2.4	1.7	0.99	1.9	0.6	2000	2800	200	59000
Calcium	11300	110000	57500	72800	17900	59300	56600	9300	--	--	--	--
Chromium	35.2	289	19.2	176	22.8	20.4	40.1	16.2	10000	420	4100	8800
Cobalt	8.1	30.1	6.4	9	7	11.2	9	8.9	120000	--	12000	--
Copper	23.3	50.6	15.3	34.3	23.2	28.4	49.8	19.6	82000	--	8200	--
Iron	15400	50700	18700	30300	31600	22900	24400	15900	610000 a	--	--	--
Lead	101	441	21.5	113	62.8	21.3	171	36	400	--	400	--
Magnesium	5470	31500	25000	18900	7120	27200	15600	4820	--	--	--	--

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Table B-4
Comparison of Soil Data to IEPA Tier I Soil Remediation Objectives
U.S. Drum II
Lake Calumet Cluster Site
Chicago, Illinois
(Continued)

Source	ESI	ESI	ESI	ESI	ESI	ESI	ESI	IEPA Background Concentration	IEPA Tier I Concentration			
Sample ID	SS01	SS02	SS03	SS04	SS05	SS06	SS07		Commercial/Industrial		Construction Worker	
Depth (inches)	10 - 12	10 - 12	14 - 16	14 - 16	8 - 10	9 - 12	9 - 12		Ingestion	Inhalation	Ingestion	Inhalation
Notes	Approx 30 ft west of the northwest corner of the concrete platform.	Approx 10 ft southeast of the southeastern corner of the concrete platform.	In the southwest site quadrant, approx. 450 ft south and 25 ft west of the southwestern corner of the concrete platform.	In the southeastern site quadrant, approx. 550 ft south of the site's northeastern corner and about 25 ft west of the site's eastern fenceline.	Offsite, north of 119th St, approx. 200 ft norht an d50 ft west of Paxton Landfill's nested monitoring wells located near the northeastern site corner; background.	Offsite, about 300 ft north of 122nd St and about 300 ft east of Paxton Landfill's 122nd St entrace gate.	Offsite, about 300 ft south of 119th St and 100 ft west o fthe access road located along the site's western border. Composite of three samples collected about 50 ft apart.					
Manganese	389	9530	485	6640	599	405	480	636	9600	91000	9600	8700
Mercury	0.32	1.4	0.12u	0.22	0.21	0.11u	0.35	0.06	610	540000	61	52000
Nickel	21.5	21.8	20.3	24.3	18.8	31.1	29.3	18	41000	21000	4100	440000
Potassium	1210	879	1780	1670	1030	2370	1560	1268		--	--	--
Selenium	0.76	0.54	0.37u	0.39u	1.5u	0.34u	0.7	0.48	10000	--	1000	--
Silver	0.73u	1.7	0.7u	0.72u	0.93u	0.78u	0.83u	0.55	10000	--	1000	--
Sodium	341	440	631	453	838	165	171	130	--	--	--	--
Thallium	0.72	0.48	0.37u	0.59	0.91	0.74	0.4u	0.32	160	--	160	--
Vanadium	26.1	162	18.1	75.6	19.7	21.7	25.2	25.2	14000	--	1400	--
Zinc	110	632	73.6	138	174	89.7	259	95	610000	--	61000	--
Cyanide	3.3u	7.7	2.9u	3u	3.6u	3u	3.6u	0.51	41000	--	4100	--

Shaded value indicates IEPA Tier I remediation objective was exceeded.
-- = Not available.
r = Unusable data.
u = Not detected; numerical value presented is the sample quantitation limit.
a = U.S. EPA Region III Risk-based concentration (U.S. EPA, 1997).
For chemicals lacking remediation objectives, the following proxy chemicals were used:

Chemical	Proxy
2-Methylnaphthalene	Naphthalene
Acenaphthylene	Pyrene
Phenanthrene	Pyrene
Benzo(g,h,i)perylene	Pyrene
endrin ketone	endrin

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Table B-5
Comparison of Soil Data to IEPA Tier I Remediation Objectives
MSD #4
Lake Calumet Cluster Site
Chicago, Illinois

Source	ESI	ESI	ESI	IEPA Background Concentration	IEPA Tier I Remediation Objective			
Sample ID	SS01	SS02	SS03		Commercial/Industrial		Construction Worker	
Depth (inches)	0-6	0-6	0-6		Ingestion	Inhalation	Ingestion	Inhalation
Notes	East of Crandon Ave, near 124th St.	West of Crandon Ave, north of 124th St	South of 122nd St, east of Norfolk and Western RR; background.					
Volatile Organic Compounds (ug/kg)								
Carbon disulfide	1	12u	11u	--	200000000 a	--	--	--
1,1,1-Trichloroethane	1	2	11u	--	--	1200000	--	1200000
Tetrachloroethene	13u	12u	7	--	110000	20000	2400000	28000
Toluene	1	12u	6	--	410000000	650000	410000000	42000
Chlorobenzene	2	12u	11u	--	4.10E+07	2.10E+05	4100000	1300
Semivolatile Organic Compounds (ug/kg)								
Naphthalene	420u	390u	52	--	82000000	--	8200000	--
2-Methylnaphthalene	420u	390u	50	--	82000000	--	8200000	--
Acenaphthene	420u	390u	130	--	120000000	--	120000000	--
Dibenzofuran	420u	390u	90	--	8200000 a	--	--	--
Fluorene	420u	390u	140	--	82000000	--	82000000	--
Phenanthrene	300	100	1600	--	61000000	--	61000000	--
Anthracene	55	390u	360	--	6.10E+08	--	6.10E+08	--
Carbazole	83	390u	450	--	290000	--	6200000	--
Fluoranthene	430	170	2400	--	82000000	--	82000000	--
Pyrene	610	390u	3300	--	61000000	--	61000000	--
Butylbenzylphthalate	47	390u	270	--	410000000	930000	410000000	930000
Benzo(a)anthracene	360	130	2000	--	8000	--	170000	--
Chyrsene	300	130	1500	--	780000	--	17000000	--
Di-n-octylphthalate	420u	390u	170	--	41000000	10000000	4100000	10000000
Benzo(b)fluoranthene	500	230	2900	--	8000	--	170000	--
Benzo(a)pyrene	230	110	1400	--	800	--	17000	--
Indeno(1,2,3-cd)pyrene	230	110	690	--	8000	--	170000	--
Benzo(g,h,i)perylene	240	110	1400	--	61000000	--	61000000	--
Pesticides/PCBs (ug/kg)								
4,4-DDD	29	31	27	--	24000	--	520000	--
Aroclor-1254	400	170	160	--	1000	--	1000	--

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Table B-5
Comparison of Soil Data to IEPA Tier I Remediation Objectives
MSD #4
Lake Calumet Cluster Site
Chicago, Illinois
(Continued)

Source	ESI	ESI	ESI	IEPA Background Concentration	IEPA Tier I Remediation Objective			
Sample ID	SS01	SS02	SS03		Commercial/Industrial		Construction Worker	
Depth (inches)	0-6	0-6	0-6		Ingestion	Inhalation	Ingestion	Inhalation
Notes	East of Crandon Ave, near 124th St.	West of Crandon Ave, north of 124th St	South of 122nd St, east of Norfolk and Western RR; background.					
Inorganics (mg/kg)								
Aluminum	10700	7270	14900	9500	1000000 a	–	–	–
Antimony	r	r	r	4	820		82	
Arsenic	9.9	13.9	15.3	7.2	3	1200	61	25000
Barium	147	81.6	200	110	140000	910000	14000	870000
Beryllium	0.52u	0.59	2.7	0.59	1	2100	29	44000
Cadmium	8	5	0.68u	0.6	2000	2800	200	59000
Calcium	50700	39100	12000	9300	–	–	–	–
Chromium	204	113	232	16.2	10000	420	4100	8800
Cobalt	7.2	7	4.5	8.9	120000	–	12000	–
Copper	88.2	58.3	88.2	19.6	82000	–	8200	–
Iron	24000	17600	33800	15900	610000 a	–	–	–
Lead	77.6	56.8	89.8	36	400	–	400	–
Magnesium	2200	17300	42200	4820	–	–	–	–
Manganese	1380	1180	4160	636	96000	91000	9600	8700
Nickel	32.7	22.9	26.1	18	41000	21000	4100	440000
Potassium	2430	1330	1360	1268	–	–	–	–
Silver	3.1	1.4u	1.7	0.55	10000	–	1000	–
Sodium	263	160	672	130	–	–	–	–
Vanadium	43.5	35.7	65.2	25.2	14000	–	1400	–
Zinc	320	221	214	95	610000	–	61000	–

Shading indicates value exceeds remediation objective.
– = Not available.
r = Unusable data.
u = Not detected; numerical value is the sample quantitation limit.
a = U.S. EPA Region III Risk-based concentration (U.S. EPA, 1996).

For chemicals lacking remediation objectives, the following proxy chemicals were used:

Chemical	Proxy
2-Methylnaphthalene	Naphthalene
Acenaphthylene	Pyrene
Phenanthrene	Pyrene
Benzo(g,h,i)perylene	Pyrene

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TBL 4

Comparison of Sediment Data to IEPA Tier I Soil Remediation Objectives
Paxton Landfill
Lake Calumet Cluster Site
Chicago, Illinois

Source	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	IEPA Background Concentration	IEPA Tier I Concentration			
											Commercial/Industrial		Construction Worker	
Sample ID	ST01	ST02	ST03	ST04	ST05	ST06	ST07	ST08	ST10		Ingestion	Inhalation	Ingestion	Inhalation
Depth (inches)	0-6	0-6	0-6	0-6	0-6	0-6	0-6	0-6	0-6					
Notes	Drainage ditch along northcentral edge of Paxton II.	Drainage ditch along Stony Island Ave., approx. 30 ft west of the southwestern corner of Paxton II.	North of Paxton II, where ditch along Stony Island Ave. enters culvert to pass under Stony Island Ave. bkgnd	West of Paxton II, across Stony Island Ave., where culvert water from under Stony Island Ave. spills into Lake Calumet.	Northeast of Paxton I, from surface water body east of Norfolk and Western Railroad. Background.	Retention pond in northwest corner of Paxton II.	Retention pond in the northeastern corner of Paxton I.	Retention pond north of the equipment and scrap area.	Ditch along Stony Island Ave., approx. 30 feet west of the northwestern corner of Paxton II.					
recycled														
Volatile Organic Compounds (ug/kg)														
Acetone	13u	12u	14 u	61	200	13 u	31	13 u	15 u	--	200000000	100000000	200000000	100000000
1,2-Dichloroethene (Total)	13u	12u	14 u	17 u	32 u	13 u	13 u	13 u	11	--	20000000	12000000	20000000	1200000
Tetrachloroethene	13u	7	14 u	12	32 u	13 u	13 u	13 u	15 u	--	110000	20000	2400000	28000
Semivolatile Organic Compounds (ug/kg)														
Naphthalene	430u	2100u	480u	540u	1000	450u	230	390u	500u	--	82000000	--	8200000	--
2-Methylnaphthalene	430u	2100u	480u	540u	370	450u	430u	390u	500u	--	82000000	--	8200000	--
Acenaphthylene	430u	2100u	480u	540u	390	450u	430u	390u	500u	--	61000000	--	61000000	--
Acenaphthene	190	2100u	480u	540u	890u	450u	430u	390u	500u	--	120000000	--	120000000	--
Dibenzofuran	430u	2100u	480u	540u	370	450u	430u	390u	500u	--	8200000 a	--	--	--
Fluorene	250	2100u	480u	540u	890u	450u	430u	390u	500u	--	82000000	--	82000000	--
Phenanthrene	2000	4400	1500	1700	1300	270	960	960	1100	--	61000000	--	61000000	--
Anthracene	530	1100	380	440	400	450u	230	270	280	--	610000000	--	610000000	--
Carbazole	210	2100u	480u	540u	890u	450u	430u	390u	500u	--	290000	--	6200000	--
Fluoranthene	2200	8900	2000	2300	1800	260	1100	1100	1400	--	82000000	--	82000000	--
Pyrene	4500	8500	2800	3600	2500	310	1800	2100	2900	--	61000000	--	61000000	--
Butylbenzyl phthalate	430u	2100u	480u	540u	890u	450u	430u	390u	500u	--	410000000	930000	410000000	930000
Benzo(a)anthracene	1700	3600	1200	1500	1100	450u	780	920	970	--	8000	--	170000	--
Chrysene										--	780000	--	17000000	--
bis(2-ethylhexyl)phthalate	710	2100u	280	480	890u	450u	430u	390u	510		410000	31000000	4100000	31000000
Benzo(b)fluoranthene	2200	4500	1400	2000	2100	450u	980	1200	1300	--	8000	--	170000	--
Benzo(k)fluoranthene	830	2000	580	820	730	450u	370	320	510		78000	--	1700000	--
Benzo(a)pyrene	1600	3200	1100	1600	1300	450u	840	930	910	--	800	--	17000	--
Indeno(1,2,3-cd)pyrene	1600	1700	840	1200	1300	450u	920	830	740	--	8000	--	170000	--
Dibenzo(a,h)anthracene	350	2100u	190	270	890u	450u	210	190	500u	--	800	--	17000	--
Benzo(g,h,i)perylene	1300	1500	760	1000	1200	450u	700	820	830	--	61000000	--	61000000	--
Pesticides/PCBs (ug/kg)														
delta-BHC	2.2u	2.2u	2.5u	2.8u	6.5 y	2.3u	2.2u	2.1u	2.5u	--	900	1500	20000	2100
Dieldrin	4.3u	4.3u	3.2	5.4u	8.9u	4.4u	4.3u	4u	3.1	--	400	2200	7800	3100
4,4-DDE	8.6	12	10	11	42	4.4u	6.6	3.7	6.7	--	17000	--	370000	--
4,4-DDD	14	11	21	18	31	4.4u	10	4u	7.6	--	24000	--	520000	--
4,4-DDT	12	39	20	14	62	4.4u	6.9	5.6	6.9	--	17000	1500000	100000	2100000
Methoxychlor	53	40	20	27	54	23u	8.9	29	15	--	10000000	--	1000000	--
Endrin ketone	18	4.3u	10	8	20	4.4u	4.3u	11	7	--	610000	--	61000	--
alpha-Chlordane	2.3	7.5	2.9	2.8	8	2.3u	2.1	1.9	2.2	--	4000	38000	12000	53000
gamma-Chlordane	2.2u	5.5	4.3	1.9	3.3	2.3u	2.2u	2.4	4	--	4000	38000	12000	53000
Aroclor-1242	47	65	47	64	89u	44u	43u	40u	49u	--	1000	--	1000	--
Aroclor-1254	50	70	91	61	94	44u	49	40u	73	--	1000	--	1000	--
Inorganics (mg/kg)														
Aluminum	10200	7730	10100	10300	5340	12300	7820	7310	10200	9500	1000000 a	--	--	--
Arsenic	9.2	8.1	8.1	6.7	12.6	5.18	28.3	5.3	8.4	7.2	3	1200	61	25000
Barium	81.5	66.8	61.2	65.1	124	51.4	74.5	48	64.7	110	140000	910000	14000	870000
Beryllium	0.74	0.6	0.8	0.55	0.98	0.73	1	0.39	0.46	0.59	1	2100	29	44000
Cadmium	1.2	0.97	1.6	1u	1.9u	0.82u	0.78u	.82u	0.93u	0.6	2000	2800	200	59000
Calcium	62800	60000	62900	61200	13000	58000	60900	55900	61400	9300	--	--	--	--
Chromium	23.1	22.2	23.4	23.5	28.3	21	33.1	15	22.3	16.2	10000	420	4100	6800
Cobalt	12	11.9	9.6	11.8	7.5	11.6	7.2	8.3	11.3	8.9	120000	--	12000	--
Copper	48.7	39.4	37.5	38.4	130	26.2	31.6	24.3	37.6	19.6	82000	--	8200	--
Iron	21600	18700	22200	21800	33200	21600	18200	15300	22100	15900	610000 a	--	--	--
Lead	105	88.5	92.3	75.5	206	31.6	68.4	63.9	73.1	38	400	--	400	--
Magnesium	31900	29400	31500	29800	4170	28600	26300	30100	31000	4820	--	--	--	--
Manganese	634	714	600	575	238	400	688	371	531	636	96000	91000	9600	8700
Mercury	na	0.13u	0.15u	0.17u	0.32u	0.14u	0.13u	0.21	0.15u	0.06	610	540000	61	52000
Nickel	31.8	27.6	24	29.3	31.1	27.6	19.9	22	27.9	18	41000	21000	4100	440000

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Table B-4
Comparison of Sediment Data to IEPA Tier I Soil Remediation Objectives
Paxton Landfill
Lake Calumet Cluster Site
Chicago, Illinois
(Continued)

Source	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	IEPA Background Concentration	IEPA Tier I Concentration			
Sample ID	ST01	ST02	ST03	ST04	ST05	ST06	ST07	ST08	ST10		Commercial/Industrial		Construction Worker	
Depth (inches)	0-6	0-6	0-6	0-6	0-6	0-6	0-6	0-6	0-6		Ingestion	Inhalation	Ingestion	Inhalation
Notes	Drainage ditch along northcentral edge of Paxton II.	Drainage ditch along Stony Island Ave., approx. 30 ft west of the southwestern corner of Paxton II.	North of Paxton II, where ditch along Stony Island Ave. enters culvert to pass under Stony Island Ave. bkgnd	West of Paxton II, across Stony Island Ave., where culvert water from under Stony Island Ave. spills into Lake Calumet.	Northeast of Paxton I, from surface water body east of Norfolk and Western Railroad. Background.	Retention pond in northwest corner of Paxton II.	Retention pond in the northeastern corner of Paxton I.	Retention pond north of the equipment and scrap area.	Ditch along Stony Island Ave., approx. 30 feet west of the northwestern corner of Paxton II.					
Potassium	2870	1990	3100	3170	716	3680	1690	2060	2910	1268	–	–	–	–
Selenium	0.31 u	0.31u	0.53	1.2	3.2	0.33u	0.3u	0.33u	0.37u	0.48	10000	–	1000	–
Sodium	202	171	279	267	291	215	248	257	218	130	–	–	–	–
Thallium	0.56	0.58	0.48	0.65	0.65	0.58	0.63	0.33	0.71	0.32	160	–	160	–
Vanadium	24.1	20.2	24.8	27.5	25.7	25.6	20.4	17.7	24.3	25.2	14000	–	1400	–
Zinc	108	102	97.3	101	484	57.5	153	69.1	97.9	95	610000	–	61000	–
Cyanide	NA	4.7	7.4	6.6	9.9	1.4	3.2	1.1	4.8	0.51	41000	–	4100	–

Shaded value indicates remediation objective was exceeded.
NA = Not analyzed.
– = Not available.
u = Not detected; numerical value is the sample quantitation limit.
a = U.S. EPA Region III Risk-based concentration (U.S. EPA, 1997).
For chemicals lacking remediation objectives, the following proxy chemicals were used:

Chemical	Proxy
2-Methylnaphthalene	Naphthalene
Acenaphthylene	Pyrene
Phenanthrene	Pyrene
Benzo(g,h,i)perylene	Pyrene
delta-BHC	alpha-BHC
ehdrin ketone	endrin

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Tbl.

Comparison of Sediment Data to IEPA Tier I Concentrations
Land and Lakes 63
Lake Calumet Cluster Site
Chicago, Illinois

Source	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	IEPA Background Concentration	IEPA Tier I Concentration			
																Commercial/Industrial		Construction Worker	
Sample ID	ST01	ST02	ST03	ST04	ST05	ST06	ST07	ST08	ST09	ST10	ST11	ST12	ST13	ST14		Ingestion	Inhalation	Ingestion	Inhalation
Depth (feet)	0.5 - 1	0.5 - 1	<2	<2	1 - 1.5	0.5 - 1	<2	<2	<2	<2	<2								
Notes	In ditch along the east side of Stony Island Ave, about 30 feet north of the culvert inlet, which drains to Lake Calumet	In the ditch along the east side of Stony Island Ave., about 35 ft south of the culvert inlet, which drains to Lake Calumet	In Lake Calumet, at the outfall to the culvert, whic drains from the site	In the ditch along the east side of Stony Island Ave, about 25 feet north of 122nd St	In the ditch along 122nd Street, just east of the inlet to western culvert, which drains to Deadstick Pond.	Offsite, at the outlet to the western culvert, which drains from the site to Deadstick Pond	In the ditch along the north side of 122nd St., about 25 ft west of the eastern site boundary.	In the ditch along the north side of 122nd St, about 30 ft east of the eastern site boundary.	Offsite, at the outlet to the eastern culvert, which drains the site to Deadstick Pond.	At the southern bank of Lake Calumet, about 150 yards southwest of ST03.	In the ditch along the east side of Stony Island Ave., about 40 ft north of the northern site boundary.	In Lake Calumet, about 500 ft west of ST03.	In Deadstick Pond, about 100 yards south of ST08, near the bank of the pond	Offsite, in a ditch that flows to Deadstick Pond, about 500 feet west of ST09					
Volatile Organic Compounds (ug/kg)																			
Methylene chloride	12u	12u	83	20u	12u	16u	17u	18u	74u	18u	12u	14u	18u	18u	–	760000	24000	12000000	34000
Acetone	12u	12u	120	120	12u	15u	24	270	74u	21	12u	14u	23	29	–	200000000	100000000	200000000	100000000
1,2-Dichloroethene (total)	12u	12u	27u	20u	12u	16u	38	18u	74u	18u	12u	14u	18u	18u	–	20000000	1200000	20000000	1200000
2-Butanone	12u	12u	27u	32	12u	16u	17u	19	74u	18u	12u	14u	18u	18u	–	1000000000 a	–	–	–
Trichloroethene	12u	12u	27u	20u	12u	16u	18	18u	74u	18u	12u	14u	18u	18u	–	520000	8900	1200000	12000
Benzene	12u	12u	27u	20u	12u	16u	44	53	74u	18u	12u	14u	18u	18u	–	200000	1500	4300000	2100
Toluene	12u	12u	27u	20u	12u	16u	33	78	74u	18u	12u	14u	18u	18u	–	410000000	650000	410000000	42000
Chlorobenzene	12u	12u	27u	20u	12u	16u	17u	20	74u	18u	12u	14u	18u	18u	–	41000000	210000	4100000	1300
Ethylbenzene	12u	12u	27u	20u	12u	16u	17u	30	840	18u	12u	14u	18u	100	–	200000000	400000	20000000	58000
Xylene (total)	12u	12u	27u	20u	12u	18u	38	130	3300	18u	12u	14u	18	380	–	1.00E+09	410000	410000000	410000
Semivolatile Organic Compounds (ug/kg)																			
Phenol	400u	410u	2100	1700u	820u	2500u	2500	1000u	3600u	520u	390u	970u	520u	890u	–	1.00E+09	–	120000000	–
4-Methylphenol	400u	410u	890	1700u	820u	2500u	3700	1300	3600u	520u	390u	970u	520u	890u	–	10000000 a	–		–
Naphthalene	400u	430	790u	1700u	820u	2500u	980u	740	3600u	520u	390u	970u	400	890u	–	82000000	–	8200000	–
2-Methylnaphthalene	400u	220	790u	1700u	2000u	2500u	980u	1000u	3600u	520u	390u	970u	520u	890u	–	82000000	–	8200000	–
Acenaphthene	400u	690	790u	1700u	820u	2500u	980u	1000u	3600u	520u	390u	970u	520u	890u	–	120000000	–	120000000	–
Dibenzofuran	400u	510	790u	1700u	820u	2500u	980u	1000u	3600u	520u	390u	970u	520u	890u	–	8200000 a	–		–
Fluorene	400u	870	790u	1300u	820u	2500u	540u	1000u	3600u	520u	390u	650	520u	890u	–	82000000	–	82000000	–
Phenanthrene	340	7400	1400	12000	1500	4200	4000	3000	6400	580	1400	2800	1100	920	–	61000000	–	61000000	–
Anthracene	400u	2200	790u	3000	450	1400	1100	840	3600u	520u	420	750	350	890u	–	610000000	–	610000000	–
Carbazole	400u	930	790u	1100	820u	2500u	980u	1000u	3600u	520u	390u	970u	520u	890u	–	290000	–	6200000	–
Fluoranthene	410	12000	2200	19000	3000	10000	5900	3900	7100	770	2600	4200	1200	2400	–	82000000	–	82000000	–
Pyrene	320	9300	1900	17000	2500	8800	4600	2600	5400	700	1900	4500	1500	2400	–	61000000	–	61000000	–
Butylbenzyl phthalate	400u	520	790u	1700u	820u	2500u	980u	1000u	3600u	520u	390u	970u	520u	890u	–	410000000	930000	410000000	930000
Benzo(a)anthracene	400u	5400	1000	7600	1700	3300	2600	1700	3100	320	1600	2000	710	1200	–	8000	–	170000	–
Chrysene	250	5600	1200	9000	1900	3800	2900	2100	3600	370	1500	2200	930	1400	–	780000	–	17000000	–
Bis(2-ethylhexyl)phthalate	290	2000	780	6800	500	2500u	4100	3600	11000	520u	1000	1200	2500	890u	–	410000	31000000	4100000	31000000
Di-n-octylphthalate	400u	290	790u	1700u	820u	2500u	980u	1000u	19000	520u	390u	970u	520u	890u	–	41000000	10000000	4100000	10000000
Benzo(b)fluoranthene	400u	4300	910	6100	2000	3300	2700	1400	3600u	520u	970	1700	1100	1500	–	8000	–	170000	–
Benzo(k)fluoranthene	400u	3200	670	7100	2200	3200	2900	1200	3600u	520u	940	1700	620	1400	–	78000	–	1700000	–
Benzo(a)pyrene	400u	4100	830	6300	2100	3900	2400	1700	3600	520u	1200	1700	890	1300	–	800	–	17000	–
Indeno(1,2,3-cd)pyrene	400u	3600	680	4400	1800	2800	1500	1900	2900	520u	1200	1200	1100	1200	–	8000	–	170000	–
Dibenz(a,h)anthracene	400u	1100	790u	1800	820u	2500u	620	710	3600u	520u	440	970u	310	890u	–	800	–	17000	–
Benzo(g,h,i)perylene	400u	2100	420	2500	1100	1900	950	1200	3600u	520u	650	880	640	870	–	61000000	–	61000000	–
Pesticides/PCBs (ug/kg)																			
delta-BHC	2u	2.1u	4u	21	2.1u	3.2	2.8	2.7u	12u	2.7u	5.8	2.8	13u	2.3u	–	900	1500	20000	2100
Aldrin	2u	2.1u	5u	6.9	2.1u	7	8.1	7	12u	2.7u	3	50	13u	2.3u	–	300	6600	6100	9300
Heptachlor	2u	2.1u	4u	2.9u	2.1u	2.6u	2.5u	2.7u	12u	2.7u	2u	3.7	13u	2.3u	–	1000	11000	28000	16000
Heptachlor epoxide	2u	2.1u	4u	2.9u	2.1u	6.7	2.5u	3.2	12u	2.7u	2u	2.5u	20	2.3u	–	800	9200	2700	13000
Dieldrin	4u	4.1u	7.9u	5.7u	4.1u	15	6.7	6.1	23u	5.2u	8.8	4.9u	26u	4.5u	–	400	2200	7800	3100
4,4-DDE	4u	4.5	7.7	12	4.1u	23	43	12	23u	5.2u	3.9u	8	32	4.5u	–	17000	–	370000	–
Endrin	4u	4.1u	7.9u	5.7u	6.6	11	7.1	6.1	23u	5.2u	5	4.9u	23u	4.5u	–	61000	–	61000	–
Endosulfan I	2u	2.1u	4u	7	2.1u	2.6u	2.5u	2.7u	12u	2.7u	2u	2.5u	13u	2.3u	–	12000000	–	1200000	–
Endosulfan II	4u	4.1u	7.9u	5.7u	5	5u	7	7	23u	5.2u	3.9u	5.2	23u	4.5u	–	12000000	–	1200000	–
4,4-DDD	3.8u	12	7.9u	24	6.2	24	27	20	31	5.7	3.8	25	26u	5.2	–	24000	–	520000	–
Endosulfan sulfate	4u	5	7.9u	5.7u	24	5u	4.9u	5.2u	23u	5.2u	3.9u	4.9u	26u	4.5u	–	12000000	–	1200000	–
4,4-DDT	4u	2.9	7.9u	10	11	18	9.9	9.9	26	5.2u	3.9u	23	26u	3.5	–	17000	1500000	100000	2100000
Methoxychlor	20u	19	62	62	28	26	38	40	41	27u	75	24	130u	24	–	10000000	–	1000000	–
Endrin ketone	4u	9.4	7.9u	25	20	5u	18	14	23u	5.2u	18	4.9u	26u	4.5u	–	610000	–	61000	–
Endrin aldehyde	4u	4.1u	7.9u	5.7u	4.1u	8	4.9u	5.2u	23u	5.2u	3.9u	4.9u	26u	4.5u	–	610000	–	61000	–
alpha-Chlordane	1.6	2	4u	9.2	1.5	6.8	9	6.9	12u	2.7u	4	5.2	9.9	2.3u	–	4000	38000	12000	53000
gamma-Chlordane	2.6	4.4	4u	9.8	4.1	9	14	12	31	2.7u	2	4	48	2.2	–	4000	38000	12000	53000
Toxaphene	200u	210u	400u	290u	210u	260u	250u	270u	1200u	270u	420	250u	1300u	230u	–	6200	170000	110000	240000
Aroclor-1016	40u	130	79u	270	130	50u	260	280	230u	52u	170	49u	260u	45u	–	1000	–	1000	–
Aroclor-1221	81u	170	160u	270	180	100u	320	340	460u	100u	170	99u	530u	91u	–	1000	–	1000	–
Aroclor-1232	40u	170	79u	400	130	50u	320	340	230u	52u	250	49u	260u	45u	–	1000	–	1000	–
Aroclor-1242	40u	130	79u	270	130	50u	260	280	230u	52u	170	49u	260u	45u	–	1000	–	1000	–
Aroclor-1248	40u	130	160	270	130	170	260	280	1400	80	220	170	2000	67	–	1000	–	1000	–
Aroclor-1254	40	92	200	200	110	180	340	350	650	52u	170	100	970	45	–	1000	–	1000	–
Aroclor-1260	40u	100	79u	460	180	150	370	400	340	52u	220u	49u	380	45u	–	1000	–	1000	–

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Table B-7
Comparison of Sediment Data to IEPA Tier I Concentrations
Land and Lakes 93
Lake Calumet Cluster Site
Chicago, Illinois
(Continued)

Source	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	IEPA Background Concentration	IEPA Tier I Concentration			
																Commercial/Industrial		Construction Worker	
Sample ID	ST01	ST02	ST03	ST04	ST05	ST06	ST07	ST08	ST09	ST10	ST11	ST12	ST13	ST14		Ingestion	Inhalation	Ingestion	Inhalation
Depth (feet)	0.5 - 1	0.5 - 1	<2	<2	1 - 1.5	0.5 - 1	<2	<2	<2	<2	<2								
Notes	In ditch along the east side of Stony Island Ave, about 30 feet north of the culvert inlet, which drains to Lake Calumet	In the ditch along the east side of Stony Island Ave, about 35 ft south of the culvert inlet, which drains to Lake Calumet	In Lake Calumet, at the outfall to the culvert, whic drains from the site.	In the ditch along the east side of Stony Island Ave, about 25 feet north of 122nd St	In the ditch along 122nd Street, just east of the inlet to western culvert, which drains to Deadstick Pond	Offsite, at the outlet to the western culvert, which drains from the site to Deadstick Pond	In the ditch along the north side of 122nd St, about 25 ft west of the eastern site boundary.	In the ditch along the north side of 122nd St, about 30 ft east of the eastern site boundary.	Offsite, at the outlet to the eastern culvert, which drains the site to Deadstick Pond.	At the southern bank of Lake Calumet, about 150 yards southwest of ST03.	In the ditch along the east side of Stony Island Ave, about 40 ft north of the northern site boundary.	In Lake Calumet, about 500 ft west of ST03	In Deadstick Pond, about 100 yards south of ST08, near the bank of the pond	Offsite, in a ditch that flows to Deadstick Pond, about 500 feet west of ST09					
Inorganics (mg/kg)																			
Aluminum	8740	12400	11400	16300	19100	13500	20100	21800	7880	12800	8930	11700	12100	11600	9500	1000000 e	–	–	–
Antimony	15.3	18	8.3	15.7	10.5	18.2	7.2	14.9	30.2	26	10.8	17.6	54.9	55.5	4	820	–	82	–
Arsenic	7.6	11.2	19.8	9	7.4	6.7	6.5	6.3	21.6	20.4	6.2	21.3	28.1	18.1	7.2	3	1200	61	25000
Barium	35.9	97.3	93.9	259	201	142	244	224	113	91.4	70.7	71.6	222	213	110	140000	910000	14000	870000
Beryllium	0.86	1	1.4	1.7	1.9	1.3	2.6	3	1	2.5	0.86	1.6	1.3	1.7	0.59	1	2100	29	44000
Cadmium	0.48u	1.3	1.5	6.9	4.3	8.4	11.3	2.4	5	2.7	0.61	1.1	34.4	0.77	0.6	2000	2800	200	59000
Calcium	4.29E+04	6.20E+04	1.32E+05	1.07E+05	9.73E+04	44400	108000	104000	73100	58700	84200	55900	58400	93100	9300	–	–	–	–
Chromium	79.8	47.4	42.7	192	826	153	148	109	126	49.4	49.6	38.1	832	78.9	16.2	10000	420	4100	6800
Cobalt	8.4	9.3	8.8	7.9	8	7.7	8.2	8.5	10.8	8.9	7.8	11.4	13.9	7.5	8.9	120000	–	12000	–
Copper	26.3	45.4	46.2	151	78.6	98.8	117	82.4	174	30.5	30.9	44.2	342	156	19.6	82000	–	8200	–
Iron	38100	22000	21700	28800	34300	27400	17900	42400	58000	47000	19000	29700	83000	87300	15900	610000 e	–	–	–
Lead	27.3	86.3	90.5	274	204	132	124	142	264	59.9	78.7	114	422	252	36	400	–	400	–
Magnesium	16300	28500	32700	36600	29400	18100	38100	34800	34000	9820	28500	21900	23500	20100	4820	–	–	–	–
Manganese	1820	882	540	1600	4580	1140	1210	2120	1190	357	1030	695	1390	2660	836	98000	91000	9600	6700
Mercury	0.12u	0.12u	0.26u	0.47	0.27	0.34	0.56	0.16u	0.34	0.16u	0.19	0.17	1	0.39	0.06	610	540000	61	52000
Nickel	32.4	27.3	28	46.4	156	35.8	36.4	72	72.8	39.9	24.2	35.1	131	46.9	19	41000	21000	4100	440000
Potassium	3240	4020	4360	4110	3300	2430	3890	5400	2010	2710	2770	3330	27900	2890	1268	–	–	–	–
Selenium	0.95u	0.99u	2.1u	1.6u	1u	1.1u	1.4	1.2u	1.1u	1.3u	1u	1.2u	1.4u	1.1u	0.48	10000	–	1000	–
Silver	0.9	0.89	1u	6.4	2.4	5.2	3.9	2.5	3	0.91	0.54	1.1	5.4	1.6	0.55	10000	–	1000	–
Sodium	500u	688u	1620u	32300	925u	1960u	1750u	1640u	783u	1190u	838u	779u	1020u	1570u	130	–	–	–	–
Thallium	2.4	1.5u	3.1u	3.3	4	1.7u	1.8u	2.3	1.7u	1.9u	1.5u	2.2	2u	1.7u	0.32	160	–	160	–
Vanadium	60.7	35.1	32.8	54.3	55	39.8	28.5	39.8	21.4	59.7	33	33.1	29.6	30.1	26.2	14000	–	1400	–
Zinc	49	612	151	629	303	351	307	211	611	303	92.2	271	1480	337	96	610000	–	61000	–
Cyanide	0.66	0.62u	2.1	2	1.4	1.7	0.8	1.1	2	0.8u	0.63u	2.3	3.2	1.8	0.51	41000	–	4100	–

Shaded value indicates remediation objective was exceeded.
– = Not available
u = Not detected, numerical value presented is sample quantitation limit.
e = U.S. EPA Region III Risk-based concentration (U.S. EPA, 1997)
For chemicals lacking remediation objectives, the following proxy chemicals were used.

Chemical	Proxy
2-Methylnaphthalene	Naphthalene
Acenaphthylene	Pyrene
Phenanthrene	Pyrene
Benzo(g,h,i)perylene	Pyrene
delta-BHC	alpha-BHC
endrin ketone	endrin
endrin aldehyde	endrin
endosulfan I	endosulfan
endosulfan II	endosulfan
endosulfan sulfate	endosulfan

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Table
Comparison of Sediment Data to IEPA Tier I Soil Remediation Objectives
Album Incinerator
Lake Calumet Cluster Site
Chicago, Illinois

Source	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	IEPA Background Concentration	IEPA Tier I Concentration			
Sample ID	ST01	ST02	ST03	ST04	ST05	ST06	ST07	ST08	ST09	ST10	ST11		Commercial/Industrial		Construction Worker	
Depth (inches)	4 - 6	5 - 7	4 - 6	4 - 6	6 - 8	4 - 6	4 - 6	4 - 6	6 - 10	4 - 6	4 - 6		Ingestion	Inhalation	Ingestion	Inhalation
Notes	40 ft northwest of the site's southeastern corner.	Northeast edge of pond in southwestern portion of the site.	80 ft east of the site's entrance gate.	North of monitoring well P2 on the southern edge of the northeast pond.	Offsite, 140 ft south and 5 ft east of the northeast corner of the site.	Offsite, 20 ft east and 8 ft north of the northeast corner of the site.	Offsite (upgradient), 100 ft west and 75 ft north of the northeastern corner.	Offsite, 25 ft west and 10 ft north of the northeast site fence corner.	Offsite, 140 ft east and 20 ft north of the northeast fence corner.	Background; in the drainage ditch east of railroad tracks beyong east end of 119th Street.	Background; from ditch east of railroad tracks, 100 feet south of ST10.					
Volatile Organic Compounds (ug/kg)																
Methylene chloride	13u	13u	20u	15u	14u	19u	19u	14u	110	14u	180	–	760000	24000	12000000	34000
Acetone	230	59	240	150	48	98	120	180	180	21	20u	–	200000000	100000000	200000000	100000000
Carbon disulfide	13u	13u	20u	15u	13u	19u	19u	14	36u	14u	20u	–	200000000	720000	20000000	9000
1,2-Dichloroethene (total)	13u	13u	20u	5	13u	3	19u	3	36u	14u	11	–	20000000	1200000	20000000	1200000
Chloroform	13u	13u	20u	15u	13u	19u	19u	14u	36u	14u	20u	–	940000	540	2000000	760
1,2-Dichloroethane	13u	13u	20u	5	13u	19u	19u	14u	36u	14u	20u	–	63000	700	1400000	990
Benzene	13u	13u	20u	15u	13u	19u	19u	3	52	4	20u	–	200000	1500	4300000	2100
4-Methyl-2-pentanone	13u	13u	20u	15u	13u	19u	19u	5	9	14u	20u	–	160000000 a	–	–	–
Tetrachloroethene	13u	13u	20u	15u	13u	19u	19u	14u	36u	14u	11	–	110000	20000	2400000	26000
1,1,2,2-Tetrachloroethane	13u	13u	20u	15u	13u	19u	19u	14u	36u	14u	20u	–	29000 a	–	–	–
Toluene	13u	3	20u	15u	13u	160	4	2	32	14u	20u	–	410000000	650000	410000000	42000
Ethylbenzene	4	2	20u	15u	13u	19u	4	9	200	14u	20u	–	200000000	400000	20000000	58000
Xylene (total)	13u	21	20u	17	13u	19	10	42	220	14u	20u	–	1.00E+09	410000	410000000	410000
Semivolatile Organic Compounds (ug/kg)																
1,4-Dichlorobenzene	4400u	4200u	6500u	480u	430u	6300u	6300u	30	530	4600u	650u	–	–	17000000	–	340000
Nitrobenzene	4400u	4200u	6500u	480u	390	6300u	6300u	470u	4700u	4600u	650u	–	1000000	140000	1000000	9400
Isophorone	4400u	4200u	6500u	150	430u	6300u	6300u	470u	4700u	4600u	650u	–	410000000	4600000	410000000	4600000
2,4-Dimethylphenol	4400u	4200u	6500u	480u	430u	6300u	6300u	470u	2100	4600u	650u	–	41000000	–	41000000	–
Naphthalene	4400u	4200u	6500u	180	420	6300u	340	320	10000	410	1100	–	82000000	–	8200000	–
2-Methylnaphthalene	4400u	4200u	6500u	110	520	330	470	290	720	450	1400	–	82000000	–	8200000	–
Acenaphthylene	300	4200u	6500u	37	330	6300u	6300u	57	4700u	4600u	150	–	61000000	–	61000000	–
3-Nitroaniline	11000u	10000u	16000u	1200u	1000u	15000u	15000	1100u	11000u	11000u	1600u	–	6100000 a	–	–	–
Acenaphthene	4400u	4200u	6500u	72	140	6300u	510	350	320	4600u	180	–	120000000	–	120000000	–
Dibenzofuran	4400u	4200u	6500u	59	76	6300u	450	260	240	4600u	600	–	8200000 a	–	–	–
Fluorene	4400u	4200u	6500u	51	190	460	460	370	280	4600u	210	–	82000000	–	82000000	–
Hexachlorobenzene	4400u	4200u	6500u	38	130	6300u	6300u	470u	4700u	4600u	650u	–	4000	1600	78000	2600
Pentachlorophenol	11000u	10000u	2600	1200u	1000u	15000u	15000u	1100u	11000u	11000u	1600u	–	24000	–	520000	–
Phenanthrene	1400	670	2400	620	940	2400	4300	3700	1600	1000	2100	–	61000000	–	61000000	–
Anthracene	530	4200u	580	160	180	730	1100	940	360	290	310	–	610000000	–	610000000	–
Carbazole	4400u	4200u	340	82	430u	390	490	360	480	4600u	260	–	290000	–	8200000	–
Di-n-butylphthalate	4400u	4200u	450	210	370	6300u	6300u	74	4700u	4600u	38	–	200000000	2300000	200000000	2300000
Fluoranthene	3200	1300	4000	710	390	4400	8100	3800	2100	2300	3200	–	82000000	–	82000000	–
Pyrene	5500	1600	5500	1300	1200	4800	6900	5000	2200	2200	4800	–	61000000	–	61000000	–
Butylbenzyl phthalate	300	4200u	940	240	430u	480	6300u	350	250	4600u	650u	–	410000000	930000	410000000	930000
Benzo(a)anthracene	2400	810	2500	570	410	3000	4900	2500	1400	1500	2600	–	8000	–	170000	–
Chyrsene	3200	1200	4000	750	620	3100	5600	2600	1500	2100	3500	–	780000	–	17000000	–
bis(2-ethylhexyl)phthalate	4400u	4200u	6500u	4500	1700	6300u	6300u	1000	4700u	4600u	650u	–	410000	31000000	4100000	31000000
Benzo(b)fluoranthene	4600	2300	5200	1300	1000	4800	7900	4200	2300	3800	6700	–	8000	–	170000	–
Benzo(a)pyrene	3200	1000	2900	670	610	2700	4500	2400	1300	1600	2500	–	800	–	17000	–
Indeno(1,2,3-cd)pyrene	2500	1000	2700	630	870	2100	2800	1600	1000	1400	2000	–	8000	–	170000	–
Dibenz(a,h)anthracene	1200	410	1600	480u	360	1300	1200	720	380	990	1200	–	800	–	17000	–
Benzo(g,h,i)perylene	2800	980	3100	730	1200	2200	2400	1300	1100	1500	2000	–	61000000	–	61000000	–
Pesticides/PCBs (ug/kg)																
gamma-BHC	2.3u	2.7	3.3u	2.5u	2.2u	3.3u	3.3u	2.4u	2.4u	2.4u	3.3u	–	4000	–	96000	–
alpha-BHC	2.3u	2.2u	3.3u	2.5u	2.2u	6.6	3.3u	6.8	8.1	2.4u	3.3u	–	900	–	20000	–
beta-BHC	2.3u	2.2u	3.3u	2.5u	5.6	3.3u	3.3u	2.4u	2.4u	2.4u	3.3u	–	900	–	20000	–
delta-BHC	2.3u	2.2u	3.3u	2.5u	2.2u	5.4	3.3u	2.4u	2.4u	2.4u	3.3u	–	900	–	20000	–
Heptachlor	3.5	2.2u	3.3u	9.3	3.4	16	3.3u	2.4u	2.4u	2.4u	3.3u	–	1000	–	28000	–
Heptachlor epoxide	2.3u	2.2u	39	2.5u	2.2u	3.3u	3.3u	5.6	3u	2.4u	3.3u	–	600	9200	2700	13000

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Table B-8
Comparison of Sediment Data to IEPA Tier I Soil Remediation Objectives
Album Incinerator
Lake Calumet Cluster Site
Chicago, Illinois
(Continued)

Source	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	IEPA Background Concentration	IEPA Tier I Concentration			
													Commercial/Industrial		Construction Worker	
Sample ID	ST01	ST02	ST03	ST04	ST05	ST06	ST07	ST08	ST09	ST10	ST11		Ingestion	Inhalation	Ingestion	Inhalation
Depth (inches)	4 - 6	5 - 7	4 - 6	4 - 6	6 - 8	4 - 6	4 - 6	4 - 6	6 - 10	4 - 6	4 - 6					
Notes	40 ft northwest of the site's southeastern corner.	Northeast edge of pond in southwestern portion of the site.	80 ft east of the site's entrance gate.	North of monitoring well P2 on the southern edge of the northeast pond.	Offsite, 140 ft south and 5 ft east of the northeast corner of the site.	Offsite, 20 ft east and 8 ft north of the northeast corner of the site.	Offsite (upgradient), 100 ft west and 75 ft north of the northeastern corner.	Offsite, 25 ft west and 10 ft north of the northeast site fence corner.	Offsite, 140 ft east and 20 ft north of the northeast fence corner.	Background; in the drainage ditch east of railroad tracks beyong east end of 119th Street.	Background; from ditch east of railroad tracks, 100 feet south of ST10.					
Dieldrin	7.9	7.4	45	11	54	6.8	9.1	12	6.1	12	10	–	400	2200	7800	3100
4,4-DDE	9	16	53	5.8	4.3u	16	29	10	6.6	29	230	–	17000	–	370000	–
Endrin	9	21	110	16	46	38	24	35	23	28	65	–	610000	–	61000	–
Endosulfan II	4.4u	6.5	6.5u	7.8	6.6	6.3u	6.3u	17	4.7u	4.6u	6.5u	–	12000000	–	1200000	–
4,4-DDD	27	41	130	26	34	38	63	31	19	52	91	–	24000	–	520000	–
Endosulfan sulfate	4.4u	4.2u	6.5u	4.9u	6	6.3u	6.3u	7.6	4.7u	4.6u	6.5u	–	12000000	–	1200000	–
4,4-DDT	17	21	170	10	36	60	60	25	27	210	680	–	17000	1500000	100000	2100000
Methoxychlor	23u	22u	52	25u	22u	33u	33u	24u	24u	24u	33u	–	10000000	–	1000000	–
Endrin ketone	4.4u	4.2u	24	4.9u	6.6	6.3u	12	10	5.5	10	6.5u	–	610000	–	61000	–
Endrin aldehyde	39	42	300	50	38	170	56	64	41	180	18	–	610000	–	61000	–
alpha-Chlordane	8	5.4	22	40	47	13	13	9.4	7.1	2.4u	3.3u	–	4000	38000	12000	53000
gamma-Chlordane	4.2	3.2	17	61	37	7	7.8	7.5	6.5	3.8	3.3u	–	4000	38000	12000	53000
Aroclor-1016	44u	42u	550u	210	200	140	63u	170	47u	46u	65u	–	1000	–	1000	–
Aroclor-1260	320u	210	760	190	490	210	63u	350	47u	46u	65u	–	1000	–	1000	–
Inorganics (mg/kg)																
Aluminum	12700	9660	16000	8290	14200	13800	16500	14100	12100	3930	5150	9500	1000000 a	–	–	–
Antimony	6.4u	5.2u	17.2	14.1	8.9	7.7u	9.1u	6.6u	6.3u	7.3u	12.5	4	820	–	82	–
Arsenic	9	5.6	9.6	21.7	27.7	10.5	10.6	18.1	10.6	6.8	16.2	7.2	3	1200	61	25000
Barium	299	706	547	296	550	144	114	149	119	104	192	110	140000	910000	14000	870000
Beryllium	1.9	1.3	2.3	0.85	1.7	1.3	1	1.2	1.2	1.4	1.1	0.59	1	2100	29	44000
Cadmium	1.4	4.2	4.9	4.7	3.6	1.5u	1.8u	2.4	1.2u	1.8	1.8u	0.6	2000	2800	200	59000
Calcium	2.00E+05	1.00E+05	2.00E+05	1.00E+05	1.00E+05	80900	63500	85200	75800	13000	22200	9300	–	–	–	–
Chromium	286	566	295	297	572	136	42.2	180	67.4	14.7	40.5	16.2	10000	420	4100	8800
Cobalt	7.6	18.4	11.9	9	16	11.7	14	10.7	11.8	6.4	7.5	8.9	120000	–	12000	–
Copper	100	124	173	76.1	201	65.7	62.4	80.2	61.1	56.7	69.3	19.6	82000	–	8200	–
Iron	54500	41600	46000	39900	38100	38300	27700	43400	29900	34600	54100	15900	61000 a	–		–
Lead	293	298	612	405	497	147	123	177	102	93.5	165	36	400	–	400	–
Magnesium	22500	18300	26500	21500	22900	25300	25400	26300	29300	3820	8750	4820	–	–	–	–
Manganese	11400	6720	6560	8480	7570	2350	849	2960	1720	246	409	636	96000	91000	9600	8700
Mercury	1.1	0.16	1.1	0.56	1.7	0.27	0.28	0.39	0.17	0.12	2.2	0.06	610	540000	61	52000
Nickel	74.6	26.9	59.4	25.5	54.6	34.1	40.6	39.6	36.4	17.7	16.1	18	41000	21000	4100	440000
Potassium	731	495	1900	842	1800	2190	3520	2320	3260	521u	576u	1266	–	–	–	–
Selenium	0.39	0.51	3.5	0.85	0.86	0.64	0.37u	0.52	0.66	0.91	1.6u	0.46	10000	–	1000	–
Silver	1.2u	1u	1.7u	1.4u	1u	1.5u	1.7u	1.3u	4.3	1.4u	1.5u	0.55	10000	–	1000	–
Sodium	602	400	826	615	700	566	452	512	941	527	583	130	–	–	–	–
Thallium	0.21u	0.15u	0.26u	0.22u	0.31	0.42	0.5	0.46	0.61	0.28	0.4	0.32	160	–	160	–
Vanadium	96.6	90.5	107	123	62.5	51.1	44.6	59.4	38.2	21.6	19.5	25.2	14000	–	1400	–
Zinc	451	1040	770	735	1660	264	173	336	196	167	266	95	610000	–	61000	–
Cyanide	0.74u	0.56	1.2	0.86u	4.8	0.93	1u	0.75u	0.71u	0.83u	0.94u	0.51	41000	–	4100	–

Shading indicates remediation objective was exceeded.
– = Not available
u = Not detected; numerical value is the sample quantitation limit.
a = U.S. EPA Region III Risk-based concentration (U.S. EPA, 1997).

For chemicals lacking remediation objectives, the following proxy chemicals were used:

Chemical	Proxy
2-Methylnaphthalene	Naphthalene
Acenaphthylene	Pyrene
Phenanthrene	Pyrene
Benzo(g,h,i)perylene	Pyrene
delta-BHC	alpha-BHC

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Table
Comparison of Sediment Data to IEPA Tier I Soil Remediation Objectives
U.S. Drum II
Lake Calumet Cluster Site
Chicago, Illinois

Source	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	IEPA Background Concentration	IEPA Tier I Concentration			
Sample ID	ST01	ST02	ST03	ST04	ST05	ST06	ST07	ST08	ST09		Commercial/Industrial		Construction Worker	
Depth (inches)	3 - 6	2 - 4	3 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6		Ingestion	Inhalation	Ingestion	Inhalation
Notes	Approx. 15 ft south of the telephone pole located near the northwestern site corner.	Approx. 30 ft southwest of the Paxton Landfill's nested monitoring wells, near the northeastern site corner.	Standing water in the southeastern site quadrant, approx. 350 ft south and 100 ft east of the southeastern corner of the concrete platform.	Offsite, in eastern drainage ditch, upgradient, at a point about 75 ft north of the northern site boundary; Background.	Offsite, in the eastern drainage ditch, about 250 ft south of ST04 location and about 75 ft south of the southern side of the concrete platform.	Offsite, in the eastern drainage ditch, about 100 ft south of ST05.	Offsite, just north of 122nd St at the northeastern corner of a small pond located south of the site's southeastern corner.	Offsite pond east of railroad tracks and approx. 100 ft south of an east-west line at ST05 location; background.	Offsite, approx. 100 ft north of the northern site boundary at the edge of a pond located east of the railroad tracks; background.					
Volatile Organic Compounds (ug/kg)														
Vinyl chloride	15u	3	15u	14 u	17 u	14 u	110u	22u	14 u	--	3000	60	65000	60
Methylene chloride	15u	5	3	24	200	60	98	22u	11	--	760000	24000	1200000	34000
Acetone	21	17u	15u	190	710u	1100u	1900 b	85	130 b	--	200000000	100000000	200000000	100000000
1,1-Dichloroethane	15u	11	15u	14 u	17 u	14 u	110u	22u	14 u	--	200000000	1700000	200000000	130000
1,2-Dichloroethene (Total)	15u	16u	15u	14 u	17 u	14 u	110u	22u	11	--	20000000	1200000	20000000	1200000
Chloroform	15u	14	15u	14 u	17 u	14 u	110u	22u	14 u	--	940000	540	2000000	760
1,2-Dichloroethane	15u	73	15u	14 u	17 u	14 u	110u	22u	14 u	--	63000	700	1400000	990
1,1,1-Trichloroethane	15u	9	15u	14 u	17 u	14 u	110u	22u	14 u	--	--	1200000	--	1200000
Trichloroethene	15u	5	15u	14 u	17 u	14 u	110u	22u	1	--	520000	8900	1200000	12000
Benzene	15u	37	15u	14 u	17 u	14 u	110u	22u	14 u	--	200000	1500	4300000	2100
Tetrachloroethene	15u	10	15u	14 u	17 u	14 u	110u	22u	14 u	--	110000	20000	2400000	28000
Toluene	15u	14	15u	14 u	17 u	14 u	110u	22u	4	--	410000000	650000	410000000	42000
Chlorobenzene	15u	16u	15u	14 u	2	14 u	110u	22u	14 u	--	41000000	210000	4100000	1300
Ethylbenzene	15u	4	15u	14 u	17 u	14 u	110u	22u	14 u	--	200000000	400000	20000000	58000
Xylene (total)	15u	30	15u	14 u	17 u	14 u	110u	22u	3	--	1.00E+09	410000	410000000	410000
Semivolatile Organic Compounds (ug/kg)														
1,2-Dichlorobenzene	510u	40	4990u	14000u	550u	450u	730u	720u	450u		180000000	580000	18000000	310000
Isophorone	74	87	490u	14000u	550u	450u	730u	720u	450u		410000000	4800000	410000000	4800000
Naphthalene	48	90	490u	14000u	550u	450u	130	730	310	--	82000000	--	8200000	--
2-Methylnaphthalene	31	61	490u	14000u	550u	450u	110	980	450	--	82000000	--	8200000	--
Acenaphthylene	510u	530u	490u	14000u	550u	450u	77	230	280	--	61000000	--	61000000	--
Acenaphthene	510u	530u	490u	14000u	550u	450u	480	81	450u	--	120000000	--	120000000	--
Dibenzofuran	510u	530u	490u	14000u	550u	450u	260	350	170	--	8200000 a	--	--	--
Fluorene	510u	530u	490u	14000u	550u	450u	530	86	30	--	82000000	--	82000000	--
Phenanthrene	120	190	210	14000u	76	450u	4900	1400	720	--	61000000	--	61000000	--
Anthracene	510u	44	29	14000u	550u	450u	1400	280	130	--	610000000	--	610000000	--
Carbazole	510u	530u	490u	14000u	550u	450u	360	190	98	--	290000	--	6200000	--
Fluoranthene	880	680	280	14000u	120	450u	7500	2200	1100	--	82000000	--	82000000	--
Pyrene	300	360	230	14000u	110	450u	8200	2100	1400	--	61000000	--	61000000	--
Butylbenzyl phthalate	510u	53	490u	14000u	550u	450u	730u	720u	450u	--	410000000	930000	410000000	930000
Benzo(a)anthracene	140	220	120	14000u	94	450	5100	1300	790	--	8000	--	170000	--
Chrysene	230	320	140	14000u	110	24	4000	1800	960	--	780000	--	17000000	--
bis(2-ethylhexyl)phthalate	790	840	100	990	210	54	1000	270	110		410000	31000000	4100000	31000000
Benzo(b)fluoranthene	310	470	160	14000u	140	450u	7100	2700	1500	--	8000	--	170000	--
Benzo(a)pyrene	170	150	82	14000u	59	450u	2500	1100	450	--	800	--	17000	--
Indeno(1,2,3-cd)pyrene	510u	530u	490u	14000u	550u	450u	800	410	270	--	8000	--	170000	--
Benzo(g,h,i)perylene	510u	530u	490u	14000u	550u	450u	910	360	400	--	61000000	--	61000000	--
Pesticides/PCBs (ug/kg)														
gamma-BHC	5.5	5.5	3.4	3.7	3.3	2.3u	11	6.9	6.6	--	4000	--	98000	--
beta-BHC	2.6u	2.7u	2.5u	2.4u	2.8u	2.3u	3.8u	5.2	3.1	--	900	1500	20000	2100
Heptachlor	6.9	4.7	2.5u	2.4u	2.8u	2.3u	3.8u	3.7u	2.3u	--	1000	11000	28000	16000
Aldrin	3.5	2.7u	2.5u	12	2.8u	2.3u	3.8u	7.1	4.4	--	300	6600	6100	9300
Heptachlor epoxide	2.6u	2.7u	2.5u	2.8	2.8u	2.3u	3.8u	3.7u	2.3u	--	600	9200	2700	13000
Dieldrin	5.1u	5.3u	6.2	4.6u	5.5u	4.5u	7.3u	7.2u	4.5u	--	400	2200	7800	3100
4,4-DDE	7	9.4	4.9u	4.6u	5.5u	4.5u	7.3u	70	15	--	17000	--	37000J	--
Endrin	5.1u	5.3u	4.9u	8.1	5.5u	4.5u	7.3u	7.2u	4.5u	--	610000	--	61000	--
4,4-DDD	6.8	5.3u	2.4	4.6u	5.5u	4.5u	7.3u	44	8	--	24000	--	520000	--
Endosulfan sulfate	8.5	5.8	4.9u	4.6u	5.5u	4.5u	7.3u	7.2u	4.5u	--	12000000	--	1200000	--
4,4-DDT	8.6	7	4.9u	6.6	5.5u	4.5u	7.3u	250	160	--	17000	1500000	100000	2100000
Endrin ketone	5.1u	5.3u	4.9u	30	5.5u	4.5u	7.3u	7.2u	4.5u	--	610000	--	61000	--
Endrin aldehyde	5.1u	5.3u	4.9u	4.6u	5.5u	4.5u	7.3u	7.2u	7.5	--	610000	--	61000	--
alpha-Chlordane	3.6	3.2	2.5u	6.4	2.8u	2.3u	3.8u	3.7u	2.3u	--	4000	38000	12000	53000
gamma-Chlordane	2.6u	2.7u	2.5u	6.2	2.8u	2.3u	3.8u	3.7u	2.3u	--	4000	38000	12000	53000
Aroclor-1248	260	250	49u	46u	55u	45u	73u	72u	45u	--	1000	--	1000	--
Aroclor-1254	140	130	49u	46u	55u	45u	73u	72u	45u	--	1000	--	1000	--

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Table B-9
Comparison of Sediment Data to IEPA Tier I Soil Remediation Objectives
U.S. Drum II
Lake Calumet Cluster Site
Chicago, Illinois
(Continued)

Source	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	IEPA Background Concentration	IEPA Tier I Concentration			
											Commercial/Industrial		Construction Worker	
Sample ID	ST01	ST02	ST03	ST04	ST05	ST06	ST07	ST08	ST09		Ingestion	Inhalation	Ingestion	Inhalation
Depth (inches)	3 - 6	2 - 4	3 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6					
Notes	Approx. 15 ft south of the telephone pole located near the northwestern site corner.	Approx. 30 ft southwest of the Paxton Landfill's nested monitoring wells, near the northeastern site corner.	Standing water in the southeastern site quadrant, approx. 350 ft south and 100 ft east of the southeastern corner of the concrete platform.	Offsite, in eastern drainage ditch, upgradient, at a point about 75 ft north of the northern site boundary; Background.	Offsite, in the eastern drainage ditch, about 250 ft south of ST04 location and about 75 ft south of the southern side of the concrete platform.	Offsite, in the eastern drainage ditch, about 100 ft south of ST05.	Offsite, just north of 122nd St at the northeastern corner of a small pond located south of the site's southeastern corner.	Offsite pond east of railroad tracks and approx. 100 ft south of an east-west line at ST05 location; background.	Offsite, approx. 100 ft north of the northern site boundary at the edge of a pond located east of the railroad tracks; background.					
Inorganics (mg/kg)														
Aluminum	9970	8790	10100	9060	8810	3810	7150	3930	4640	9500	1000000 e	--	--	--
Antimony	5.6	7.7	2.7u	2.8u	2.7u	2.4u	3.6u	3.6u	2.5u	4	820	--	82	--
Arsenic	7	8.1	3.6	13.9	11.3	3.5	5.9	15.3	8.2	7.2	3	1200	61	25000
Barium	88.9	107	78.1	50.7	41.7	22.4	41.7	108	81.8	110	140000	910000	14000	870000
Beryllium	0.63	0.74	0.71	0.75	0.5	0.05u	0.38	0.95	0.75	0.59	1	2100	29	44000
Cadmium	4	2.4	0.3u	0.31u	0.3u	0.26u	0.39u	0.74	0.38	0.6	2000	2800	200	59000
Calcium	17500	69300	6790	51200	51700	52600	50500	12900	15300	9300	--	--	--	--
Chromium	61.1	78.1	18.5	37.8	18.8	9.9	25	20.3	10.6	16.2	10000	420	4100	8800
Cobalt	6.8	6.4	6.5	12.9	13.4	4.5	11.1	4.6	3.7	8.9	120000	--	12000	--
Copper	26.2	30.6	20.2	37.2	34.7	8.6	38.7	71.3	33.4	19.6	82000	--	8200	--
Iron	15900	18100	12500	24000	21400	8780	19100	16800	17800	15900	610000 e	--	--	--
Lead	73.7	91.5	25.1	33.2	27.8	11.2	55	119	57.1	38	400	--	400	--
Magnesium	7240	10900	3960	22500	25100	24100	23000	4730	5110	4820	--	--	--	--
Manganese	1310	2630	261	697	468	273	530	156	187	636	98000	91000	9800	8700
Mercury	0.09	0.11	0.07u	0.08u	0.07u	0.06u	0.09u	0.11	0.07u	0.06	610	540000	61	52000
Nickel	21.1	21.4	19.6	31.8	34	12.2	29.5	15.2	12.5	18	41000	21000	4100	440000
Potassium	1960	1810	1520	2610	2420	1100	2310	771	577	1268	--	--	--	--
Selenium	1	0.86	0.83u	0.86u	0.83u	0.73u	1.1u	1.1u	0.77u	0.48	10000	--	1000	--
Sodium	201	268	98.4	394	485	328	1560	800	426	130	--	--	--	--
Thallium	0.96	2	0.47u	0.5	1.5	0.82	1.5	0.78	0.44u	0.32	160	--	160	--
Vanadium	30.8	45	20.2	24.7	21.8	12	27	26.5	14.8	25.2	14000	--	1400	--
Zinc	171	241	77	99.5	85.2	39.6	119	186	108	95	610000	--	61000	--
Cyanide	0.71u	1.1	0.69u	0.79u	0.74u	0.68u	0.95u	1u	1.2	0.51	41000	--	4100	--

Shaded value indicates IEPA Tier I remediation objective was exceeded
u = Not detected; numerical value presented is the sample quantitation limit
e = U.S. EPA Region III Risk-based concentration (U.S. EPA, 1997).
For chemicals lacking remediation objectives, the following proxy chemicals were used:

Chemical	Proxy
1-Methylnaphthalene	Naphthalene
Acenaphthylene	Pyrene
Phenanthrene	Pyrene
Benzo(g,h,i)perylene	Pyrene
beta-BHC	alpha-BHC
endrin ketone	endrin
endrin aldehyde	endrin
endosulfan sulfate	endosulfan

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Table [illegible]
Comparison of Sediment Data to IEPA Tier I Remediation Objectives
MSD #4
Lake Calumet Cluster Site
Chicago, Illinois

Source	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	IEPA Background Concentration	IEPA Tier I Concentration			
Sample ID	ST01	ST02	ST03	ST04	ST05	ST06	ST07	ST08		Commercial/Industrial		Construction Worker	
Estimated depth (inches)	0 - 6			0 - 6	0 - 6	0 - 6	0 - 6	0 - 6		Ingestion	Inhalation	Ingestion	Inhalation
Notes	East of Crandon Ave., near 124th St.	West of Crandon Ave., near 124th St.	West of Crandon Ave, south of 124th St.	In ditch on south side of 122nd St, west of gun club property.	Outlet of Dead Stick Lake to Calumet River.	Head of ditch draining the pond by the gun club building.	Outlet of ditch draining the pond by the gun club building.	South of 122nd St., east of the Norfolk and Western RR.					
Volatile Organic Compounds (ug/kg)													
Chloromethane	15u	16u	15u	32	16u	14u	13u	17u	–	440000 a	–	–	–
Toluene	15u	16u	63	160	16u	14u	13u	17u	–	410000000	650000	410000	42000
Chlorobenzene	15u	16u	15u	32	16u	14u	13u	17u	–	41000000	210000	4100000	1300
Ethylbenzene	15u	16u	15u	29	16u	14u	13u	17u	–	200000000	400000	20000000	58000
Xylene (total)	15u	16u	15u	93	16u	14u	13u	17u	–	1.00E+09	4.10E+05	410000000	410000
Semivolatile Organic Compounds (ug/kg)													
4-Methylphenol	510u	520u	510u	530	510u	460u	410u	560u		10000000 a	–	–	–
Isophorone	510u	730	510u	380u	510u	460u	410u	560u		410000000	4600000	410000000	4600000
Naphthalene	510u	520u	510u	800	510u	460u	410u	560u	–	82000000	–	8200000	–
2-Methylnaphthalene	510u	520u	510u	580	510u	460u	410u	560u	–	82000000	–	8200000	–
Acenaphthene	510u	520u	510u	770	510u	460u	410u	560u	–	120000000	–	120000000	–
Dibenzofuran	510u	520u	510u	800	510u	460u	410u	560u	–	8200000 a	–	–	–
Diethylphthalate	510u	1300	660	380u	510u	460u	410u	560u		1.00E+09	2000000	1.00E+09	2000000
Fluorene	510u	520u	510u	1300	510u	460u	410u	560u	–	82000000	–	82000000	–
Phenanthrene	510u	520u	510u	26000	510u	1800	810	1700	–	61000000	–	61000000	–
Anthracene	510u	520u	510u	1800	510u	460u	410u	560u	–	610000000	–	610000000	–
Carbazole	R	R	510u	2300	R	R	R	R	–	290000	–	6200000	–
Di-n-butylphthalate	510u	2200	510u	380u	510u	460u	410u	560u		200000000	2300000	200000000	2300000
Fluoranthene	510u	520u	510u	38000	560	2300	840	2600	–	82000000	–	82000000	–
Pyrene	510u	520u	510u	34000	610	2000	870	2200	–	61000000	–	61000000	–
Butylbenzyl phthalate	510u	520u	1000	380u	510u	460u	410u	560u	–	410000000	930000	410000000	930000
Benzo(a)anthracene	510u	520u	510u	16000	510u	960	410u	1500	–	8000	–	170000	–
Chyrsene	510u	520u	510u	14000	510u	920	410u	1500	–	780000	–	17000000	–
Benzo(b)fluoranthene	510u	520u	510u	1600	870	460u	410u	560u	–	8000	–	170000	–
Benzo(k)fluoranthene	510u	520u	510u	1100	510u	1400	410u	2900		78000	–	1700000	–
Benzo(a)pyrene	510u	520u	510u	1100	510u	720	410u	1400	–	800	–	17000	–
Indeno(1,2,3-cd)pyrene	510u	520u	510u	380u	510u	460u	410u	900	–	8000	–	170000	–
Benzo(g,h,i)perylene	510u	520u	510u	380u	510u	470	410u	880	–	61000000	–	61000000	–
Pesticides/PCBs (ug/kg)													
Dieldrin	2.3	2.1	0.5	R	R	R	R	R	–	400	2200	7800	3100
4,4-DDE	2.5	51	54	R	R	R	R	R	–	17000	–	370000	–
4,4-DDD	3.8	37	47	67	R	R	R	R	–	24000	–	520000	–
4,4-DDT	4.1	11	12	R	R	R	R	R	–	17000	1500000	100000	2100000
alpha-Chlordane	2.6u	1.4	2.6u	R	R	R	R	R	–	4000	38000	12000	53000
gamma-Chlordane	0.61	3.2	2.6u	R	R	R	R	R	–	4000	38000	12000	53000
Aroclor-1248	61	92	50u	10000	R	R	R	R	–	1000	–	1000	–
Aroclor-1254	68	51u	50u	R	R	R	R	R		1000	–	1000	–
Aroclor-1260	50u	75	50u	6100	R	R	R	R	–	1000	–	1000	–
Inorganics (mg/kg)													
Aluminum	3430	5150	4510	12300	6380	2020	4110	14600	9500	1000000 a	–	–	–
Antimony	4.6u	4.7u	4u	7.4u	4.2u	4.4u	3.9u	5u	4	820	–	82	–

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Table B-10
Comparison of Sediment Data to IEPA Tier I Remediation Objectives
MSD #4
Lake Calumet Cluster Site
Chicago, Illinois
(Continued)

Source	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	IEPA Background Concentration	IEPA Tier I Concentration			
Sample ID	ST01	ST02	ST03	ST04	ST05	ST06	ST07	ST08		Commercial/Industrial		Construction Worker	
Estimated depth (inches)	0 - 6			0 - 6	0 - 6	0 - 6	0 - 6	0 - 6		Ingestion	Inhalation	Ingestion	Inhalation
Notes	East of Crandon Ave., near 124th St.	West of Crandon Ave., near 124th St.	West of Crandon Ave, south of 124th St.	In ditch on south side of 122nd St, west of gun club property.	Outlet of Dead Stick Lake to Calumet River.	Head of ditch draining the pond by the gun club building.	Outlet of ditch draining the pond by the gun club building.	South of 122nd St., east of the Norfolk and Western RR.					
Arsenic	3.6	3.8	3.6	10.1	10	3.2	17.6	2.8	7.2	3	1200	61	25000
Barium	38.4	61.5	40.7	518	59.5	18.8	28.9	214	110	140000	910000	14000	870000
Beryllium	0.57	0.6	0.59	1.1	0.54	0.34u	0.39	3.4	0.59	1	2100	29	44000
Cadmium	1.1	2.9	0.38u	6.9	0.4u	0.44	0.37u	0.93	0.6	2000	2800	200	59000
Calcium	4.59E+04	3.75E+04	2.78E+04	9.16E+04	6.00E+04	55100	50700	1.00E+05	9300	–	–	–	–
Chromium	36.9	62.9	10.2	193	49	16	9	34.6	16.2	10000	420	4100	8800
Cobalt	4.1	5.5	4.7	9.8	5.9	2.9	8	2.2	8.9	120000	–	120000	–
Copper	23.8	40.5	11.7	206	32	15.9	26.5	29.4	19.6	82000	–	8200	–
Iron	9990	12500	9580	40200	23100	7380	20400	9130	15900	610000 a	–	–	–
Lead	23.2	44.4	20.7	251	73	20.7	22.7	38.7	36	400	–	400	–
Magnesium	19200	17900	12900	32300	26400	27700	27400	25600	4820	–	–	–	–
Manganese	463	469	220	1720	1350	248	534	1310	836	96000	91000	9600	8700
Mercury	0.07u	0.09	0.06u	0.77	0.13	0.07u	0.06u	0.08u	0.06	610	540000	61	52000
Nickel	13.1	17.2	10.4	45.1	20.1	8.3	19.9	7	18	41000	21000	4100	440000
Potassium	956	771	679	2430	1520	501	892	1210	1268	–	–	–	–
Selenium	0.68u	0.69u	0.67	2.4	0.61u	0.65u	0.57u	2.1	0.46	10000	–	1000	–
Silver	1.5u	1.5u	1.3u	5.6	1.3u	1.4u	1.2u	1.6u	0.55	10000	–	1000	–
Sodium	390	92.6	81.1	1380	219	258	171	1130	130	–	–	–	–
Vanadium	15.8	21.6	14.3	50.7	23.3	7.6	12.2	13.8	25.2	14000	–	1400	–
Zinc	87.2	137	50.5	687	494	55.2	124	200	95	610000	–	61000	–
Cyanide	0.7u	0.76u	0.65u	1.8	0.68u	0.71u	0.6u	0.82u	0.51	41000	–	4100	–

Shading indicates value exceeds remediation objective.
– = Not available.
R = Unusable data.
u = Not detected; numerical value is the sample quantitation limit.
a = U.S. EPA Region III Risk-based concentration (U.S. EPA, 1997).
For chemicals lacking remediation objectives, the following proxy chemicals were used:

Chemical	Proxy
2-Methylnaphthalene	Naphthalene
Acenaphthylene	Pyrene
Phenanthrene	Pyrene
Benzo(g,h,i)perylene	Pyrene

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Table [illegible]1
Comparison of Surface Water Data to IEPA Groundwater Remediation Objectives
Paxton Landfill
Lake Calumet Cluster Site
Chicago, Illinois

Source	ESI	ESI	ESI	ESI	ESI	ESI	ESI	IEPA	
Sample ID	SW03	SW04	SW05	SW07	SW08	SW09	SW10	Groundwater Remediation Objective	
Depth (feet)	0-1	0-1	0-1	0-1	0-1	0-1	0-1	Class I	Class II
Notes	North of Paxton II, where ditch along Stony Island Ave. enters culvert to pass under Stony Island Ave. background	West of Paxton II, across Stony Island Ave., where culvert water from under Stony Island Ave. spills into Lake Calumet.	Northeast of Paxton I, from surface water body east of Norfolk and Western Railroad. Background	Leachate sump along north central edge of Paxton II.	Leachate sump along south central edge of Paxton II.	Leachate sump along east central edge of Paxton II.	Ditch along Stony Island Ave., approx. 30 ft west of northwestern corner of Paxton II.		
Volatile Organic Compounds (ug/l)									
Chloroethane	10u	10u	10u	110	50u	100u	10u	8600 a	--
Methylene chloride	10u	10u	10u	10u	5	100u	10u	5	50
Acetone	10u	10u	10u	24u	190	**1100**	10u	700	700
1,1-Dichloroethane	10u	10u	10u	1	50u	100u	10u	700	3500
1,2-Dichloroethene (Total)	10u	10u	10u	2	50u	100u	10u	70	200
2-Butanone	10u	10u	10u	10	290	320u	10u	1900 a	--
Benzene	10u	10u	10u	10u	**23**	**13**	10u	5	25
4-Methyl-2-pentanone	10u	10u	10u	10u	15	43	10u	2900 a	--
Toluene	10u	10u	10u	10u	310	170	10u	1000	2500
Chlorobenzene	10u	10u	10u	10u	8	100u	10u	100	500
Ethylbenzene	10u	10u	10u	10u	380	20	10u	700	1000
Xylene (total)	10u	10u	10u	10u	1400	48	10u	10000	10000
Semivolatile Organic Compounds (ug/L)									
Phenol	10u	10u	10u	100u	100u	78	10u	100	100
1,4-Dichlorobenzene	10u	10u	10u	100u	11	100u	10u	75	1500
Naphthalene	10u	10u	10u	100u	**37**	21	10u	25	39
2-Methylnaphthalene	10u	10u	10u	100u	9	100u	10u	--	--
Acenaphthene	10u	10u	10u	100u	6	10	10u	420	2100
Phenanthrene	10u	10u	10u	9	17	11	10u	--	--
Fluoranthene	10u	10u	10u	100u	6	100u	10u	280	1400
Di-n-octylphthalate	10u	10u	10u	9	18	100u	10u	140	700
Pesticides/PCBs (ug/L)									
Aroclor-1232	1u	1u	1u	1u	**2.2**	R	1u	0.5	2.5
Inorganics (ug/l)									
Aluminum	1140	537	1410	2780	650	230	5390	37000 a	--
Arsenic	2.3	1.4	5.8	22.8	27.2	23.2	8.1	50	200
Barium	130	132	55.9	512	545	1460	154	2000	2000
Beryllium	1u	1u	1u	0.35	0.3u	0.3u	1u	4	500
Calcium	118000	100000	81800	104000	51900	48900	256000	--	--

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Table B-11
Comparison of Surface Water Data to IEPA Groundwater Remediation Objectives
Paxton Landfill
Lake Calumet Cluster Site
Chicago, Illinois
(Continued)

Source	ESI	ESI	ESI	ESI	ESI	ESI	ESI	IEPA	
Sample ID	SW03	SW04	SW05	SW07	SW08	SW09	SW10	Groundwater Remediation Objective	
Depth (feet)	0-1	0-1	0-1	0-1	0-1	0-1	0-1	Class I	Class II
Notes	North of Paxton II, where ditch along Stony Island Ave. enters culvert to pass under Stony Island Ave. background	West of Paxton II, across Stony Island Ave., where culvert water from under Stony Island Ave. spills into Lake Calumet.	Northeast of Paxton I, from surface water body east of Norfolk and Western Railroad. Background	Leachate sump along north central edge of Paxton II.	Leachate sump along south central edge of Paxton II.	Leachate sump along east central edge of Paxton II.	Ditch along Stony Island Ave., approx. 30 ft west of northwestern corner of Paxton II.		
Chromium	9.3	6.1	10.7	29.9	316	188	14.5	100	1000
Cobalt	5u	5u	5u	28.3	37.3	14.4	9.1	1000	1000
Copper	4u	4u	43.1	11	5.4	8.1	15.5	650	650
Iron	2810	1580	17200	**8720**	**9760**	**2800**	**27100**	5000	5000
Lead	12.9	9.6	90.5	15	16.2	9	31	7.5	100
Magnesium	65700	58000	29900	405000	156000	350000	122000	--	--
Manganese	218	117	496	289	195	180	1030	150	10000
Mercury	0.2u	0.2u	0.21	0.2u	0.2u	0.2u	0.2u	2	10
Nickel	14u	14u	14u	164	236	108	14u	100	2000
Potassium	30400	33500	14200	1790000	1430000	8580000	12200	--	
Selenium	1.4	1.2u	1.2u	70u	7u	nd	1.2u	50	50
Sodium	107000	99800	21200	4330000	5090000	17400000	175000	--	--
Vanadium	5.1	3.5	6.3	19.6	75.3	61.2	14.9	49	--
Zinc	10.5	13.1	274	39.1	60.4	92.6	50.8	5000	10000
Cyanide	42.7	72.4	67.1	40u	40u	40u	55.4	200	600

Shaded value indicates Class I criteria was exceede; bold indicates Class II criteria was exceeded.
-- = Not available.
u = Not detected; numerical value is the sample quantitation limit.
+ = hardness-dependent criteria; assumes a hardness of 100 mg/L.
n = U.S. EPA Region III Risk-based Concentration for tap water (U.S. EPA, 1997).

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Table 2
Comparison of Surface Water Data to IEPA Groundwater Remediation Objectives
MSD #4
Lake Calumet Cluster Site
Chicago, Illinois

Source	ESI	ESI	ESI	ESI	IEPA	
Sample ID	SW01	SW02	SW03	SW04	Groundwater Remediation Objective	
Depth	NA	NA	NA	NA	Class I	Class II
Notes	East of Crandon Ave, near 124th St.	West of Crandon Ave, north of 124th St.	West of Crandon Ave, south of 124th St.	South of 122nd St, east of Norfolk and Western RR; Background		
Volatile Organic Compounds (ug/l)						
Acetone	40	21	10u	39	700	700
Toluene	10u	10u	14	10u	1000	2500
Semivolatile Organic Compounds						
No detections					--	--
Pesticides/PCBs						
No detections					--	--
Inorganics (ug/l)						
Aluminum	255	336	9250	519	--	--
Barium	89	57.9	125	60.3	2000	2000
Beryllium	0.4u	0.4u	0.73	0.4u	4	500
Calcium	50400	77800	90600	47800	--	--
Cobalt	3.20	1.5u	9.50	1.5u	1000	1000
Copper	6.5u	5.2u	26.4	13.3	650	650
Iron	737	1470	**16700**	1580	5000	5000
Lead	4.1	3.9	49	15.3	7.5	100
Magnesium	55700	18000	26500	14800	--	--
Manganese	82.1	1520	928	470	150	10000
Mercury	0.10	0.25	0.1u	0.1u	2	10
Nickel	10.9	4.1	21.7	3.7u	100	2000
Potassium	55600	7070	18800	4280	--	--
Sodium	300000	6440	5540	14000	--	--
Vanadium	3.5	2.3u	21.4	2.6	49	--
Zinc	39.8	23.5u	127	38.2	5000	10000
Cyanide	50.3	10u	10u	10u	200	600

Shaded value indicates Class I criteria was exceeded; bold indicates Class II criteria was exceeded.
-- = Not available.
u = Not detected; numerical value is the sample quantitation limit.

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Table B-13
Comparison of Groundwater Data to IEPA Groundwater Remediation Objectives
Paxton Landfill
Lake Calumet Cluster Site
Chicago, Illinois

Sample ID	G115	G155	G188	R105	R108	G135	G195	G205	G225	G245	G25F	G185	G158	G130	G175	G118	G110	G118	G138	G130	G138	R105	G105B	G130B	G178	G104	G124	LP-1	LP-2	LP-3	LP-4	IEPA Groundwater Remediation Objective	
Source	HARZA	HARZA	HARZA	HARZA	HARZA	HARZA	HARZA	HARZA	HARZA	HARZA	HARZA	IEPA	IEPA	IEPA	IEPA	RFW	RFW	RFW	RFW	RFW	RFW	RFW	RFW	RFW	RFW	RFW	RFW	RFW	RFW	RFW	RFW		
Depth (ft)*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	20	NA	NA	20	NA	NA	Approx. 20	NA	NA	18.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	Class I	Class II
Notes	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	North-central edge of Paxton II	NA	NA	Northwestern corner of Paxton II	NA	NA	Northwestern corner of Paxton I	NA	NA	Southwestern edge of Paxton II	NA	NA	NA	NA	NA	NA	NA	NA	NA		
Volatile organics compounds (ug/l)																																	
Benzene	–	–	5	5	–	340	–	–	–	21	70	60	–	–	–	–	–	–	340	–	–	–	–	–	–	–	–	–	18	180	–	5	25
Toluene	–	–	5	–	–	220	–	–	–	7	1300	–	300	–	–	–	–	–	310	–	–	–	–	–	–	–	–	–	380	190	19	1000	2500
Tetrahydrofuran	–	–	–	–	–	–	–	–	–	–	–	9800	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Methoxy Methylethoxy propanol	–	–	–	–	–	–	–	–	–	–	–	–	–	–	80	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Acetonitrile	–	–	–	–	–	–	–	–	–	–	–	–	40	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Acetone	–	–	–	–	–	–	–	–	–	–	23000	–	140	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	700	700
Cyclohexanone	–	–	–	–	–	–	–	–	–	–	–	–	530	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	30000 a	–
2-Methyl-2-propanol	–	–	–	–	–	–	–	–	–	–	–	–	–	20	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2-Butanone	–	–	–	–	–	–	–	–	–	–	18000	–	–	–	–	–	–	–	–	–	10	–	–	–	–	–	–	24	21	180	130	1900 a	–
1,1,1-Trichloroethane	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	8	–	–	44	–	–	5	9	–	10	200	1000
Styrene	–	–	–	–	–	88	–	–	–	88	–	–	–	–	–	–	–	–	92	–	–	–	–	–	–	–	–	–	–	–	–	100	500
Xylene	–	–	–	–	–	280	–	–	–	240	760	–	–	–	–	–	–	–	340	–	–	–	–	–	25	–	–	–	460	150	29	10000	10000
Ethylbenzene	–	–	–	–	–	19	–	–	–	–	170	–	–	–	–	–	–	–	170	–	–	–	–	–	–	–	–	5	61	44	9	700	1000
1,2-Dichloroethene	–	–	–	–	–	–	–	–	–	–	18	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	64	7	–	70	200
Chloroethane	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	29	–	8600 a	–
Chlorobenzene	–	–	–	–	–	–	–	–	–	100	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	7	–	–	100	500
4-Methyl-2-pentanone	–	–	–	–	–	–	–	–	–	–	1200	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	28	29	2800 a	–
1,1-Dichloroethane	–	–	–	–	–	–	–	–	–	–	37	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	700	3600
Vinyl acetate	–	–	–	–	–	–	–	–	–	–	58	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	7000	7000
Trichloroethene	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	10	–	–	5	25
2-Hexanone	–	–	–	–	–	–	–	–	–	–	20	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
1,2-Dichloropropane	–	–	–	–	–	–	–	–	–	–	10	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5	25
Tetrachloroethene	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	28	–	5	5	25
Semivolatile Organic Compounds (ug/L)																																	
Naphthalene	–	–	–	–	–	7000	–	–	–	71	–	–	–	30	–	–	–	–	8000	–	–	–	–	–	–	–	–	–	–	–	–	25	39
Phenanthrene	–	–	–	–	–	150	–	–	–	4	–	–	–	30	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Anthracene	–	–	–	–	–	30	–	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2100	10500
Phenol	–	–	–	–	–	180	–	–	–	–	–	–	–	–	–	–	–	–	740	–	–	–	–	35	–	–	–	–	1000	–	87	100	100
2-Methylphenol	–	–	–	–	–	280	–	–	–	–	–	–	–	–	–	–	–	–	1400	–	–	–	–	–	–	–	–	–	–	–	–	350	350
4-Methylphenol	–	–	–	–	–	340	–	–	–	–	–	–	–	–	–	–	–	–	980	–	–	–	–	120	–	–	–	–	70	60	–	180 a	–
2,4-Dimethylphenol	–	–	–	–	–	840	–	–	–	–	–	–	–	–	–	–	–	–	870	–	–	–	–	–	–	–	–	–	–	–	–	730 a	–
2-Methylnaphthalene	–	–	–	–	–	590	–	–	–	–	–	–	–	–	–	–	–	–	280	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Acenaphthylene	–	–	–	–	–	130	–	–	–	28	–	–	–	–	–	–	–	–	250	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Dibenzofuran	–	–	–	–	–	75	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	150 a	
Acenaphthene	–	–	–	–	–	18	–	–	–	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	420	2100
Flourene	–	–	–	–	–	94	–	–	–	4	–	–	–	–	–	–	–	–	130	–	–	–	–	–	–	–	–	–	–	–	–	280	1400
Fluoranthene	–	–	–	–	–	61	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	280	1400
Diethylphthalate	–	–	8	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5600	5600
Di-n-butylphthalate	6	4	5	5	–	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	700	3500
Pyrene	–	–	–	–	–	64	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	210	1050
Chrysene	–	–	–	–	–	17	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.5	7.5
Benzo(a)pyrene	–	–	–	–	–	18	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.2	2
Indeno(1,2,3-cd)pyrene	–	–	–	–	–	8	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.43	2.15
Benzo(k)fluoranthene	–	–	–	–	–	19	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.17	0.85
Benzo(b)fluoranthene	–	–	–	–	–	9	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.18	0.9
Benzo(a)anthracene	–	–	–	–	–	19	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.13	0.65
1,4-Dichlorobenzene	–	–	–	–	–	–	–	–	–	8	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	75	375
Bis(2-ethylhexyl)phthalate	–	–	–	–	–	–	–	–	–	37	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	6	60
Pesticides/PCBs (ug/L)																																	
Dieldrin	–	–	–	–	–	–	–	–	–	0.07	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.02	0.1
DDE	–	–	–	–	–	–	–	–	–	0.07	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.04	0.2
Inorganics (ug/L)																																	
Antimony	–	–	32	29	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	6	24
Arsenic	–	–	4.2	5.8	–	5.4	–	4.9	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	50	200
Barium	120	100	560	0.59	1100	460	130	330	740	620	–	–	–	–	–	–	2300	1000	511	800	240	844	383	230	739	817	843	457	457	800	558	2000	2000
Beryllium	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.5	–	–	–	4	500
Boron	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1590	–	950	6830	8070	1140	1700	560	1640	4000	3300	6000	4140	3430	17200	3100	2000	2000
Cadmium	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	7.0	–	–	10.0	10.0	–	–	–	–	18.7	6.4	11.1	–	–	27.8	20.0	5	50
Calcium	122000	252000	32000	53400	120000	59400	278000	98800	101000	46300	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Chromium	–	–	38	14	–	12	–	9.8	18	12	–	–	–	–	–	18.7	–	118	37.4	–	79.9	–	40.4	13.7	78.1		42.6		20	88.4	28.7	100	1000
Cobalt	–	–	38	13	–	19	13	7.2	13	18	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1000	1000
Copper	13	–	5.4	6.5	–	9.3	8.8	75	–	18	–	–	–	–	–	37.3	–	38	48.1	–	–	–	29.2		85.5	29.5			48.2	220	51.8	650	650
Cyanide	8.2	81	7.7	51	5.2	100	180	8	8.1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	200	600
Iron	210	–	2800	1300	220	720	540	1100	1000	980	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5000	5000
Lead	3	–	6.6	6.6	–	9.6	–	–	2.4	8.1	–	–	–	–	–	108	–	13	84	–	9	19		5	79		5	20	138	338	90	7.5	100

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Table
Comparison of Groundwater Data to IEPA Groundwater Remediation Objectives
Paxton Landfill
Lake Calumet Cluster Site
Chicago, Illinois
(Continued)

Sample ID	G11S	G15S	G18S	R10S	R10S	G13S	G19S	G20S	G22S	G24S	G25F	G18S	G15S	G13D	G17S	G11S	G11D	G11S	G13S	G13D	G13S	R10S	G10SS	G13SS	G17S	G10S	G12S	LP-1	LP-2	LP-3	LP-4	IEPA Groundwater Remediation Objective	
Source	HARZA	HARZA	HARZA	HARZA	HARZA	HARZA	HARZA	HARZA	HARZA	HARZA	HARZA	IEPA	IEPA	IEPA	IEPA	RFW	RFW	RFW	RFW	RFW	RFW	RFW	RFW	RFW	RFW	RFW	RFW	RFW	RFW	RFW	RFW	Class I	Class II
Depth (ft)*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	20	NA	NA	20	NA	NA	Approx. 20	NA	NA	19.5	NA	NA	NA	NA	NA	NA	NA	NA	NA		
Notes	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	North-central edge of Paxton II	NA	NA	Northwestern corner of Paxton II	NA	NA	Northwestern corner of Paxton I	NA	NA	Southwestern edge of Paxton II	NA	NA	NA	NA	NA	NA	NA	NA	NA		
Magnesium	72200	170000	421000	123000	71300	188000	130000	222000	305000	151000	–	–	–	–	–	135000	7240	20100	147000	277000	–	97600	8230	1030	225000	138000	219000	98500	15000	389000	402000	–	–
Manganese	287	97	20	88	250	140	180	150	47	56	–	–	–	–	–	[illegible]	95.1	210	1170	[illegible]	48.3	[illegible]	48.7	28.8	2180	84.4	79.2	[illegible]	[illegible]	1280	857	150	10000
Mercury	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.28	1.6	–	0.62	–	–	–	–	0.28	–	–	–	0.48	–	2	10
Nickel	–	–	470	130	–	100	46	780	–	118	–	–	–	–	–	–	–	98.1	[illegible]	82.8	47.3	–	–	–	314	–	[illegible]	[illegible]	217	[illegible]	100	100	2000
Potassium	17700	33500	456000	260000	17800	298000	88800	141000	320000	374000	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Sodium	76400	80700	2580000	1300000	77000	1480000	721000	1230000	1380000	1980000	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Thallium	–	–	8.6	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	20
Vanadium	–	–	29	20	–	16	5	6.9	20	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	134	–	–	–	–	93.8	–	48	–
Zinc	240	58	41	51	42	130	100	80	100	170	–	–	–	–	–	170	–	82.8	103	40.4	30.1	42.9	20.3	18.9	428	38	12.8	43	571	1780	171	5000	10000

Shaded value indicates Class I criteria was exceeded, bold indicates Class II criteria was exceeded
NA = Not available.
– = Not available, not detected
Groundwater data based on samples collected by HARZA in 1993, IEPA in 1997; and Roy F. Weston in 1999 and presented in ESI report
a = Risk-based concentration for tap water (U.S. EPA, 1997)
u = Not detected, numerical value is the sample quantitation limit
* Depth indicates the distance from the top of the well riser to bottom of well casing

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Table B-14
Comparison of Groundwater Data to IEPA Groundwater Remediation Objectives
Land and Lakes #3
Lake Calumet Cluster Site
Chicago, Illinois

Sample ID:	GW01	GW04	GW14	GW16	IEPA Groundwater Remediation Objective	
Source:	ESI	ESI	ESI	ESI		
Depth (ft)*:	12.26	11.6	8.18	6.1	Class I	Class II
Notes:	MW-GA1S, northeastern corner of site.	MW-GA4S, southeastern corner of site.	MW-14S, southwestern corner of site.	MW-R16S, northwestern corner of site.		
Volatile Organic Compounds (ug/L)						
Chloromethane	10u	21	10u	10u	1.4 a	--
Vinyl chloride	10u	34	10u	10u	2	10
Chloroethane	10u	40	10u	10u	8600 a	--
Methylene chloride	10u	11	10u	10u	5	50
Acetone	10u	10u	26	10u	700	700
Carbon disulfide	10u	41	10u	10u	700	3500
1,1-Dichloroethane	10u	11	10u	10u	700	3500
1,2-Dichloroethene (total)	10u	8	10u	10u	70	200
2-Butanone	10u	150	10u	10u	1900 a	
Trichloroethene	10u	21	10u	10u	5	25
Benzene	190	1100	10u	10u	5	25
4-Methyl-2-pentanone	10u	34	10u	10u	2900 a	--
Tetrachloroethene	10u	6	10u	10u	5	25
Toluene	24	4000	10u	10u	1000	2500
Ethylbenzene	140	49	10u	10u	700	1000
Xylene	470	180	10u	10u	10000	10000
Semivolatile Organic Compounds (ug/L)						
2-Methylphenol	10u	14	10u	10u	1800 a	--
4-Methylphenol	10u	21	10u	10u	180 a	--
2,4-Dimethylphenol	14	20	10u	10u	730 a	--
Naphthalene	10	32	10u	10u	25	39
2-Methylnaphthalene	10u	5	10u	10u	--	--
Bis(2-ethylhexyl)phthalate	10u	20	10u	10u	6	60
Pesticides/PCBs (ug/L)						
Delta-BHC	0.072	0.05u	0.15	0.05u	--	--
Aldrin	0.031	0.05u	0.05u	0.05u	0.04	0.2
Aroclor-1254	1u	0.8	1u	1u	0.5	2.5

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Table 1
Comparison of Groundwater Data to IEPA Groundwater Remediation Objectives
Land and Lakes #3
Lake Calumet Cluster Site
Chicago, Illinois
(Continued)

Sample ID:	GW01	GW04	GW14	GW16	IEPA Groundwater Remediation Objective	
Source:	ESI	ESI	ESI	ESI		
Depth (ft)*:	12.26	11.6	8.18	6.1	Class I	Class II
Notes:	MW-GA1S, northeastern corner of site.	MW-GA4S, southeastern corner of site.	MW-14S, southwestern corner of site.	MW-R16S, northwestern corner of site.		
Inorganics (ug/L)						
Arsenic	18.5	2u	2u	2u	50	200
Barium	405	412	289	73.4	2000	2000
Calcium	47000	202000	591000	956000	--	--
Chromium	66.9	17.1	3u	3.9u	100	1000
Cobalt	18.2	4u	4.5	4u	1000	1000
Copper	7.7	2.5	2u	2u	650	650
Iron	4340	**29600**	75.1	77.3u	5000	5000
Lead	8.8	9	5	4.1	7.5	100
Magnesium	179000	176000	106u	24100	--	--
Manganese	21.3	**543**	15.5	113	150	10000
Nickel	**176**	10u	10u	10u	2	10
Potassium	714000	95000	148000	47800	--	
Selenium	4.1	4u	4u	4u	50	50
Sodium	2350000	248000	261000	199000	--	--
Thallium	8.2	13.8	14.2	6u	2	20
Vanadium	24	5.9	5u	5.2	49	--
Zinc	14.7	2u	2u	2u	5000	10000
Cyanide	22.7	10.1	10u	10u	200	600

Shading indicates value exceeds Class I criteria; bold indicates value exceeds Class II criteria.
-- = Not available.
u = Not detected; numerical value is the sample quantitation limit.
* Depth indicates the distance from the top of the well riser to bottom of well casing.

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APPENDIX C

DATA COMPARISONS TO ECOLOGICAL SCREENING BENCHMARKS

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Comparison of Sediment Data to Sediment Screening Benchmarks
Paxton Landfill
Lake Calumet Cluster Site
Chicago, Illinois

Source	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	U.S. EPA 1996	Long et al. 1991 [b]		Provincial		ORNL
Sample ID	ST01	ST02	ST03	ST04	ST05	ST06	ST07	ST08	ST10	EcoTox Threshold [a]	ER-L	ER-M	SQG [c]		PRG [d]
Depth (inches)	0-6	0-6	0-6	0-6	0-6	0-6	0-6	0-6	0-6	Freshwater			Low	Severe	
Notes	Drainage ditch along northcentral edge of Paxton II.	Drainage ditch along Stony Island Ave., approx. 30 ft west of the southwestern corner of Paxton II.	North of Paxton II, where ditch along Stony Island Ave. enters culvert to pass under Stony Island Ave. bound	West of Paxton II, across Stony Island Ave., where culvert water from under Stony Island Ave. spills into Lake Calumet.	Northeast of Paxton I, from surface water body east of Norfolk and Western Railroad. Background.	Retention pond in northwest corner of Paxton II.	Retention pond in the northeastern corner of Paxton I.	Retention pond north of the equipment and scrap area.	Ditch along Stony Island Ave., approx. 30 feet west of the northwestern corner of Paxton II.						
Volatile Organic Compounds (ug/kg)															
Acetone	13u	12u	14 u	61	200	13 u	91	13 u	15 u	–	–	–	–	–	9.1
1,2-Dichloroethene (Total)	13u	12u	14 u	17 u	32 u	13 u	13 u	13 u	11	–	–	–	–	–	400
Tetrachloroethene	13u	7	14 u	12	32 u	13 u	13 u	13 u	15 u	530	–	–	–	–	3200
Semivolatile Organic Compounds (ug/kg)															
Naphthalene	430u	2100u	480u	540u	1000	450u	230	390u	500u	480	160	2100	–	–	390
2-Methylnaphthalene	430u	2100u	480u	540u	370	450u	430u	390u	500u	–	70	670	–	–	–
Acenaphthylene	430u	2100u	480u	540u	390	450u	430u	390u	500u	–	44	640	–	–	130
Acenaphthene	190	2100u	480u	540u	890u	450u	430u	390u	500u	820	16	500	–	–	89
Dibenzofuran	430u	2100u	480u	540u	370	450u	430u	390u	500u	2000	–	–	–	–	420
Fluorene	250	2100u	480u	540u	890u	450u	430u	390u	500u	540	19	540	190	160000	140
Phenanthrene	2000	4400	1500	1700	1300	270	980	960	1100	850	240	1500	560	950000	540
Anthracene	630	1100	360	440	400	450u	230	270	280	–	85.3	1100	220	370000	250
Carbazole	210	2100u	480u	540u	890u	450u	430u	390u	500u	–	–	–	–	–	–
Fluoranthene	2200	6900	2000	2300	1800	260	1100	1100	1400	2900	600	5100	750	1020000	1500
Pyrene	4500	6500	2800	3600	2500	310	1800	2100	2900	–	665	2600	490	850000	1400
Butylbenzyl phthalate	430u	2100u	480u	540u	890u	450u	430u	390u	500u	11000	–	–	–	–	–
Benzo(a)anthracene	1700	3800	1200	1600	1100	450u	780	820	970	–	261	1600	320	1480000	890
Chrysene	–	–	–	–	–	–	–	–	–	–	384	2800	340	460000	850
bis(2-ethylhexyl)phthalate	710	2100u	280	480	890u	450u	430u	390u	510	–	–	–	–	–	2700
Benzo(b)fluoranthene	2200	4500	1400	2000	2100	450u	980	1200	1300	–	384	2800	340	460000	850
Benzo(k)fluoranthene	830	2000	660	820	730	450u	370	320	610	–	–	–	240	1340000	–
Benzo(a)pyrene	1600	3200	1100	1500	1300	450u	840	930	910	430	430	1600	370	1440000	760
Indeno(1,2,3-cd)pyrene	1600	1700	840	1200	1300	450u	820	830	740	–	–	–	200	320000	–
Dibenzo(a,h)anthracene	360	2100u	190	270	890u	450u	210	190	500u	–	63.4	260	60	130000	140
Benzo(g,h,i)perylene	1300	1500	760	1000	1200	450u	700	620	630	–	–	–	170	32000000	–
Pesticides/PCBs (ug/kg)															
delta-BHC	2.2u	2.2u	2.5u	2.6u	6.6	2.3u	2.2u	2.1u	2.5u	–	–	–	3	120	–
Dieldrin	4.3u	4.3u	3.2	5.4u	8.9u	4.4u	4.3u	4u	3.1	52	0.02	8	2	910	4.3
4,4-DDE	8.6	12	10	11	42	4.4u	6.6	3.7	6.7	–	2.2	27	5	190	27
4,4-DDD	14	11	21	18	31	4.4u	10	4u	7.6	–	–	–	8	60	7.8
4,4-DDT	12	39	20	14	62	4.4u	8.9	8.6	8.9	1.6	1	7	7	120	52
Methoxychlor	53	40	20	27	64	23u	8.9	29	15	19	–	–	–	–	19
Endrin ketone	16	4.3u	10	8	20	4.4u	4.3u	11	7	–	–	–	–	–	–
alpha-Chlordane	2.3	7.5	2.9	2.8	8	2.3u	2.1	1.9	2.2	–	0.5	6	7	60	4.8
gamma-Chlordane	2.2u	5.6	4.3	1.9	3.3	2.3u	2.2u	2.4	4	–	0.5	6	7	60	4.8
Aroclor-1242	47	65	47	64	89u	44u	43u	40u	49u	23	22.7	180	–	–	29000
Aroclor-1254	50	70	91	61	94	44u	49	40u	79	23	22.7	180	60	340	72000
Inorganics (mg/kg)															
Aluminum	10200	7730	10100	10300	5340	12300	7820	7310	10200	–	–	–	–	–	–
Arsenic	9.2	8.1	8.1	8.7	12.6	16	20.3	5.3	9.4	6.2	8.2	70	6	33	42
Barium	81.5	66.8	61.2	65.1	124	51.4	74.5	46	64.7	–	–	–	–	–	–
Beryllium	0.74	0.6	0.6	0.55	0.98	0.73	1	0.39	0.48	–	–	–	–	–	–
Cadmium	1.2	0.97	1.6	1u	1.9u	0.82u	0.76u	0.82u	0.93u	1.2	1.2	9.6	0.6	10	4.2
Calcium	62600	60000	62900	61200	13000	58000	60900	55900	61400	–	–	–	–	–	–
Chromium	23.1	22.2	23.4	23.5	28.3	21	33.1	15	22.3	81	81	370	26	110	160
Cobalt	12	11.9	9.6	11.8	7.5	11.6	7.2	8.3	11.3	–	–	–	–	–	–
Copper	48.7	39.4	37.8	38.4	130	28.2	31.6	24.3	37.6	34	34	270	16	110	110
Iron	21600	18700	22200	21600	33200	21600	18200	15300	22100	–	–	–	20000	40000	–
Lead	106	88.6	92.3	75.6	208	31.6	68.4	63.9	73.1	47	46.7	218	31	250	110
Magnesium	31900	29400	31500	29800	4170	28600	26300	30100	31000	–	–	–	–	–	–
Manganese	634	714	600	575	238	400	688	371	531	–	–	–	460	1110	–
Mercury	NA	0.13u	0.15u	0.17u	0.32u	0.14u	0.13u	0.21	0.15u	0.15	0.15	0.71	0.2	2	0.7

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Table C-1
Comparison of Sediment Data to Sediment Screening Benchmarks
Paxton Landfill
Lake Calumet Cluster Site
Chicago, Illinois
(Continued)

Source	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	U.S. EPA 1996 EcoTox Threshold[a] Freshwater	Long et al. 1991[b]		Provincial SQG[c]		ORNL PRG[d]
Sample ID	ST01	ST02	ST03	ST04	ST05	ST06	ST07	ST08	ST10		ER-L	ER-M	Low	Severe	
Depth (inches)	0-6	0-6	0-6	0-6	0-6	0-6	0-6	0-6	0-6						
Notes	Drainage ditch along northcentral edge of Paxton II.	Drainage ditch along Stony Island Ave., approx 30 ft west of the southwestern corner of Paxton II.	North of Paxton II, where ditch along Stony Island Ave. enters culvert to pass under Stony Island Ave. bound	West of Paxton II, across Stony Island Ave., where culvert water from under Stony Island Ave. spills into Lake Calumet.	Northeast of Paxton I, from surface water body east of Norfolk and Western Railroad. Background.	Retention pond in northwest corner of Paxton II.	Retention pond in the northeastern corner of Paxton I.	Retention pond north of the equipment and scrap area.	Ditch along Stony Island Ave., approx. 30 feet west of the northwestern corner of Paxton II.						
Nickel	31.8	27.6	24	29.3	31.1	27.8	19.6	22	27.8	21	20.9	51.6	16	75	43
Potassium	2870	1990	3100	3170	718	3680	1690	2060	2910	--	--	--	--	--	--
Selenium	0.31 u	0.31u	0.53	1.2	3.2	0.33u	0.3u	0.33u	0.37u	--	--	--	--	--	--
Sodium	202	171	279	267	291	215	248	257	218	--	--	--	--	--	--
Thallium	0.56	0.56	0.48	0.65	0.65	0.58	0.63	0.33	0.71	--	--	--	--	--	--
Vanadium	24.1	20.2	24.8	27.5	25.7	25.8	20.4	17.7	24.3	--	--	--	--	--	--
Zinc	108	102	97.3	101	484	57.5	183	69.1	97.9	150	150	410	120	820	270
Cyanide	NA	4.7	7.4	6.6	0.9	1.4	3.2	1.1	4.8	--	--	--	--	--	--

Shaded value indicates lowest screening benchmark exceeded, bold indicates highest benchmark exceeded
NA = Not analyzed
-- = Not available
u = Not detected, numerical value presented is the sample quantitation limit.
a = U.S. EPA (1996) *Ecotox Thresholds* ECO Update Intermittent Bulletin Vol 3 No 2 Office of Solid Waste and Emergency Response EPA/540/F-95/038
b = Long, E R, D D Macdonald, S L Smith, and F D Calder, "Incidence of Adverse Biological Effects Within Ranges of Chemical Concentrations in Marine and Estuarine Sediments". *Environ. Mgt* 19(1) 81-97.
c = Persaud, D, R Jaagumagi, and A Hayton 1993 *Guidelines for the Protection and Management of Aquatic Sediment Quality* Water Resources Branch, Ontario Ministry of the Environment.
d = Efroymson, R A, G W Suter II, B E Sample, and D S. Jonas 1996 *Preliminary Remediation Goals for Ecological Endpoints*. Environmental Restoration Risk Assessment Program. Oak Ridge National Laboratory ES/ER/RM-162/R1

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Tab.
Comparison of Sediment Data to Sediment Screening Benchmarks
Land and Lakes #3
Lake Calumet Cluster Site
Chicago, Illinois

Source	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	U S EPA 1996 EcoTox Threshold[a] Freshwater	Long et al 1991[b]		Provincial SQG[c]		ORNL PRG[d]
Sample ID	ST01	ST02	ST03	ST04	ST05	ST06	ST07	ST08	ST09	ST10	ST11	ST12	ST13	ST14		ER-L	ER-M			
Depth (feet)	0 5 - 1	0 5 - 1	<2	<2	1 - 1 5	0 5 - 1	<2	<2	<2	<2	<2							Low	Severe	
Notes	In ditch along the east side of Stony Island Ave, about 30 feet north of the culvert inlet, which drains to Lake Calumet	In the ditch along the east side of Stony Island Ave , about 35 ft south of the culvert inlet, which drains to Lake Calumet	In Lake Calumet, at the outfall to the culvert, which drains from the site	In the ditch along the east side of Stony Island Ave, about 25 feet north of 122nd St	In the ditch along 122nd Street, just east of the inlet to western culvert, which drains to Deadstick Pond	Offsite, at the outlet to the western culvert, which drains from the site to Deadstick Pond	In the ditch along the north side of 122nd St , about 25 ft west of the eastern site boundary	In the ditch along the north side of 122nd St, about 30 ft east of the eastern site boundary	Offsite, at the outlet to the eastern culvert, which drains the site to Deadstick Pond	At the southern bank of Lake Calumet, about 150 yards southwest of ST03	In the ditch along the east side of Stony Island Ave , about 40 ft north of the northern site boundary.	In Lake Calumet, about 500 ft west of ST03	In Deadstick Pond, about 100 yards south of ST08, near the bank of the pond	Offsite, in a ditch that flows to Deadstick Pond, about 500 feet west of ST08						
Volatile Organic Compounds (ug/kg)																				
Methylene chloride	12u	12u	83	20u	12u	18u	17u	18u	74u	18u	12u	14u	18u	18u	–	–	–	–	–	18000
Acetone	12u	12u	120	120	12u	15u	24	270	74u	21	12u	14u	23	29	–	–	–	–	–	9 1
1,2-Dichloroethene (total)	12u	12u	27u	20u	12u	18u	38	18u	74u	18u	12u	14u	18u	18u	–	–	–	–	–	400
2-Butanone	12u	12u	27u	32	12u	18u	17u	19	74u	18u	12u	14u	18u	18u	–	–	–	–	–	270
Trichloroethene	12u	12u	27u	20u	12u	18u	16	18u	74u	18u	12u	14u	18u	18u	1600	–	–	–	–	52000
Benzene	12u	12u	27u	20u	12u	18u	44	53	74u	18u	12u	14u	18u	18u	57	–	–	–	–	160
Toluene	12u	12u	27u	20u	12u	18u	33	78	74u	18u	12u	14u	18u	18u	670	–	–	–	–	50
Chlorobenzene	12u	12u	27u	20u	12u	18u	17u	20	74u	18u	12u	14u	18u	18u	820	–	–	–	–	417
Ethylbenzene	12u	12u	27u	20u	12u	18u	17u	30	840	18u	12u	14u	18u	100	3800	–	–	–	–	5400
Xylene (total)	12u	12u	27u	20u	12u	18u	38	130	3300	18u	12u	14u	18	380	25	–	–	–	–	160
Semivolatile Organic Compounds (ug/kg)																				
Phenol	400u	410u	2100	1700u	820u	2500u	2800	1000u	3600u	520u	390u	970u	520u	890u	–	–	–	–	–	32
4-Methylphenol	400u	410u	890	1700u	820u	2500u	3700	1300	3600u	520u	390u	970u	520u	890u	–	–	–	–	–	–
Naphthalene	400u	430	790u	1700u	820u	2500u	980u	740	3600u	520u	390u	970u	400	890u	480	160	2100	–	–	390
2-Methylnaphthalene	400u	220	790u	1700u	2000u	2500u	980u	1000u	3600u	520u	390u	970u	520u	890u	–	70	670	–	–	–
Acenaphthene	400u	890	790u	1700u	820u	2500u	980u	1000u	3600u	520u	390u	970u	520u	890u	620	16	500	–	–	89
Dibenzofuran	400u	510	790u	1700u	820u	2500u	980u	1000u	3600u	520u	390u	970u	520u	890u	2000	–	–	–	–	420
Fluorene	400u	870	790u	1300u	820u	2500u	540u	1000u	3600u	520u	390u	850	520u	890u	540	19	540	190	160000	140
Phenanthrene	340	7400	1400	12000	1500	4200	4000	3000	8400	680	1400	2800	1100	920	850	240	1500	560	950000	540
Anthracene	400u	2200	790u	3000	480	1400	1100	840	3600u	520u	420	750	350	890u	–	85 3	1100	220	370000	250
Carbazole	400u	930	790u	1100	820u	2500u	980u	1000u	3600u	520u	390u	970u	520u	890u	–	–	–	–	–	–
Fluoranthene	410	12000	2200	19000	3000	10000	6000	3900	7100	770	2800	4200	1200	2400	2900	600	5100	750	1020000	1500
Pyrene	320	9300	1900	17000	2600	8800	4800	2800	6400	700	1800	4800	1600	2400	–	665	2600	490	850000	1400
Butylbenzyl phthalate	400u	520	790u	1700u	820u	2500u	980u	1000u	3600u	520u	390u	970u	520u	890u	11000	–	–	–	–	–
Benzo(a)anthracene	400u	6400	1000	7600	1700	3300	2800	1700	3100	320	1600	2000	710	1200	–	261	1600	320	1480000	690
Chrysene	250	5800	1200	9000	1900	3800	2900	2100	3800	370	1500	2200	930	1400	–	384	2800	340	460000	850
Bis(2-ethylhexyl)phthalate	290	2000	780	8800	500	2500u	4100	3800	11000	520u	1000	1200	2500	890u	–	–	–	–	–	2700
Di-n-octylphthalate	400u	290	790u	1700u	820u	2500u	980u	1000u	19000	520u	390u	970u	520u	890u	–	–	–	–	–	–
Benzo(b)fluoranthene	400u	4300	910	6100	2000	3300	2700	1400	3600u	520u	970	1700	1100	1600	–	384	2800	340	460000	850
Benzo(k)fluoranthene	400u	3200	670	7100	2200	3200	2900	1200	3600u	520u	840	1700	820	1400	–	–	–	240	1340000	–
Benzo(a)pyrene	400u	4100	830	6300	2100	3900	2400	1700	2600	520u	1200	1700	850	1300	430	430	1600	370	1440000	780
Indeno(1,2,3-cd)pyrene	400u	3800	880	4400	1800	2800	1500	1800	2900	520u	1200	1200	1100	1200	–	–	–	200	320000	–
Dibenz(a,h)anthracene	400u	1100	790u	1800	820u	2500u	620	710	3600u	520u	440	970u	310	890u	–	63 4	260	60	130000	140
Benzo(g,h,i)perylene	400u	2100	420	2600	1100	1800	980	1200	3600u	520u	680	680	840	670	–	–	–	170	32000000	–
Pesticides/PCBs (ug/kg)																				
delta-BHC	2u	2 1u	4u	21	2 1u	3.2	2 8	2.7u	12u	2 7u	6.6	2 6	13u	2.3u	–	–	–	3	120	–
Aldrin	2u	2 1u	5u	6.9	2 1u	7	8.1	7	12u	2 7u	3	60	13u	2 3u	–	–	–	2	80	80
Heptachlor	2u	2 1u	4u	2 9u	2 1u	2.6u	2 5u	2 7u	12u	2 7u	2u	3 7	13u	2 3u	–	–	–	–	–	13000
Heptachlor epoxide	2u	2.1u	4u	2 9u	2 1u	8.7	2 5u	3 2	12u	2.7u	2u	2 5u	20	2 3u	–	–	–	5	50	–
Dieldrin	4u	4 1u	7 9u	5 7u	4 1u	16	8.7	8.1	23u	5.2u	8.8	4 9u	26u	4 5u	52	0 02	8	2	910	4 3
4,4-DDE	4u	4.6	7.7	12	4 1u	23	43	12	23u	5 2u	3 9u	8	32	4 5u	–	2 2	27	5	190	27
Endrin	4u	4.1u	7 9u	5 7u	8.8	11	7.1	8.1	23u	5 2u	5	4 9u	23u	4 5u	20	0 02	45	3	1300	45
Endosulfan I	2u	2.1u	4u	7	2.1u	2.6u	2.5u	2 7u	12u	2 7u	2u	2 5u	13u	2 3u	5 4	–	–	–	–	5 5
Endosulfan II	4u	4 1u	7 9u	5 7u	5	5u	7	7	23u	5 2u	3 9u	5 2	23u	4 5u	5.4	–	–	–	–	5 5
4,4-DDD	3 8u	12	7 9u	24	6 2	24	27	20	31	5.7	3 8	28	26u	5.2	–	–	–	8	60	7 8
Endosulfan sulfate	4u	5	7 9u	5 7u	24	5u	4 9u	5 2u	23u	5 2u	3 9u	4 9u	26u	4 5u	6 4	–	–	–	–	–
4,4-DDT	4u	2.9	7 9u	10	11	16	9.9	9.9	26	5 2u	3.9u	23	26u	3 5	1 6	1	7	7	120	52
Methoxychlor	20u	19	82	82	29	28	38	40	41	27u	78	24	130u	24	19	–	–	–	–	19
Endrin ketone	4u	9 4	7 9u	25	20	5u	16	14	23u	5 2u	15	4 9u	26u	4 5u	–	–	–	–	–	–
Endrin aldehyde	4u	4 1u	7 9u	5 7u	4 1u	8	4 9u	5 2u	23u	5 2u	3 9u	4 9u	26u	4 5u	–	–	–	–	–	–
alpha-Chlordane	1 6	2	4u	9.2	1.6	8.8	9	6.9	12u	2 7u	4	5.2	9 9	2 3u	–	0 5	6	7	60	4 8
gamma-Chlordane	2.6	4.4	4u	9.8	4 1	9	14	12	31	2.7u	2	4	49	2.2	–	0 5	6	7	60	4 8
Toxaphene	200u	210u	400u	290u	210u	260u	250u	270u	1200u	270u	420	250u	1300u	230u	28	–	–	–	–	–
Aroclor-1016	40u	130	79u	270	130	50u	260	280	230u	52u	170	49u	260u	45u	23	22 7	180	7	530	–
Aroclor-1221	81u	170	160u	270	180	100u	320	340	460u	100u	170	99u	530u	91u	23	22 7	180	–	–	120
Aroclor-1232	40u	170	79u	400	130	50u	320	340	230u	52u	250	49u	260u	45u	23	22 7	180	–	–	600
Aroclor-1242	40u	130	79u	270	130	50u	260	280	230u	52u	170	49u	260u	45u	23	22 7	180	–	–	29000
Aroclor-1248	40u	130	160	270	130	170	260	280	1400	80	220	170	2000	62	23	22 7	180	30	1500	1000
Aroclor-1254	40	92	200	200	110	180	340	350	850	52u	170	100	970	45	23	22 7	180	60	340	72000
Aroclor-1260	40u	100	79u	460	180	150	370	400	340	52u	220u	49u	380	45u	23	22 7	180	5	240	63000

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Table C-2
Comparison of Sediment Data to Sediment Screening Benchmarks
Land and Lakes #3
Lake Calumet Cluster Site
Chicago, Illinois
(Continued)

Source	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	U.S. EPA 1996 EcoTox Threshold[a] Freshwater	Long et al 1995[b] ER-L	ER-M	Provincial SQG[c] Low	Severe	ORNL PRG[d]
Sample ID	ST01	ST02	ST03	ST04	ST05	ST06	ST07	ST08	ST09	ST10	ST11	ST12	ST13	ST14						
Depth (feet)	0.5 - 1	0.5 - 1	<2	<2	1 - 1.5	0.5 - 1	<2	<2	<2	<2	<2									
Notes	In ditch along the east side of Stony Island Ave, about 30 feet north of the culvert inlet, which drains to Lake Calumet	In the ditch along the east side of Stony Island Ave, about 35 ft south of the culvert inlet, which drains to Lake Calumet	In Lake Calumet, at the outfall to the culvert, which drains from the site	In the ditch along the east side of Stony Island Ave, about 25 feet north of 122nd St	In the ditch along 122nd Street, just east of the inlet to western culvert, which drains to Deadstick Pond	Offsite, at the outlet to the western culvert, which drains from the site to Deadstick Pond	In the ditch along the north side of 122nd St, about 25 ft west of the eastern site boundary	In the ditch along the north side of 122nd St, about 30 ft east of the eastern site boundary	Offsite, at the outlet to the eastern culvert, which drains the site to Deadstick Pond	At the southern bank of Lake Calumet, about 150 yards southwest of ST03	In the ditch along the east side of Stony Island Ave, about 40 ft north of the northern site boundary.	In Lake Calumet, about 500 ft west of ST03.	In Deadstick Pond, about 100 yards south of ST08, near the bank of the pond	Offsite, in a ditch that flows to Deadstick Pond, about 500 feet west of ST09						
Inorganics (mg/kg)																				
Aluminum	8740	12400	11400	16300	19100	13500	20100	21800	7880	12800	8930	11700	12100	11600	–	–	–	–	–	–
Antimony	18.3	16	8.3	16.7	10.6	16.2	7.2	14.9	**30.3**	**35**	10.6	17.6	64.9	**68.5**	–	2	25	–	–	–
Arsenic	7.5	11.2	19.5	9	7.4	9.7	8.5	9.3	21.8	20.4	8.2	21.3	25.1	19.1	8.2	8.2	70	6	33	42
Barium	35.9	97.3	93.9	259	201	142	244	224	113	91.4	70.7	71.6	222	213	–	–	–	–	–	–
Beryllium	0.86	1	1.4	1.7	1.9	1.3	2.9	3	1	2.5	0.86	1.6	1.3	1.7	–	–	–	–	–	–
Cadmium	0.48u	1.3	1.5	6.9	4.3	8.4	11.3	2.4	8	2.7	0.51	1.1	34.4	0.77	1.2	1.2	9.6	0.6	10	4.2
Calcium	4.29E+04	6.20E+04	1.32E+05	1.07E+05	9.73E+04	44400	108000	104000	73100	58700	64200	55600	58400	93100	–	–	–	–	–	–
Chromium	79.9	47.4	42.7	192	926	153	148	109	128	49.4	49.6	59.1	832	78.9	81	81	370	26	110	160
Cobalt	6.4	9.3	6.6	7.9	8	7.7	6.2	8.5	10.8	8.9	7.8	11.4	13.9	7.5	–	–	–	–	–	–
Copper	26.3	48.4	46.2	151	78.6	69.8	117	82.4	174	30.5	30.8	44.2	342	186	34	34	270	16	110	110
Iron	38100	22000	21700	28800	34300	27400	17900	42400	86000	47000	19000	20700	63900	87300	–	–	–	20000	40000	
Lead	27.3	86.3	90.5	774	204	132	124	147	254	50.9	76.7	114	433	283	47	46.7	218	31	250	110
Magnesium	19300	28500	32700	36600	29400	19100	36100	34600	34000	9620	28500	21900	23500	20100	–	–	–	–	–	–
Manganese	1020	682	840	1600	4880	1140	1210	2120	1160	357	1030	606	1380	2960	–	–	–	460	1110	–
Mercury	0.12u	0.12u	0.26u	0.47	0.27	0.34	0.68	0.16u	0.34	0.16u	0.19	0.17	1	0.39	0.15	0.15	0.71	0.2	2	0.7
Nickel	32.4	27.9	28	46.4	186	38.8	38.4	73	72.8	39.9	24.2	36.1	131	48.9	21	20.9	51.6	16	75	43
Potassium	3240	4020	4360	4110	3300	2430	3690	5400	2010	2710	2770	3330	27900	2890	–	–	–	–	–	–
Selenium	0.95u	0.99u	2.1u	1.6u	1u	1.1u	1.4	1.2u	1.1u	1.3u	1u	1.2u	1.4u	1.1u	–	–	–	–	–	–
Silver	0.8	0.89	1u	6.4	2.4	6.2	3.9	2.5	3	0.91	0.54	1.1	8.4	1.6	–	1	3.7	–	–	1.6
Sodium	500u	688u	1620u	32300	925u	1860u	1750u	1640u	793u	1190u	636u	779u	1020u	1570u	–	–	–	–	–	–
Thallium	2.4	1.5u	3.1u	3.3	4	1.7u	1.8u	2.3	1.7u	1.9u	1.5u	2.2	2u	1.7u	–	–	–	–	–	–
Vanadium	60.7	35.1	32.8	54.3	56	39.6	26.5	39.6	21.4	59.7	33	33.1	29.6	30.1	–	–	–	–	–	–
Zinc	49	612	181	629	903	381	307	211	611	303	92.2	271	1480	337	150	150	410	120	820	270
Cyanide	0.68	0.62u	2.1	2	1.4	1.7	6.8	1.1	2	0.8u	0.63u	2.3	3.2	1.6	–	–	–	–	–	–

Shaded value indicates lowest benchmark was exceeded, bold indicates highest benchmark was exceeded
– = Not available
u = Not detected, numerical value presented is the sample quantitation limit
a = U.S. EPA (1996) *Ecotox Thresholds*. ECO Update Intermittent Bulletin Vol 3 No 2 Office of Solid Waste and Emergency Response. EPA/540/F-95/038
b = Long, E.R., D.D. Macdonald, S.L. Smith, and F.D. Calder. "Incidence of Adverse Biological Effects Within Ranges of Chemical Concentrations in Marine and Estuarine Sediments" *Environ Mgt* 19(1) 81-97.
c = Persaud, D., R. Jaagumagi, and A. Hayton 1993 *Guidelines for the Protection and Management of Aquatic Sediment Quality*. Water Resources Branch Ontario Ministry of the Environment.
d = Efroymson, R.A., G.W. Suter II, B.E. Sample, and D.S. Jones 1996 *Preliminary Remediation Goals for Ecological Endpoints*. Environmental Restoration Risk Assessment Program Oak Ridge National Laboratory ES/ER/RM-162/R1.

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Tab.

Comparison of Sediment Data to Sediment Screening Benchmarks
Album Incinerator
Lake Calumet Cluster Site
Chicago, Illinois

Source	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	U.S. EPA 1996	Long et al. 1991 [b]		Provincial		ORNL
Sample ID	ST01	ST02	ST03	ST04	ST05	ST06	ST07	ST08	ST09	ST10	ST11	EcoTox Threshold [a]	ER-L	ER-M	SQG [c]		PRG [d]
Depth (inches)	4 - 6	5 - 7	4 - 6	4 - 6	6 - 8	4 - 6	4 - 6	4 - 6	6 - 10	4 - 6	4 - 6	Freshwater			Low	Severe	
Notes	40 ft northwest of the site's southeastern corner.	Northeast edge of pond in southwestern portion of the site.	60 ft east o the site's entrance gate.	North of monitoring well P2 on the southern edge of the northeast pond.	Offsite, 140 ft south and 5 ft east of the northeast corner of the site.	Offsite, 20 ft east and 8 ft north of the northeast corner of the site.	Offsite (upgradient), 100 ft west and 75 ft north of the northeastern corner.	Offsite, 25 ft west and 10 ft north of the northeast site fence corner.	Offsite, 140 ft east and 20 ft north of the northeast fence corner.	Background; in the drainage ditch east of railroad tracks beyong east end of 119th Street.	Background; fro ditch east of railroad tracks, 100 feet south of ST10.						
Volatile Organic Compounds (ug/kg)																	
Methylene chloride	13u	13u	20u	15u	14u	19u	19u	14u	110	14u	180	--	--	--	--	--	18000
Acetone	230	59	240	160	48	98	120	180	180	21	20u	--	--	--	--	--	9 1
Carbon disulfide	13u	13u	20u	15u	13u	19u	19u	14	36u	14u	20u	--	--	--	--	--	0 88
1,2-Dichloroethene (total)	13u	13u	20u	5	13u	3	19u	3	36u	14u	11	--	--	--	--	--	400
Chloroform	13u	13u	20u	15u	13u	19u	19u	14u	36u	14u	20u	--	--	--	--	--	960
1,2-Dichloroethane	13u	13u	20u	5	13u	19u	19u	14u	36u	14u	20u	--	--	--	--	--	4300
Benzene	13u	13u	20u	15u	13u	19u	19u	3	52	4	20u	57	--	--	--	--	180
4-Methyl-2-pentanone	13u	13u	20u	15u	13u	19u	19u	5	9	14u	20u	--	--	--	--	--	15000
Tetrachloroethene	13u	13u	20u	15u	13u	19u	19u	14u	36u	14u	11	530	--	--	--	--	3200
1,1,2,2-Tetrachloroethane	13u	13u	20u	15u	13u	19u	19u	14u	36u	14u	20u	940	--	--	--	--	5400
Toluene	13u	3	20u	15u	13u	160	4	2	32	14u	20u	670	--	--	--	--	50
Ethylbenzene	4	2	20u	15u	13u	19u	4	9	200	14u	20u	3600	--	--	--	--	5400
Xylene (total)	13u	21	20u	17	13u	19	10	42	220	14u	20u	25	--	--	--	--	160
Semivolatile Organic Compounds (ug/kg)																	
1,4-Dichlorobenzene	4400u	4200u	6500u	480u	430u	6300u	6300u	30	530	4600u	650u	350	--	--	--	--	350
Nitrobenzene	4400u	4200u	6500u	480u	390	6300u	6300u	470u	4700u	4600u	650u	--	--	--	--	--	--
Isophorone	4400u	4200u	6500u	150	430u	6300u	6300u	470u	4700u	4600u	650u	--	--	--	--	--	--
2,4-Dimethylphenol	4400u	4200u	6500u	480u	430u	6300u	6300u	470u	2100	4600u	650u	--	--	--	--	--	--
Naphthalene	4400u	4200u	6500u	180	420	6300u	340	320	10000	410	1100	480	160	2100	--	--	390
2-Methylnaphthalene	4400u	4200u	6500u	110	520	330	470	260	720	450	1400	--	70	670	--	--	--
Acenaphthylene	300	4200u	6500u	37	330	6300u	6300u	57	4700u	4600u	150	--	44	640	--	--	130
3-Nitroaniline	11000u	10000u	16000u	1200u	1000u	15000u	15000	1100u	11000u	11000u	1600u	--	--	--	--	--	--
Acenaphthene	4400u	4200u	6500u	72	140	6300u	810	350	320	4600u	180	620	16	500	--	--	89
Dibenzofuran	4400u	4200u	6500u	59	78	6300u	450	260	240	4600u	600	2000	--	--	--	--	420
Fluorene	4400u	4200u	6500u	81	190	480	460	370	280	4600u	210	540	19	540	190	160000	140
Hexachlorobenzene	4400u	4200u	6500u	38	130	6300u	6300u	470u	4700u	4600u	650u	--	--	--	--	--	--
Pentachlorophenol	11000u	10000u	2600	1200u	1000u	15000u	15000u	1100u	11000u	11000u	1600u	--	--	--	--	--	--
Phenanthrene	1400	670	2400	620	940	2400	4300	3700	1600	1000	2100	850	240	1500	560	950000	540
Anthracene	530	4200u	580	160	180	730	1100	940	360	290	310	--	85.3	1100	220	370000	250
Carbazole	4400u	4200u	340	82	430u	390	490	360	460	4600u	260	--	--	--	--	--	--
Di-n-butylphthalate	4400u	4200u	450	210	370	6300u	6300u	74	4700u	4600u	38	11000	--	--	--	--	240
Fluoranthene	3200	1300	4000	710	390	4400	8100	3800	2100	2300	3200	2900	600	5100	750	1020000	1500
Pyrene	5500	1600	5500	1300	1200	4800	6900	6000	2200	2200	4800	--	665	2600	490	850000	1400
Butylbenzyl phthalate	300	4200u	940	240	430u	480	6300u	350	250	4600u	650u	11000	--	--	--	--	--
Benzo(a)anthracene	2400	810	2500	570	410	3000	4900	2500	1400	1500	2600	--	261	1600	320	1480000	690
Chrysene	3200	1200	4000	750	620	3100	5600	2600	1500	2100	3500	--	384	2800	340	460000	850
bis(2-ethylhexyl)phthalate	4400u	4200u	6500u	4500	1700	6300u	6300u	1000	4700u	4600u	650u	--	--	--	--	--	2700
Benzo(b)fluoranthene	4800	2300	5200	1300	1000	4800	7900	4200	2300	3800	6700	--	384	2800	340	460000	850
Benzo(a)pyrene	3200	1000	2900	670	610	2700	4500	2400	1300	1600	2500	430	430	1600	370	1440000	760
Indeno(1,2,3-cd)pyrene	2500	1000	2700	630	870	2100	2800	1600	1000	1400	2000	--	--	--	200	320000	--
Dibenz(a,h)anthracene	1200	410	1600	480u	380	1300	1200	720	380	990	1200	--	63.4	260	60	130000	140
Benzo(g,h,i)perylene	2800	980	3100	730	1200	2200	2400	1300	1100	1500	2000	--	--	--	170	320000	--
Pesticides/PCBs (ug/kg)																	
gamma-BHC	2.3u	2.7	3 3u	2.5u	2.2u	3.3u	3.3u	2.4u	2.4u	2.4u	3.3u	3.7	--	--	3	10	0.99
alpha-BHC	2.3u	2.2u	3.3u	2.5u	2.2u	6.6	3.3u	6.8	6.1	2.4u	3.3u	--	--	--	6	100	--
beta-BHC	2.3u	2.2u	3.3u	2.5u	5.8	3.3u	3.3u	2.4u	2.4u	2.4u	3.3u	--	--	--	5	210	--
delta-BHC	2.3u	2.2u	3.3u	2.5u	2.2u	6.4	3.3u	2.4u	2.4u	2.4u	3.3u	--	--	--	3	120	--
Heptachlor	3.5	2.2u	3.3u	9 3	3.4	16	3 3u	2.4u	2.4u	2.4u	3.3u	--	--	--	--	--	13000
Heptachlor epoxide	2.3u	2.2u	39	2 5u	2 2u	3.3u	3.3u	5.6	3u	2.4u	3.3u	--	--	--	5	50	--
Dieldrin	7.9	7.4	45	11	54	6.6	9.1	12	6.1	12	10	52	0.02	8	2	910	4 3
4,4-DDE	9	16	53	5.6	4.3u	16	29	10	6.6	29	230	--	2.2	27	5	190	27

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Table C-3
Comparison of Sediment Data to Sediment Screening Benchmarks
Album Incinerator
Lake Calumet Cluster Site
Chicago, Illinois
(Continued)

Source	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	U.S. EPA 1996	Long et al. 1991 [b]		Provincial		ORNL
Sample ID	ST01	ST02	ST03	ST04	ST05	ST06	ST07	ST08	ST09	ST10	ST11	EcoTox Threshold [a]	ER-L	ER-M	SQG [c]		PRG [d]
Depth (inches)	4 - 6	5 - 7	4 - 6	4 - 6	6 - 8	4 - 6	4 - 6	4 - 6	6 - 10	4 - 6	4 - 6	Freshwater			Low	Severe	
Notes	40 ft northwest of the site's southeastern corner.	Northeast edge of pond in southwestern portion of the site.	80 ft east o the site's entrance gate.	North of monitoring well P2 on the southern edge of the northeast pond	Offsite, 140 ft south and 5 ft east of the northeast corner of the site.	Offsite, 20 ft east and 8 ft north of the northeast corner of the site.	Offsite (upgradient), 100 ft west and 75 ft north of the northeastern corner.	Offsite, 25 ft west and 10 ft north of the northeast site fence corner.	Offsite, 140 ft east and 20 ft north of the northeast fence corner.	Background, in the drainage ditch east of railroad tracks beyong east end of 119th Street.	Background; fro ditch east of railroad tracks, 100 feet south of ST10.						
Endrin	9	21	110	16	46	38	24	35	23	28	65	20	0.02	45	3	1300	45
Endosulfan II	4.4u	6.5	6.5u	7.8	8.6	6.3u	6.3u	17	4.7u	4.6u	6.5u	5.4	–	–	–	–	5.5
4,4-DDD	27	41	130	26	34	38	63	31	10	52	61	–	–	–	8	60	7.8
Endosulfan sulfate	4.4u	4.2u	6.5u	4.9u	8	6.3u	6.3u	7.8	4.7u	4.6u	6.5u	5.4	–	–	–	–	–
4,4-DDT	17	21	170	10	38	60	60	25	27	210	880	1.6	1	7	7	120	52
Methoxychlor	23u	22u	82	25u	22u	33u	33u	24u	24u	24u	33u	19	–	–	–	–	19
Endrin ketone	4.4u	4.2u	24	4.9u	8.6	6.3u	12	10	5.5	10	6.5u	–	–	–	–	–	–
Endrin aldehyde	39	42	300	50	38	170	56	64	41	180	18	–	–	–	–	–	–
alpha-Chlordane	8	5.4	22	40	47	13	13	9.4	7.1	2.4u	3.3u	–	0.5	6	7	60	4.8
gamma-Chlordane	4.2	3.2	17	81	37	7	7.8	7.8	8.5	3.8	3.3u	–	0.5	6	7	60	4.8
Aroclor-1016	44u	42u	550u	210	200	140	63u	170	47u	46u	65u	23	22.7	180	7	530	–
Aroclor-1260	320u	210	760	190	490	210	63u	350	47u	46u	65u	23	22.7	180	5	240	63000
Inorganics (mg/kg)																	
Aluminum	12700	9660	16000	8290	14200	13800	16500	14100	12100	3930	5150	–	–	–	–	–	–
Antimony	6.4u	5.2u	17.2	14.1	8.9	7.7u	9.1u	6.6u	6.3u	7.3u	12.5	–	2	25	–	–	–
Arsenic	9	5.6	9.6	21.7	27.7	10.5	10.6	18.1	10.8	8.8	16.2	8.2	8.2	70	6	33	42
Barium	299	706	547	296	550	144	114	149	119	104	192	–	–	–	–	–	–
Beryllium	1.9	1.3	2.3	0.85	1.7	1.3	1	1.2	1.2	1.4	1.1	–	–	–	–	–	–
Cadmium	1.4	4.2	4.9	4.7	3.6	1.5u	1.8u	2.4	1.2u	1.8	1.6u	1.2	1.2	9.6	0.6	10	4.2
Calcium	2.00E+05	1.00E+05	2.00E+05	1.00E+05	1.00E+05	60900	63500	65200	75800	13000	22200	–	–	–	–	–	–
Chromium	286	564	295	297	572	136	42.2	160	67.4	14.7	40.5	61	81	370	26	110	160
Cobalt	7.6	18.4	11.9	9	16	11.7	14	10.7	11.8	6.4	7.5	–	–	–	–	–	–
Copper	100	124	173	76.1	201	68.7	62.4	80.2	61.1	56.7	69.3	34	34	270	16	110	110
Iron	54500	41600	46000	39900	36100	36300	27700	43400	29000	34600	64100	–	–	–	2.00E+04	40000	–
Lead	293	268	612	405	497	147	123	177	102	93.5	185	47	46.7	218	31	250	110
Magnesium	22500	18300	26500	21500	22900	25300	25400	26300	29300	3820	8750	–	–	–	–	–	–
Manganese	11400	6720	6540	8480	7870	2350	840	2960	1720	246	409	–	–	–	460	1110	–
Mercury	1.1	0.16	1.1	0.58	1.7	0.27	0.28	0.39	0.17	0.12	2.2	0.15	0.15	0.71	0.2	2	0.7
Nickel	74.6	26.9	69.4	25.6	54.6	34.1	40.8	39.6	36.4	17.7	16.1	21	20.9	51.6	16	75	43
Potassium	731	495	1900	842	1600	2190	3520	2320	3260	521u	576u	–	–	–	–	–	–
Selenium	0.39	0.51	3.5	0.85	0.86	0.64	0.37u	0.52	0.86	0.91	1.6u	–	–	–	–	–	–
Silver	1.2u	1u	1.7u	1.4u	1u	1.5u	1.7u	1.3u	4.3	1.4u	1.5u	–	1	3.7	–	–	1.8
Sodium	602	400	826	615	700	566	452	512	941	527	583	–	–	–	–	–	–
Thallium	0.21u	0.15u	0.26u	0.22u	0.31	0.42	0.5	0.46	0.61	0.28	0.4	–	–	–	–	–	–
Vanadium	96.6	90.5	107	123	62.5	51.1	44.6	59.4	38.2	21.8	19.5	–	–	–	–	–	–
Zinc	451	1040	770	735	1660	264	173	336	196	167	286	150	150	410	120	820	270
Cyanide	0.74u	0.56	1.2	0.86u	4.8	0.93	1u	0.75u	0.71u	0.83u	0.94u	–	–	–	–	–	–

Shading indicates value exceeds lowest screening benchmark; bold indicates values exceeds highest screening benchmark.
– = Not available.
u = Not detected; numerical value presented is the sample quantitation limit.
a = U.S. EPA (1996). *Ecotox Thresholds*. ECO Update. Intermittent Bulletin Vol. 3 No. 2. Office of Solid Waste and Emergency Response. EPA/540/F-95/038.
b = Long, E.R., D.D. Macdonald, S.L. Smith, and F.D. Calder. "Incidence of Adverse Biological Effects Within Ranges of Chemical Concentrations in Marine and Estuarine Sediments". *Environ. Mgt.* 19(1):81-97.
c = Persaud, D., R. Jaagumagi, and A. Hayton. 1993. *Guidelines for the Protection and Management of Aquatic Sediment Quality*. Water Resources Branch. Ontario Ministry of the Environment.
d = Efroymson, R.A., G.W. Suter II, B.E. Sample, and D.S. Jones. 1996. *Preliminary Remediation Goals for Ecological Endpoints*. Environmental Restoration Risk Assessment Program. Oak Ridge National Laboratory. ES/ER/HM-162/R1.

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Table
Comparison of Sediment Data to Sediment Screening Benchmarks
U.S. Drum II
Lake Calumet Cluster Site
Chicago, Illinois

Source	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	U S EPA 1996	Long et al 1991 [a]		Provincial		ORNL
Sample ID	ST01	ST02	ST03	ST04	ST05	ST06	ST07	ST08	ST09	EcoTox Threshold [a] Freshwater	ER-L	ER-M	SQG [a] Low	SQG [a] Severe	PRG [a]
Depth (inches)	3 - 6	2 - 4	3 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6						
Notes	Approx 15 ft south of the telephone pole located near the northwestern site corner	Approx 30 ft southwest of the Paxton Landfill's nested monitoring wells, near the northeastern site corner	Standing water in the southeastern site quadrant, approx. 350 ft south and 100 ft east of the southeastern corner of the concrete platform	Offsite, in eastern drainage ditch, upgradient, at a point about 75 ft north of the northern site boundary, Background	Offsite, in the eastern drainage ditch, about 250 ft south of ST04 location and about 75 ft south of the southern side of the concrete platform.	Offsite, in the eastern drainage ditch, about 100 ft south of ST06	Offsite, just north of 122nd St at the northeastern corner of a small pond located south of the site's southeastern corner.	Offsite pond east of railroad tracks and approx 100 ft south of an east-west line at ST05 location, background	Offsite, approx. 100 ft north of the northern site boundary at the edge of a pond located east of the railroad tracks; background						
Volatile Organic Compounds (ug/kg)															
Vinyl chloride	15u	3	15u	14 u	17 u	14 u	110u	22u	14 u	–	–	–	–	–	–
Methylene chloride	15u	5	3	24	200	60	98	22u	11	–	–	–	–	–	18000
Acetone	21	17u	15u	190	710u	1100u	1900 b	85	130 b	–	–	–	–	–	9 1
1,1-Dichloroethane	15u	11	15u	14 u	17 u	14 u	110u	22u	14 u	–	–	–	–	–	27
1,2-Dichloroethene (Total)	15u	16u	15u	14 u	17 u	14 u	110u	22u	11	–	–	–	–	–	400
Chloroform	15u	14	15u	14 u	17 u	14 u	110u	22u	14 u	–	–	–	–	–	960
1,2-Dichloroethane	15u	73	15u	14 u	17 u	14 u	110u	22u	14 u	–	–	–	–	–	4300
1,1,1-Trichloroethane	15u	9	15u	14 u	17 u	14 u	110u	22u	14 u	170	–	–	–	–	9600
Trichloroethene	15u	5	15u	14 u	17 u	14 u	110u	22u	1	1600	–	–	–	–	52000
Benzene	15u	37	15u	14 u	17 u	14 u	110u	22u	14 u	57	–	–	–	–	160
Tetrachloroethene	15u	10	15u	14 u	17 u	14 u	110u	22u	14 u	530	–	–	–	–	3200
Toluene	15u	14	15u	14 u	17 u	14 u	110u	22u	4	670	–	–	–	–	50
Chlorobenzene	15u	16u	15u	14 u	2	14 u	110u	22u	14 u	820	–	–	–	–	417
Ethylbenzene	15u	4	15u	14 u	17 u	14 u	110u	22u	14 u	3600	–	–	–	–	5400
Xylene (total)	15u	30	15u	14 u	17 u	14 u	110u	22u	3	25	–	–	–	–	160
Semivolatile Organic Compounds (ug/kg)															–
1,2-Dichlorobenzene	510u	40	4990u	14000u	550u	450u	730u	720u	450u	340	–	–	–	–	330
Isophorone	74	87	490u	14000u	550u	450u	730u	720u	450u	–	–	–	–	–	–
Naphthalene	48	90	490u	14000u	550u	450u	130	730	310	480	160	2100	–	–	390
2-Methylnaphthalene	31	61	490u	14000u	550u	450u	110	880	450	–	70	670	–	–	–
Acenaphthylene	510u	530u	490u	14000u	550u	450u	77	230	260	–	44	640	–	–	130
Acenaphthene	510u	530u	490u	14000u	550u	450u	480	91	450u	820	16	500	–	–	89
Dibenzofuran	510u	530u	490u	14000u	550u	450u	260	350	170	2000	–	–	–	–	420
Fluorene	510u	530u	490u	14000u	550u	450u	530	98	30	540	19	540	190	160000	140
Phenanthrene	120	190	210	14000u	76	450u	4900	1400	720	850	240	1500	560	950000	540
Anthracene	510u	44	29	14000u	550u	450u	1400	280	130	–	85 3	1100	220	370000	250
Carbazole	510u	530u	490u	14000u	550u	450u	360	190	98	–	–	–	–	–	–
Fluoranthene	880	680	280	14000u	120	450u	7600	2200	1100	2900	600	5100	750	1020000	1500
Pyrene	300	360	230	14000u	110	450u	6200	2100	1400	–	665	2600	490	850000	1400
Butylbenzyl phthalate	510u	53	490u	14000u	550u	450u	730u	720u	450u	11000	–	–	–	–	–
Benzo(a)anthracene	140	220	120	14000u	94	450	5100	1300	790	–	261	1600	320	1480000	690
Chrysene	230	320	140	14000u	110	24	4000	1800	990	–	384	2800	340	460000	850
bis(2-ethylhexyl)phthalate	790	840	100	990	210	54	1000	270	110	–	–	–	–	–	2700
Benzo(b)fluoranthene	310	470	160	14000u	140	450u	7100	2700	1500	–	–	–	–	–	–
Benzo(a)pyrene	170	150	82	14000u	59	450u	2500	1100	460	430	430	1600	370	1440000	760
Indeno(1,2,3-cd)pyrene	510u	530u	490u	14000u	550u	450u	800	410	270	–	–	–	200	320000	–
Benzo(g,h,i)perylene	510u	530u	490u	14000u	550u	450u	910	360	400	–	–	–	170	320000	–
Pesticides/PCBs (ug/kg)															
gamma-BHC	6 6	6.6	3 4	3 7	3.3	2.3u	11	6.6	6.6	3 7	–	–	3	10	0 99
beta-BHC	2 6u	2.7u	2 5u	2 4u	2 8u	2.3u	3 8u	5.2	3 1	–	–	–	5	210	–
Heptachlor	6 9	4 7	2 5u	2 4u	2 8u	2.3u	3 8u	3.7u	2 3u	–	–	–	–	–	13000
Aldrin	3.5	2.7u	2 5u	12	2 8u	2 3u	3 8u	7.1	4.4	–	–	–	2	80	80
Heptachlor epoxide	2.6u	2 7u	2 5u	2 8	2 8u	2.3u	3 8u	3 7u	2 3u	–	–	–	5	50	–
Dieldrin	5 1u	5 3u	8 2	4 6u	5 5u	4 5u	7 3u	7.2u	4 5u	52	0 02	8	2	910	4 3
4,4-DDE	7	8.4	4 9u	4 6u	5 5u	4.5u	7.3u	70	15	–	2 2	27	5	190	27
Endrin	5 1u	5 3u	4 9u	8.1	5 5u	4.5u	7 3u	7.2u	4 5u	20	0 02	45	3	1300	45
4,4-DDD	6 8	5 3u	2 4	4.6u	5 5u	4.5u	7.3u	44	6	–	–	–	8	60	7 8
Endosulfan sulfate	8.6	6.8	4 9u	4 6u	5 5u	4 5u	7.3u	7 2u	4 5u	5 4	–	–	–	–	–
4,4-DDT	8.6	7	4 9u	8.6	5 5u	4 5u	7.3u	260	160	1 6	1	7	7	120	52
Endrin ketone	5 1u	5 3u	4 9u	30	5 5u	4.5u	7 3u	7 2u	4 5u	–	–	–	–	–	–
Endrin aldehyde	5 1u	5 3u	4 9u	4.6u	5 5u	4 5u	7 3u	7 2u	7 5	–	–	–	–	–	–
alpha-Chlordane	3.6	3.2	2.5u	8.4	2 8u	2.3u	3 8u	3 7u	2 3u	–	0.5	6	7	60	4 8
gamma-Chlordane	2 6u	2 7u	2 5u	6.2	2 8u	2 3u	3 8u	3 7u	2 3u	–	0 5	6	7	60	4 8
Aroclor-1248	260	250	49u	46u	55u	45u	73u	72u	45u	23	22 7	180	30	1500	1000
Aroclor-1254	140	130	49u	46u	55u	45u	73u	72u	43u	23	22 7	180	60	340	72000
Inorganics (mg/kg)															
Aluminum	9970	8790	10100	9060	8810	3810	7150	3930	4640	–	–	–	–	–	–
Antimony	5 6	7.7	2 7u	2 8u	2 7u	2 4u	3 6u	3 6u	2 5u	–	2	25	–	–	–
Arsenic	7	8.1	3 6	13.9	11.3	3 5	5 9	16.3	6.2	8 2	8 2	70	6	33	42
Barium	86 9	107	76 1	50 7	41 7	22 4	41 7	108	81 6	–	–	–	–	–	–
Beryllium	0 83	0 74	0.71	0 75	0 5	0 05u	0 36	0 95	0 75	–	–	–	–	–	–

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Table C-4
Comparison of Sediment Data to Sediment Screening Benchmarks
U.S. Drum II
Lake Calumet Cluster Site
Chicago, Illinois
(Continued)

Source	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	U S EPA 1996 EcoTox Threshold[a] Freshwater	Long et al 1991[b]		Provincial SQG[c]		ORNL PRG[d]
Sample ID	ST01	ST02	ST03	ST04	ST05	ST06	ST07	ST08	ST09		ER-L	ER-M	Low	Severe	
Depth (inches)	3 - 6	2 - 4	3 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	0 - 6						
Notes	Approx 15 ft south of the telephone pole located near the northwestern site corner	Approx 30 ft southwest of the Paxton Landfill's nested monitoring wells, near the northeastern site corner	Standing water in the southeastern site quadrant, approx. 350 ft south and 100 ft east of the southeastern corner of the concrete platform	Offsite, in eastern drainage ditch, upgradient, at a point about 75 ft north of the northern site boundary, Background	Offsite, in the eastern drainage ditch, about 250 ft south of ST04 location and about 75 ft south of the southern side of the concrete platform	Offsite, in the eastern drainage ditch, about 100 ft south of ST05.	Offsite, just north of 122nd St at the northeastern corner of a small pond located south of the site's southeastern corner.	Offsite pond east of railroad tracks and approx 100 ft south of an east-west line at ST05 location, background.	Offsite, approx 100 ft north of the northern site boundary at the edge of a pond located east of the railroad tracks, background						
Cadmium	4	2.4	0.3u	0.31u	0.3u	0.26u	0.39u	0.74	0.38	1.2	1.2	9.6	0.6	10	4.2
Calcium	17500	89300	8790	51200	51700	52600	50500	12900	15300	–	–	–	–	–	–
Chromium	81.1	79.1	18.5	37.8	18.8	9.9	25	20.3	10.8	81	81	370	26	110	180
Cobalt	6.8	8.4	6.5	12.9	13.4	4.8	11.1	4.6	3.7	–	–	–	–	–	–
Copper	28.2	30.6	20.2	37.2	34.7	8.8	38.7	71.3	33.4	34	34	270	16	110	110
Iron	15900	18100	12500	24000	21400	8780	19100	18800	17800	–	–	–	20000	40000	–
Lead	73.7	91.8	25.1	33.2	27.8	11.2	86	119	67.1	47	46.7	218	31	250	110
Magnesium	7240	10900	3960	22500	25100	24100	23000	4730	5110	–	–	–	–	–	–
Manganese	1310	2630	261	887	488	273	850	158	187	–	–	–	460	1110	–
Mercury	0.09	0.11	0.07u	0.08u	0.07u	0.08u	0.09u	0.11	0.07u	0.15	0.15	0.71	0.2	2	0.7
Nickel	21.1	21.4	19.8	31.8	34	12.2	28.8	15.2	12.5	21	20.9	51.6	16	75	43
Potassium	1960	1810	1520	2610	2420	1100	2310	771	577	–	–	–	–	–	–
Selenium	1	0.86	0.83u	0.86u	0.83u	0.73u	1.1u	1.1u	0.77u	–	–	–	–	–	–
Sodium	201	268	98.4	384	485	328	1560	800	426	–	–	–	–	–	–
Thallium	0.96	2	0.47u	0.5	1.6	0.82	1.5	0.78	0.44u	–	–	–	–	–	–
Vanadium	30.8	45	20.2	24.7	21.8	12	27	26.5	14.8	–	–	–	–	–	–
Zinc	171	241	77	99.5	85.2	39.8	119	186	106	150	150	410	120	820	270
Cyanide	0.71u	1.1	0.69u	0.76u	0.74u	0.68u	0.85u	1u	1.2	–	–	–	–	–	–

Shaded value indicates lowest benchmark exceeded, bold indicates highest benchmark exceeded

u = Not detected; numerical value presented is the sample quantitation limit

a = U S EPA (1996) *Ecotox Thresholds* ECO Update Intermittent Bulletin Vol 3 No 2 Office of Solid Waste and Emergency Response EPA/540/F-95/038

b = Long, E R , D D Macdonald, S L Smith, and F.D Calder "Incidence of Adverse Biological Effects Within Ranges of Chemical Concentrations in Marine and Estuarine Sediments". *Environ. Mgt.* 19(1) 81-97.

c = Persaud, D , R Jaagumagi, and A Hayton 1993 *Guidelines for the Protection and Management of Aquatic Sediment Quality*. Water Resources Branch. Ontario Ministry of the Environment.

d = Efroymson, R A., G W Suter II, B E Sample, and D S Jones 1996. *Preliminary Remediation Goals for Ecological Endpoints*. Environmental Restoration Risk Assessment Program Oak Ridge National Laboratory ES/ER/RM-162/R1

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Tab

Comparison of Sediment Data to Sediment Screening Benchmarks
MSD #4
Lake Calumet Cluster Site
Chicago, Illinois

Source	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	U.S. EPA 1996	Long et al. 1991 [b]		Provincial		ORNL
Sample ID	ST01	ST02	ST03	ST04	ST05	ST06	ST07	ST08	EcoTox Threshold [a]	ER-L	ER-M	SQG [c]		PRG [d]
Estimated depth (inches)	0 - 6			0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	Freshwater			Low	Severe	
Notes	East of Crandon Ave., near 124th St.	West of Crandon Ave., near 124th St.	West of Crandon Ave, south of 124th St.	In ditch on south side of 122nd St, west of gun club property.	Outlet of Dead Stick Lake to Calumet River.	Head of ditch draining the pond by the gun club building.	Outlet of ditch draining the pond by the gun club building.	South of 122nd St., east of the Norfolk and Western RR.						
Volatile Organic Compounds (ug/kg)														
Chloromethane	15u	16u	15u	32	16u	14u	13u	17u	--	--	--	--	--	--
Toluene	15u	16u	63	160	16u	14u	13u	17u	670	--	--	--	--	50
Chlorobenzene	15u	16u	15u	32	16u	14u	13u	17u	820	--	--	--	--	417
Ethylbenzene	15u	16u	15u	29	16u	14u	13u	17u	3600	--	--	--	--	5400
Xylene (total)	15u	16u	15u	93	16u	14u	13u	17u	25	--	--	--	--	160
Semivolatile Organic Compounds (ug/kg)														
4-Methylphenol	510u	520u	510u	530	510u	460u	410u	560u	--	--	--	--	--	--
Isophorone	510u	730	510u	380u	510u	460u	410u	560u	--	--	--	--	--	--
Naphthalene	510u	520u	510u	800	510u	460u	410u	560u	480	160	2100	--	--	390
2-Methylnaphthalene	510u	520u	510u	580	510u	460u	410u	560u	--	70	670	--	--	--
Acenaphthene	510u	520u	510u	770	510u	460u	410u	560u	620	16	500	--	--	89
Dibenzofuran	510u	520u	510u	800	510u	460u	410u	560u	2000	--	--	--	--	420
Diethylphthalate	510u	1300	680	380u	510u	460u	410u	560u	630	--	--	--	--	610
Fluorene	510u	520u	510u	1300	510u	460u	410u	560u	540	19	540	190	160000	140
Phenanthrene	510u	520u	510u	26000	510u	1800	810	1700	850	240	1500	560	950000	540
Anthracene	510u	520u	510u	1800	510u	460u	410u	560u	--	85.3	1100	220	370000	250
Carbazole	R	R	510u	2300	R	R	R	R	--	--	--	--	--	--
Di-n-butylphthalate	510u	2200	510u	380u	510u	460u	410u	560u	--	--	--	--	--	240
Fluoranthene	510u	520u	510u	38000	560	2300	840	2600	2900	600	5100	750	1020000	1500
Pyrene	510u	520u	510u	34000	610	2000	870	2200	--	665	2600	490	850000	1400
Butylbenzyl phthalate	510u	520u	1000	380u	510u	460u	410u	560u	11000	--	--	--	--	--
Benzo(a)anthracene	510u	520u	510u	16000	510u	960	410u	1500	--	261	1600	320	1480000	690
Chyrsene	510u	520u	510u	14000	510u	920	410u	1500	--	384	2800	340	460000	850
Benzo(b)fluoranthene	510u	520u	510u	1600	870	460u	410u	560u	--	384	2800	340	460000	850
Benzo(k)fluoranthene	510u	520u	510u	1100	510u	1400	410u	2900	--	--	--	240	1340000	--
Benzo(a)pyrene	510u	520u	510u	1100	510u	720	410u	1400	430	430	1600	370	1440000	760
Indeno(1,2,3-cd)pyrene	510u	520u	510u	380u	510u	460u	410u	900	--	--	--	200	320000	--
Benzo(g,h,i)perylene	510u	520u	510u	380u	510u	470	410u	880	--	--	--	170	320000	--
Pesticides/PCBs (ug/kg)														
Dieldrin	2.3	2.1	0.5	R	R	R	R	R	52	0.02	8	2	910	4.3
4,4-DDE	2.5	51	54	R	R	R	R	R	--	2.2	27	5	190	27
4,4-DDD	3.8	37	47	67	R	R	R	R	--	--	--	8	60	7.8
4,4-DDT	4.1	11	12	R	R	R	R	R	1.6	1	7	7	120	52
alpha-Chlordane	2.6u	1.4	2.6u	R	R	R	R	R	--	0.5	6	7	60	4.8
gamma-Chlordane	0.61	3.2	2.6u	R	R	R	R	R	--	0.5	6	7	60	4.8
Aroclor-1248	61	92	50u	10000	R	R	R	R	23	22.7	180	30	1500	1000
Aroclor-1254	68	51u	50u	R	R	R	R	R	23	22.7	180	60	340	72000
Aroclor-1260	50u	75	50u	6100	R	R	R	R	23	22.7	180	5	240	63000
Inorganics (mg/kg)														
Aluminum	3430	5150	4510	12300	6380	2020	4110	14600	--	--	--	--	--	--
Arsenic	3.6	3.8	3.6	10.1	10	3.2	17.6	2.8	8.2	8.2	70	6	33	42
Barium	38.4	61.5	40.7	518	59.5	18.8	28.9	214	--	--	--	--	--	--
Beryllium	0.57	0.6	0.59	1.1	0.54	0.34u	0.39	3.4	--	--	--	--	--	--
Cadmium	1.1	2.9	0.38u	6.9	0.4u	0.44	0.37u	0.93	1.2	1.2	9.6	0.6	10	4.2
Calcium	4.59E+04	3.75E+04	2.78E+04	9.16E+04	6.00E+04	55100	50700	1.00E+05	--	--	--	--	--	--
Chromium	36.9	62.9	10.2	193	49	16	9	34.6	81	81	370	26	110	160
Cobalt	4.1	5.5	4.7	9.8	5.9	2.9	8	2.2	--	--	--	--	--	--
Copper	23.8	40.5	11.7	206	32	15.9	26.5	29.4	34	34	270	16	110	110

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Table C-5
Comparison of Sediment Data to Sediment Screening Benchmarks
MSD #4
Lake Calumet Cluster Site
Chicago, Illinois
(Continued)

Source	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	U.S. EPA 1996	Long et al. 1991 [b]		Provincial		ORNL
Sample ID	ST01	ST02	ST03	ST04	ST05	ST06	ST07	ST08	EcoTox Threshold [a]	ER-L	ER-M	SQG [c]		PRG [d]
Estimated depth (inches)	0 - 6			0 - 6	0 - 6	0 - 6	0 - 6	0 - 6	Freshwater			Low	Severe	
Notes	East of Crandon Ave., near 124th St.	West of Crandon Ave., near 124th St.	West of Crandon Ave, south of 124th St.	In ditch on south side of 122nd St, west of gun club property.	Outlet of Dead Stick Lake to Calumet River.	Head of ditch draining the pond by the gun club building.	Outlet of ditch draining the pond by the gun club building.	South of 122nd St., east of the Norfolk and Western RR.						
Iron	9990	12500	9580	**40200**	23100	7380	20400	9130	–	–	–	20000	40000	–
Lead	23.2	44.4	20.7	**261**	73	20.7	22.7	38.7	47	46.7	218	31	250	110
Magnesium	19200	17900	12900	32300	26400	27700	27400	25600	–	–	–	–	–	–
Manganese	463	469	220	**1720**	**1350**	248	534	**1310**	–	–	–	460	1110	–
Mercury	0.07u	0.09	0.06u	**0.77**	0.13	0.07u	0.06u	0.08u	0.15	0.15	0.71	0.2	2	0.7
Nickel	13.1	17.2	10.4	**45.1**	20.1	8.3	19.9	7	21	20.9	51.6	16	75	43
Potassium	956	771	679	2430	1520	501	892	1210	–	–	–	–	–	–
Selenium	0.68u	0.69u	0.67	2.4	0.61u	0.65u	0.57u	2.1	–	–	–	–	–	–
Silver	1.5u	1.5u	1.3u	**5.6**	1.3u	1.4u	1.2u	1.6u	–	1	3.7	–	–	1.8
Sodium	390	92.6	81.1	1380	219	258	171	1130	–	–	–	–	–	–
Vanadium	15.8	21.6	14.3	50.7	23.3	7.6	12.2	13.6	–	–	–	–	–	–
Zinc	87.2	137	50.5	**687**	494	55.2	124	200	150	150	410	120	820	270
Cyanide	0.7u	0.76u	0.65u	1.8	0.66u	0.71u	0.6u	0.82u	–	–	–	–	–	–

Shading indicates value exceeds lowest screening benchmark; bold indicates values exceeds highest benchmark.
– = Not available.
R = Unusable data.
u = Not detected; numerical value is the sample quantitation limit.
a = U.S. EPA (1996). *Ecotox Thresholds*. ECO Update. Intermittent Bulletin Vol. 3 No. 2. Office of Solid Waste and Emergency Response. EPA/540/F-95/038.
b = Long, E.R., D.D. Macdonald, S.L. Smith, and F.D. Calder. "Incidence of Adverse Biological Effects Within Ranges of Chemical Concentrations in Marine and Estuarine Sediments". *Environ. Mgt.* 19(1):81-97.
c = Persaud, D., R. Jaagumagi, and A. Hayton. 1993. *Guidelines for the Protection and Management of Aquatic Sediment Quality*. Water Resources Branch. Ontario Ministry of the Environment.
d = Efroymson, R.A., G.W. Suter II, B.E. Sample, and D.S. Jones. 1996. *Preliminary Remediation Goals for Ecological Endpoints*. Environmental Restoration Risk Assessment Program. Oak Ridge National Laboratory. ES/ER/RM-162/R1.

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Table 3
Comparison of Surface Water Data to Water Quality Criteria
Paxton Landfill
Lake Calumet Cluster Site
Chicago, Illinois

Source	ESI	ESI	ESI	ESI	ESI	ESI	ESI	U.S. EPA	
Sample ID	SW03	SW04	SW05	SW07	SW08	SW09	SW10	Water Quality Criteria	
Depth (feet)	0-1	0-1	0-1	0-1	0-1	0-1	0-1	Chronic	Acute
Notes	North of Paxton II, where ditch along Stony Island Ave. enters culvert to pass under Stony Island Ave. background	West of Paxton II, across Stony Island Ave., where culvert water from under Stony Island Ave. spills into Lake Calumet.	Northeast of Paxton I, from surface water body east of Norfolk and Western Railroad. Background	Leachate sump along north central edge of Paxton II.	Leachate sump along south central edge of Paxton II.	Leachate sump along east central edge of Paxton II.	Ditch along Stony Island Ave., approx. 30 ft west of northwestern corner of Paxton II.		
Volatile Organic Compounds (ug/l)									
Chloroethane	10u	10u	10u	110	50u	100u	10u	--	--
Methylene chloride	*10u*	*10u*	*10u*	10u	5	100u	10u	2200 a	26000 a
Acetone	10u	10u	10u	24u	190	1100	10u	1500 a	28000 a
1,1-Dichloroethane	10u	10u	10u	1	50u	100u	10u	47 a	830 a
1,2-Dichloroethene (Total)	10u	10u	10u	2	50u	100u	10u	590 a	1100 a
2-Butanone	10u	10u	10u	10	290	320u	10u	14000 a	240000 a
Benzene	10u	10u	10u	10u	23	13	10u	130 a	2300 a
4-Methyl-2-pentanone	10u	10u	10u	10u	15	43	10u	170 a	2200 a
Toluene	10u	10u	10u	10u	**310**	**170**	10u	9.8 a	120 a
Chlorobenzene	10u	10u	10u	10u	8	100u	10u	64 a	1100 a
Ethylbenzene	10u	10u	10u	10u	**380**	20	10u	7.3 a	130 a
Xylene (total)	10u	10u	10u	10u	**1400**	**48**	10u	13 a	230 a
Semivolatile Organic Compounds (ug/L)									
Phenol	10u	10u	10u	100u	100u	78	10u	110	3600
1,4-Dichlorobenzene	10u	10u	10u	100u	11	100u	10u	15 a	180 a
Naphthalene	10u	10u	10u	100u	37	21	10u	12 a	190 a
2-Methylnaphthalene	10u	10u	10u	100u	9	100u	10u	--	--
Acenaphthene	10u	10u	10u	100u	6	10	10u	23	80
Phenanthrene	10u	10u	10u	9	17	11	10u	6.3	30
Fluoranthene	10u	10u	10u	100u	6	100u	10u	6.16	33.6
Di-n-octylphthalate	10u	10u	10u	9	18	100u	10u	708 b	--
Pesticides/PCBs (ug/L)									
Aroclor-1232	1u	1u	1u	1u	2.2	R	1u	0.58 a	10 a
Inorganics (ug/l)									
Aluminum	**1140**	537	**1410**	**2780**	650	230	**5390**	87	750
Arsenic	2.3	1.4	5.8	22.8	27.2	23.2	8.1	190	360

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Table C-6
Comparison of Surface Water Data to Water Quality Criteria
Paxton Landfill
Lake Calumet Cluster Site
Chicago, Illinois
(Continued)

Source	ESI	ESI	ESI	ESI	ESI	ESI	ESI	U.S. EPA	
Sample ID	SW03	SW04	SW05	SW07	SW08	SW09	SW10	Water Quality Criteria	
Depth (feet)	0-1	0-1	0-1	0-1	0-1	0-1	0-1	Chronic	Acute
Notes	North of Paxton II, where ditch along Stony Island Ave. enters culvert to pass under Stony Island Ave. background	West of Paxton II, across Stony Island Ave., where culvert water from under Stony Island Ave. spills into Lake Calumet.	Northeast of Paxton I, from surface water body east of Norfolk and Western Railroad. Background	Leachate sump along north central edge of Paxton II.	Leachate sump along south central edge of Paxton II.	Leachate sump along east central edge of Paxton II.	Ditch along Stony Island Ave., approx. 30 ft west of northwestern corner of Paxton II.		
Barium	**130**	**132**	**55.9**	**612**	**645**	**1460**	**154**	4 a	110 a
Beryllium	1u	1u	1u	0.35	0.3u	0.3u	1u	0.66 a	35 a
Calcium	118000	100000	81800	104000	51900	48900	256000	116000 b	--
Chromium	9.3	6.1	10.7	**29.9**	**316**	**168**	**14.5**	11 (210+)	1 6 (1700+)
Cobalt	5u	5u	5u	28.3	37.3	14.4	9.1	23 a	1500 a
Copper	4u	4u	43.1	11	5.4	8.1	15.5	12+	18+
Iron	2810	1580	17200	8720	9760	2800	27100	1000	--
Lead	12.9	9.6	**90.5**	15	16.2	9	31	3.2+	82+
Magnesium	65700	58000	29900	405000	156000	350000	122000	82000 b	--
Manganese	218	117	**496**	289	195	180	1030	120 a	2300 a
Mercury	0.2u	0.2u	0.21	0.2u	0.2u	0.2u	0.2u	2.4	--
Nickel	14u	14u	14u	184	236	108	14u	160+	1400+
Potassium	30400	33500	14200	1790000	1430000	8580000	12200	53000 b	--
Selenium	1.4	1.2u	1.2u	70u	7u	nd	1.2u	5	20
Sodium	107000	99800	21200	4330000	5090000	17400000	175000	680000 b	--
Vanadium	5.1	3.5	6.3	19.6	75.3	61.2	14.9	20 a	280 a
Zinc	10.5	13.1	**274**	39.1	60.4	92.6	50.8	110+	120+
Cyanide	**42.7**	**72.4**	**67.1**	40u	40u	40u	**55.4**	5.2	22

Shading indicates value exceeds chronic criteria; bold indicates value exceeds acute criteria.
-- = Not available.
u = Not detected; numerical value is the sample quantitation limit.
+ = hardness-dependent criteria; assumes a hardness of 100 mg/L.
a = Tier II Secondary Chronic Value and Secondary Acute Value (Suter and Tsao, 1996).
b = Lowest chronic value reported in the literature for fish and daphnids (Suter and Tsao, 1996).
For chromium, the concentrations in parantheses are for trivalent chromium.

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Table
Comparison of Surface Water Data to Water Quality Criteria
MSD#4
Lake Calumet Cluster Site
Chicago, Illinois

Source	ESI	ESI	ESI	ESI	U.S. EPA	
Sample ID	SW01	SW02	SW03	SW04	Ambient Water Quality Criteria	
Depth	NA	NA	NA	NA	Chronic	Acute
Notes	East of Crandon Ave, near 124th St.	West of Crandon Ave, north of 124th St.	West of Crandon Ave, south of 124th St.	South of 122nd St, east of Norfolk and Western RR; Background		
Volatile Organic Compounds (ug/l)						
Acetone	40	21	10u	39	1500 a	28000 a
Toluene	10u	10u	**14**	10u	9.8 a	120 a
Semivolatile Organic Compounds						
No detections						
Pesticides/PCBs						
No detections						
Inorganics (ug/l)						
Aluminum	**255**	**336**	**9250**	**519**	87	750
Barium	**89**	**57.9**	**125**	**60.3**	4 a	110 a
Beryllium	0.4u	0.4u	**0.73**	0.4u	0.66 a	35 a
Calcium	50400	77800	90600	47800	116000 b	--
Cobalt	3.20	1.5u	9.50	1.5u	23 b	1500 b
Copper	6.5u	5.2u	**26.4**	**13.3**	12+	18+
Iron	737	**1470**	**16700**	**1580**	1000	--
Lead	**4.1**	**3.9**	**49**	**15.3**	3.2+	82+
Magnesium	55700	18000	26500	14800	82000 b	--
Manganese	82.1	**1520**	**928**	**470**	120 a	2300 a
Mercury	0.10	0.25	0.1u	0.1u	2.4	--
Nickel	10.9	4.1	21.7	3.7u	160+	1400+
Potassium	**55600**	7070	18800	4280	53000 b	
Sodium	300000	6440	5540	14000	680000 b	
Vanadium	3.5	2.3u	**21.4**	2.6	20 a	280 a
Zinc	39.8	23.5u	**127**	38.2	110+	120+
Cyanide	**50.3**	10u	10u	10u	5.2	22

Shading indicates chronic value was exceeded; bold indicate acute value was exceeded.
-- = Not available.
+ = hardness-dependent criteria; assumes a hardness of 100 mg/L.
a = Tier II Secondary Chronic Value and Secondary Acute Value (Suter and Tsao, 1996).
b = *Lowest chronic value reported in the literature for fish and daphnids (Suter and Tsao, 1996).*
u = Not detected; numerical value is the sample quantitation limit.

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Table C-8
Comparison to Groundwater Data to Water Quality Criteria
Paxton Landfill
Lake Calumet Cluster Site
Chicago, Illinois

Sample ID	G11S	G15S	G16S	R105	R108	G13S	G19S	G20S	G22S	G24S	G25F	G16S	G15S	G13D	G17D
Source	HARZA	HARZA	HARZA	HARZA	HARZA	HARZA	HARZA	HARZA	HARZA	HARZA	HARZA	IEPA	IEPA	IEPA	IEPA
Depth (ft)*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	20	NA	NA
Notes	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	North-central edge of Paxton II	NA	NA
Volatile organics compounds (ug/l)															
Benzene	–	–	5	5	–	240	–	–	–	21	70	60	–	–	–
Toluene	–	–	5	–	–	220	–	–	–	7	1300	–	300	–	–
Tetrahydrofuran	–	–	–	–	–	–	–	–	–	–	–	6600	–	–	–
Methoxy Methylethoxy propanol	–	–	–	–	–	–	–	–	–	–	–	–	–	–	80
Acetonitrile	–	–	–	–	–	–	–	–	–	–	–	–	40	–	–
Acetone	–	–	–	–	–	–	–	–	–	–	22000	–	140	–	–
Cyclohexanone	–	–	–	–	–	–	–	–	–	–	–	–	530	–	–
2-Methyl-2-propanol	–	–	–	–	–	–	–	–	–	–	–	–	–	20	–
2-Butanone	–	–	–	–	–	–	–	–	–	–	18000	–	–	–	–
1,1,1-Trichloroethane	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Styrene	–	–	–	–	–	66	–	–	–	68	–	–	–	–	–
Xylene	–	–	–	–	–	260	–	–	–	340	700	–	–	–	–
Ethylbenzene	–	–	–	–	–	19	–	–	–	–	170	–	–	–	–
1,2-Dichloroethene	–	–	–	–	–	–	–	–	–	–	18	–	–	–	–
Chloroethane	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Chlorobenzene	–	–	–	–	–	–	–	–	–	100	–	–	–	–	–
4-Methyl-2-pentanone	–	–	–	–	–	–	–	–	–	–	1200	–	–	–	–
1,1-Dichloroethane	–	–	–	–	–	–	–	–	–	–	37	–	–	–	–
Vinyl acetate	–	–	–	–	–	–	–	–	–	–	88	–	–	–	–
Trichloroethene	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2-Hexanone	–	–	–	–	–	–	–	–	–	–	20	–	–	–	–
1,2-Dichloropropane	–	–	–	–	–	–	–	–	–	–	10	–	–	–	–
Tetrachloroethene	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Semivolatile Organic Compounds (ug/L)															
Naphthalene	–	–	–	–	–	7000	–	–	–	76	–	–	–	30	–
Phenanthrene	–	–	–	–	–	150	–	–	–	4	–	–	–	20	–
Anthracene	–	–	–	–	–	30	–	–	–	2	–	–	–	–	–
Phenol	–	–	–	–	–	180	–	–	–	–	–	–	–	–	–
2-Methylphenol	–	–	–	–	–	290	–	–	–	–	–	–	–	–	–
4-Methylphenol	–	–	–	–	–	340	–	–	–	–	–	–	–	–	–
2,4-Dimethylphenol	–	–	–	–	–	640	–	–	–	–	–	–	–	–	–
2-Methylnaphthalene	–	–	–	–	–	500	–	–	–	–	–	–	–	–	–
Acenaphthylene	–	–	–	–	–	130	–	–	–	26	–	–	–	–	–
Dibenzofuran	–	–	–	–	–	78	–	–	–	–	–	–	–	–	–
Acenaphthene	–	–	–	–	–	16	–	–	–	3	–	–	–	–	–
Flourene	–	–	–	–	–	94	–	–	–	4	–	–	–	–	–
Fluoranthene	–	–	–	–	–	61	–	–	–	–	–	–	–	–	–
Diethylphthalate	–	–	8	–	–	–	–	–	–	–	–	–	–	–	–
Di-n-butylphthalate	6	4	5	5	–	3	–	–	–	–	–	–	–	–	–
Pyrene	–	–	–	–	–	64	–	–	–	–	–	–	–	–	–
Chrysene	–	–	–	–	–	17	–	–	–	–	–	–	–	–	–
Benzo(a)pyrene	–	–	–	–	–	18	–	–	–	–	–	–	–	–	–
Indeno(1,2,3-cd)pyrene	–	–	–	–	–	5	–	–	–	–	–	–	–	–	–
Benzo(k)fluoranthene	–	–	–	–	–	10	–	–	–	–	–	–	–	–	–
Benzo(b)fluoranthene	–	–	–	–	–	9	–	–	–	–	–	–	–	–	–
Benzo(a)anthracene	–	–	–	–	–	18	–	–	–	–	–	–	–	–	–
1,4-Dichlorobenzene	–	–	–	–	–	–	–	–	–	8	–	–	–	–	–
Bis(2-ethylhexyl)phthalate	–	–	–	–	–	–	–	–	–	37	–	–	–	–	–
Pesticides/PCBs (ug/L)															
Dieldrin	–	–	–	–	–	–	–	–	–	0 07	–	–	–	–	–
DDE	–	–	–	–	–	–	–	–	–	0 07	–	–	–	–	–
Inorganics (ug/L)															
Antimony	–	–	32	29	–	–	–	–	–	–	–	–	–	–	–
Arsenic	–	–	4 2	5 8	–	5 4	–	4 9	–	–	–	–	–	–	–
Barium	120	100	800	0 50	1100	460	130	330	740	820	–	–	–	–	–
Beryllium	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Boron	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Cadmium	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Calcium	122000	252000	32000	53400	120000	59400	276000	98900	101000	48300	–	–	–	–	–
Chromium	–	–	38	14	–	12	–	9 8	18	12	–	–	–	–	–
Cobalt	–	–	38	13	–	19	13	7 2	13	18	–	–	–	–	–
Copper	13	–	5 4	6 5	–	9 3	8 6	78	–	18	–	–	–	–	–
Cyanide	8 2	61	7.7	81	5 2	100	180	8	6 1	–	–	–	–	–	–
Iron	210	–	2800	1300	220	720	540	1100	1000	980	–	–	–	–	–
Lead	3	–	6.6	6.6	[illegible]	9 6	–	–	2 4	9.1	–	–	–	–	–
Magnesium	72200	170000	421000	123000	71000	168000	130000	222000	305000	181000	–	–	–	–	–
Manganese	287	87	20	86	250	140	180	150	47	68	–	–	–	–	–

Sample ID	G11S	G11D	G11S	G13S	G13D	G13S	R105	G105B	G130B	G17S	G104	G124	LP-1	LP-2	LP-3	LP-4	U S EPA Ambient Water Quality Criteria	
Source	RFW	RFW	RFW	RFW	RFW	RFW	RFW	RFW	RFW	RFW	RFW	RFW	RFW	RFW	RFW	RFW		
Depth (ft)*	20	NA	NA	Approx. 20	NA	NA	19 5	NA	NA	NA	NA	NA	NA	NA	NA	NA	Chronic	Acute
Notes	Northwestern corner of Paxton	NA	NA	Northwestern corner of Paxton	NA	NA	Southwestern edge of Paxton II	NA	NA	NA	NA	NA	NA	NA	NA	NA		
Volatile organics compounds (ug/l)																		
Benzene	–	–	–	340	–	–	–	–	–	–	–	–	–	15	100	–	130 e	2300 e
Toluene	–	–	–	310	–	–	–	–	–	–	–	–	–	300	190	10	9 8 e	120 e
Tetrahydrofuran	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Methoxy Methylethoxy propanol	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Acetonitrile	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Acetone	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1500 e	28000 e
Cyclohexanone	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2-Methyl-2-propanol	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2-Butanone	–	–	–	–	–	10	–	–	–	–	–	–	24	21	160	130	14000 e	240000 e
1,1,1-Trichloroethane	–	–	–	–	–	–	8	–	–	44	–	–	5	8	–	10	11 e	200 e
Styrene	–	–	–	92	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Xylene	–	–	–	340	–	–	–	–	–	26	–	–	–	440	180	20	13 e	230 e
Ethylbenzene	–	–	–	170	–	–	–	–	–	–	–	–	5	91	44	8	7 3 e	130 e
1,2-Dichloroethene	–	–	–	–	–	–	–	–	–	–	–	–	–	64	7	–	590 e	1100 e
Chloroethane	–	–	–	–	–	–	–	–	–	–	–	–	–	–	29	–	–	–
Chlorobenzene	–	–	–	–	–	–	–	–	–	–	–	–	–	7	–	–	64 e	1100 e
4-Methyl-2-pentanone	–	–	–	–	–	–	–	–	–	–	–	–	–	–	20	20	170 e	2200 e
1,1-Dichloroethane	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	47 e	830 e
Vinyl acetate	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	18 e	280 e
Trichloroethene	–	–	–	–	–	–	–	–	–	–	–	–	–	10	–	–	47 e	440 e
2-Hexanone	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	99 e	1800 e
1,2-Dichloropropane	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Tetrachloroethene	–	–	–	–	–	–	–	–	–	–	–	–	–	28	–	5	98 e	830 e
Semivolatile Organic Compounds (ug/L)																		
Naphthalene	–	–	–	6000	–	–	–	–	–	–	–	–	–	–	–	–	12 e	190 e
Phenanthrene	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	6 3	30
Anthracene	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0 73 e	13 e
Phenol	–	–	–	740	–	–	–	–	35	–	–	–	–	1200	–	87	110	3800
2-Methylphenol	–	–	–	1400	–	–	–	–	–	–	–	–	–	–	–	–	13 e	230 e
4-Methylphenol	–	–	–	980	–	–	–	–	120	–	–	–	–	70	80	–	–	–
2,4-Dimethylphenol	–	–	–	970	–	–	–	–	–	–	–	–	–	–	–	–	–	–
2-Methylnaphthalene	–	–	–	280	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Acenaphthylene	–	–	–	250	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Dibenzofuran	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3 7 e	66 e
Acenaphthene	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	23	80
Flourene	–	–	–	130	–	–	–	–	–	–	–	–	–	–	–	–	3 9 e	70 e
Fluoranthene	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	8 16	33 8
Diethylphthalate	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	210 e	1800 e
Di-n-butylphthalate	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	35 e	190 e
Pyrene	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Chrysene	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Benzo(a)pyrene	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0 014 e	0 24 e
Indeno(1,2,3-cd)pyrene	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Benzo(k)fluoranthene	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Benzo(b)fluoranthene	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Benzo(a)anthracene	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0 027 e	0 49 e
1,4-Dichlorobenzene	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	15 e	180 e
Bis(2-ethylhexyl)phthalate	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3 e	27 e
Pesticides/PCBs (ug/L)																		
Dieldrin	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
DDE	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Inorganics (ug/L)																		
Antimony	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	30 e	180 e
Arsenic	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	190	360
Barium	–	2300	1000	811	900	240	844	363	230	730	817	843	487	487	900	560	4 e	110 e
Beryllium	–	–	–	–	–	–	–	–	–	–	–	–	2.5	–	–	–	0 66 e	35 e
Boron	1800	–	980	6630	6670	1140	1700	600	1040	4000	3240	5500	4140	3420	17200	3100	1 8 e	30 e
Cadmium	7.0	–	–	10.8	10.6	–	–	–	–	18.7	6.4	11.1	–	–	27.8	28.8	1 1+	3 9+
Calcium	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	116000 c	–
Chromium	10.7	–	110	37.4	–	79.8	–	48.4	13.7	78.1	–	42.8	–	38	98.4	28.7	11 (210+)	16 (1700+)
Cobalt	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	23 e	1500 e
Copper	37.3	–	30	48.1	–	–	–	29.2	–	58.8	29.8	–	–	48.2	120	61.8	12+	18+
Cyanide	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5 2	22
Iron	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1000	–
Lead	150	–	13	54	–	8	19	–	5	79	–	5	28	138	318	80	3 2+	87+
Magnesium	136000	7240	20100	147000	277000	–	87600	8230	1030	225000	138000	219000	88500	15000	388000	402000	82000 c	–
Manganese	680	85 1	210	1170	220	48 3	230	48 7	28 8	2180	84.4	79 2	287	482	1280	807	120 e	2300 e

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Tab.
Comparison to Groundwater Data to Water Quality Criteria
Paxton Landfill
Lake Calumet Cluster Site
Chicago, Illinois
(Continued)

Sample ID	G11S	G15S	G16S	R10S	R10S	G13S	G19S	G20S	G22S	G24S	G25F	G18S	G15S	G13D	G17S	G11S	G11D	G11S	G13S	G13D	G13S	R10S	G105S	G130S	G17S	G104	G124	LP-1	LP-2	LP-3	LP-4	U S EPA Ambient Water Quality Criteria	
Source	HARZA	HARZA	HARZA	HARZA	HARZA	HARZA	HARZA	HARZA	HARZA	HARZA	HARZA	IEPA	IEPA	IEPA	IEPA	RFW	RFW	RFW	RFW	RFW	RFW	RFW	RFW	RFW	RFW	RFW	RFW	RFW	RFW	RFW	RFW		
Depth (ft)*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	20	NA	NA	20	NA	NA	Approx. 20	NA	NA	19.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	Chronic	Acute
Notes	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	North-central edge of Paxton II	NA	NA	Northwestern corner of Paxton	NA	NA	Northwestern corner of Paxton	NA	NA	Southwestern edge of Paxton II	NA	NA	NA	NA	NA	NA	NA	NA	NA		
Mercury	–	–		–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.26	1.6	–	0.62	–	–	–	–	0.28	–	–	–	0.48	–	–	2.4
Nickel	–	–	470	130	–	100	46	790	–	110	–	–	–	–	–	–	–	56.1	107	92.6	47.3	–	–	–	214	–	237	104	217	263	100	160+	1400+
Potassium	17700	33500	458000	280000	17800	298000	88800	141000	320000	374000	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	53000	–
Sodium	76400	80700	2590000	1300000	77000	1490000	721000	1230000	1380000	1980000	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	680000	–
Thallium	–	–	9.8	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	12 a	110 a
Vanadium	–	–	29	20	–	16	5	6.8	20	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	134	–	–	–	–	53.6	–	20 a	280 a
Zinc	240	56	41	51	42	136	100	80	100	176	–	–	–	–	–	176	–	82.6	103	40.4	30.1	42.9	20.3	19.9	428	36	12.8	43	671	1780	171	110+	120+

Shaded value indicates chronic criteria was exceeded; bold indicates acute criteria was exceeded.
NA = Not available.
– = Not available;not detected.
Groundwater data based on samples collected by HARZA in 1993; IEPA in 1987; and Roy F. Weston in 1989 and presented in ESI report.
a = Tier II Secondary Chronic Value and Secondary Acute value (Suter and Tsao, 1996).
b = Lowest chronic value reported in the literature for fish and daphnids (Suter and Tsao, 1996).
+ = hardness-dependent criteria; assumes a hardness of 100 mg/L.
u = Not detected; numerical value is the sample quantitation limit.
* Depth indicates the distance from the top of the well riser to bottom of well casing.
For chromium, the concentrations in parentheses are for trivalent chromium.

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Table C-9
Comparison of Groundwater Data to Water Quality Standards
Land and Lakes #3
Lake Calumet Cluster Site
Chicago, Illinois

Sample ID:	GW01	GW04	GW14	GW16	U.S. EPA Ambient Water Quality Criteria	
Source:	ESI	ESI	ESI	ESI		
Depth (ft)*:	12.26	11.6	8.18	6.1	Chronic	Acute
Notes:	MW-GA1S, northeastern corner of site.	MW-GA4S, southeastern corner of site.	MW-14S, southwestern corner of site.	MW-R16S, northwestern corner of site.		
Volatile Organic Compounds (ug/L)						
Chloromethane	10u	21	10u	10u	--	--
Vinyl chloride	10u	34	10u	10u	--	--
Chloroethane	10u	40	10u	10u	--	--
Methylene chloride	10u	11	10u	10u	2200 b	26000 b
Acetone	10u	10u	26	10u	1500 a	28000 a
Carbon disulfide	10u	**41**	10u	10u	0.92 b	17 b
1,1-Dichloroethane	10u	11	10u	10u	47 b	830 b
1,2-Dichloroethene (total)	10u	8	10u	10u	590 b	1100 b
2-Butanone	10u	150	10u	10u	14000 b	240000 b
Trichloroethene	10u	21	10u	10u	47 b	440 b
Benzene	**190**	**1100**	10u	10u	130 b	2300 b
4-Methyl-2-pentanone	10u	34	10u	10u	170 b	2200 b
Tetrachloroethene	10u	6	10u	10u	98 b	830 b
Toluene	**24**	**4000**	10u	10u	9.8 a	120 a
Ethylbenzene	**140**	**49**	10u	10u	7.3 b	130 b
Xylene	**470**	**180**	10u	10u	13 b	230 b
Semivolatile Organic Compounds (ug/L)						
2-Methylphenol	10u	**14**	10u	10u	13 b	230 b
4-Methylphenol	10u	21	10u	10u	--	--
2,4-Dimethylphenol	14	20	10u	10u	--	--
Naphthalene	10	**32**	10u	10u	12 b	190 b
2-Methylnaphthalene	10u	5	10u	10u	--	--
Bis(2-ethylhexyl)phthalate	10u	**20**	10u	10u	3 b	27 b
Pesticides/PCBs (ug/L)						
Delta-BHC	0.072	0.05u	0.15	0.05u	2.2 b	39 b
Aldrin	0.031	0.05u	0.05u	0.05u	--	--
Aroclor-1254	1u	**0.8**	1u	1u	0.033 b	0.6 b

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Tabl 9

Comparison of Groundwater Data to Water Quality Standards
Land and Lakes #3
Lake Calumet Cluster Site
Chicago, Illinois
(Continued)

Sample ID:	GW01	GW04	GW14	GW16	U.S. EPA Ambient Water Quality Criteria	
Source:	ESI	ESI	ESI	ESI		
Depth (ft)*:	12.26	11.6	8.18	6.1	Chronic	Acute
Notes:	MW-GA1S, northeastern corner of site.	MW-GA4S, southeastern corner of site.	MW-14S, southwestern corner of site.	MW-R16S, northwestern corner of site.		
Inorganics (ug/L)						
Arsenic	18.5	2u	2u	2u	190	360
Barium	**405**	**412**	**289**	73.4	4 a	110 a
Calcium	47000	202000	591000	956000	116000 b	--
Chromium	**66.9**	**17.1**	3u	3.9u	11 (210+)	16 (1700+)
Cobalt	18.2	4u	4.5	4u	23 b	1500 b
Copper	7.7	2.5	2u	2u	12+	18+
Iron	4340	29600	75.1	77.3u	1000	--
Lead	8.8	9	5	4.1	3.2+	82+
Magnesium	179000	176000	106u	24100	82000 b	--
Manganese	21.3	543	15.5	113	120 a	2300 a
Nickel	176	10u	10u	10u	160+	1400+
Potassium	714000	95000	148000	47800	53000 b	--
Selenium	4.1	4u	4u	4u	5	20
Sodium	2350000	248000	261000	199000	680000 b	--
Thallium	8.2	13.8	14.2	6u	12 b	110 b
Vanadium	24	5.9	5u	5.2	20 a	280 a
Zinc	14.7	2u	2u	2u	110+	120+
Cyanide	**22.7**	10.1	10u	10u	5.2	22

Shaded value indicates chronic criteria was exceeded; bold indicates acute criteria was exceeded.
-- = Not available.
+ = hardness-dependent criteria; assumes a hardness of 100 mg/L.
a = Tier II Secondary Chronic Value and Secondary Acute Value (Suter and Tsao, 1996).
b = Lowest chronic value reported in the literature for fish and daphnids (Suter and Tsao, 1996).
c = Risk-based concentration for tap water (U.S. EPA, 1996).
u = Not detected; numerical value is the sample quantitation limit.
* Depth indicates the distance from the top of the well riser to bottom of well casing.
For chromium, values in parantheses are for trivalent chromium.

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APPENDIX D

CHEMICAL PROPERTIES AND MIGRATION CHARACTERISTICS

Table D-1

Physical and Chemical Properties of Constituents of Potential Concern
Lake Calumet Cluster Sites
Chicago, Illinois

Constituent	Hazard Class	Physical Form	Physical Description	General Chemical Class	Molecular Weight (g/mole)	Log K_{oc}[a]	Log K_{ow}[b]	Density[c] (unitless)	Boiling Point (°C)	Viscosity	Water Solubility (mg/L)	Henry's Law Constant (atm-m³/mol)	Vapor Pressure (mm Hg)	Flash Point (°C)
Volatile Organic Compounds														
Acetone	Flammable	Liquid	Colorless, volatile liquid w/sweet, fragrant odor	Solvent	58.08	-0.43	-0.24	0.7910	56.2	0.316@ 25°C	Miscible	3.97×10^{5}	266 @ 25°C	-17
Benzene	Flammable	Liquid	Colorless to light yellow liquid, aromatic odor	Solvent	78.11	1.77	2.0	0.8790	80.1	NA	1750	7.0×10^{3}	95	12
2-Butanone	Flammable	Liquid	Colorless liquid w/sweet, mint-like odor	Solvent	72.11	0.09	0.28	0.8052	79.6	NA	239,000	4.66×10^{5}	100 @ 25°C	-9
Chlorobenzene	Flammable	Liquid	Clear, colorless liquid w/sweet, almond odor	Solvent	112.56	2.1	2.84	1.1058	131.8	0.799@ 20°C	439 @ 25°C	0.0037	9 @ 20°C	28
Chloroethane	Flammable	Liquid	Colorless liquid w/ ethereal odor	Solvent	64.52	0.51	1.43	0.8974	12.3	NA	4,700@ 25°C	0.0117	1,038@ 20°C	-50
Chloroform	Poison	Liquid	Clear, water-white volatile liquid	Solvent	119.38	1.64	1.94	1.4861	61.7	0.542@ 25°C	8,380@ 25°C	0.0032	198 @ 25°C	Noncombustible
Chloromethane	Flammable	Liquid	Colorless, compressed gas or liquid	Solvent	50.49	NA	0.91	0.92	-23.7	NA	Slightly	2.4×10^{2}	4309.7@30°C	0
1,2-Dichloroethane	Flammable	Liquid	Colorless liquid w/ pleasant odor	Solvent	98.96	1.21	1.46	1.247	83.5	NA	8,312@ 25°C	0.0010	64 @ 20°C	17
Ethylbenzene	Flammable	Liquid	Clear, colorless liquid w/gasoline-like odor	Solvent	106.17	2.20	3.11	0.8670	136.2	0.691@ 17°C	184 @ 25°C	0.0065	7.08 @ 20°C	15
Methylene chloride	Poison	Liquid	Colorless liquid w/sweet, ethereal odor	Solvent	84.93	0.94	1.28	1.3266	40.2	0.393@ 30°C	16,260@ 25°C	0.0026	448 @ 25°C	≥30
Vinyl acetate	Flammable	Liquid	Colorless liquid	Solvent	86.09	0.72	0.73	0.9345	0.73	NA	20,000	5.1×10^{-4}	110	-1.1
Tetrachloroethene	Poison	Liquid	Colorless liquid w/sweet, ethereal odor	Solvent	165.83	2.43	2.53	1.6226	121.2	NA	345 @ 25°C	0.0142	20 @ 25°C	Not flammable
Toluene	Flammable	Liquid	Colorless, water-white liquid w/pleasant odor	Solvent	92.14	2.12	2.57	0.8668	110.6	0.590@ 20°C	535 @ 25°C	0.0067	22 @ 20°C	4.4

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Table D-1

Physical and Chemical Properties of Constituents of Potential Concern
Lake Calumet Cluster Sites
Chicago, Illinois
(Continued)

Constituent	Hazard Class	Physical Form	Physical Description	General Chemical Class	Molecular Weight (g/mole)	Log K_{oc}[a]	Log K_{ow}[b]	Density[c] (unitless)	Boiling Point (°C)	Viscosity	Water Solubility (mg/L)	Henry's Law Constant (atm-m³/mol)	Vapor Pressure (mm Hg)	Flash Poi (°C)
Volatile Organic Compounds (Continued)														
Trichloroethene	Poison	Liquid	Clear, colorless watery liquid w/chloroform-like odor	Solvent	131.39	1.98	2.59	1.463	87.0	NA	1,285@ 25°C	0.010	73.3@ 25°C	32.2
Vinyl chloride	Flammable	Gas	Colorless liquified compressed gas	Solvent	62.5	0.39	0.60	0.9114	-13.4	NA	1,900@ 25°C	0.056@ 25°C	2630@ 25°C	-78°C
Xylenes (total)	Flammable	Liquid	Clear, colorless liquid	Solvent	106.17	2.54	3.13	0.8718	140.6	0.69@ 20°C	175@ 25°C	0.0064	7.883@ 25°C	23.1
Semivolatile Organic Compounds														
bis(2-Ethylhexyl)-phthalate	NA	Liquid	Colorless, oily liquid	Solvent	390.57	5.0	4.65	0.985	385	NA	0.35@ 25°C	1.1×10^{5}@ 25°C	6.2×10^{8}@ 25°C	207
m,p-Cresol[e]	Poison	Solid	Colorless solid w/ phenolic odor	Phenol	108.14	1.69	1.84	1.026	202	7.0@ 40°C	20,500@ 25°C	7.92×10^{-7}@ 25°C	0.11@ 25°C	86
o-Cresol	Poison	Solid	Colorless solid w/ phenolic odor	Phenol	108.14	1.34	1.96	1.040	191	4.49@ 40°C	25,500@ 25°C	1.23×10^{-4}@ 25°C	0.28@ 25°C	8
Dibenzofuran	NA	Solid	Solid	Furan	168.2	4.0	4.2	1.0886@ 99°C	287	N/A	10@ 25°C	NA	NA	NA
Di-n-butylphthalate	NA	Liquid	Colorless, oily liquid	Phthalate ester	278.35	3.14	4.56	1.046	338	NA	10@ 25°C	6.3×10^{-5}	1.4×10^{-5} @25°C	57
1,4-Dichlorobenzene	NA	Solid	White crystals w/moth ball-like odor	Solvent	147	2.2	3.45	1.2475	174.4	NA	79@ 25°C	0.00445@ 25°C	0.4@ 25°C	65.6
Diethylphthalate	NA	Liquid	Clear, colorless liquid w/mild chemical odor	Phthalate ester	222.24	1.84	2.29	1.123	298	NA	896@ 25°C	8.46×10^{-7}	0.22 (±.07) Pa @ 25°C	140
2,4-dimethylphenol	NA	Solid	White, crystalline, solid	Solvent	122.16	2.32	2.6	1.02	211.5	NA	7.870	2×10^{-4}	0.13	NA
2-Methylnaphthalene	NA	Solid	Solid	Solvent	142.2	3.9	3.98	1.0058	241	NA	25@ 25°C	NA	NA	97
Naphthalene	Flammable	Solid	White, crystalline flakes w/aromatic odor	Solvent	128.18	3.14	3.3	1.154	218	0.967@ 80°C	32@ 25°C	6.1×10^{-4}	0.052@ 20°C	79
Phenol	Poison	Solid	White crystals	Phenol	94.11	1.34	1.47	1.0576	182	3.49@ 50°C	81,000@ 25°C	2.2×10^{-7}	0.34@ 25°C	79

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Table D-1

Physical and Chemical Properties of Constituents of Potential Concern
Lake Calumet Cluster Sites
Chicago, Illinois
(Continued)

Constituent	Hazard Class	Physical Form	Physical Description	General Chemical Class	Molecular Weight (g/mole)	Log K_{oc}[a]	Log K_{ow}[b]	Density[c] (unitless)	Boiling Point (°C)	Viscosity	Water Solubility (mg/L)	Henry's Law Constant (atm-m³/mol)	Vapor Pressure (mm Hg)	Flash Point (°C)
Polynuclear Aromatic Hydrocarbons (PAHs)														
Acenaphthene	NA	Solid	White crystalline solid	PAH	154.21	4.05	4.12	1.024@ 90°C	279	N/A	3.7@ 25°C	$1.9x10^{-4}$	0.0055@ 25°C	NA
Acenaphthylene	NA	Solid	Solid	PAH	152.2	3.68	4.07	0.8988	280	NA	3.93@ 25°C	$1.97x10^{-4}$	0.0290@ 20°C	NA
Anthracene	NA	Solid	White to yellow fluorescent crystals	PAH	178.24	4.30	4.44	1.24	340	N/A	1.29@ 25°C	$6.51x10^{-5}$	$1.1x0^{-4}$	121.1
Benzo(a)anthracene	NA	Solid	Colorless leaflets or plates	PAH	228.3	6.14	5.81	1.274	438	N/A	0.012@ 25°C	$4.3x10^{-4}$	$1.1x10^{-7}$@ 25°C	NA
Benzo(a)pyrene	NA	Solid	Odorless, yellow crystals	PAH	252.32	5.94	6.02	1.351	495	N/A	0.0039@ 25°C	$<2.4x10^{-4}$	$5.4x0^{-9}$@ 25°C	NA
Benzo(b)fluoranthene	NA	Solid	Solid	PAH	252.32	5.74	6.57	NA	NA	N/A	0.0012@ 25°C	$1.2x10^{-5}$	$5x10^{-7}$@ 20°C	NA
Benzo(g,h,i)perylene	NA	Solid	Solid	PAH	276.34	6.89	7.10	NA	>500	N/A	0.00026@ 25°C	$1.4x10^{-7}$	$1.01x0^{-10}$@ 25°C	NA
Benzo(k)fluoranthene	NA	Solid	Solid	PAH	252.32	6.64	6.85	NA	480	N/A	0.00055@ 25°C	0.00104	$9.59x10^{-11}$@ 25°C	NA
Chrysene	NA	Solid	Fluorescent, othorhombic plates	PAH	228.3	5.39	5.71	1.274	448	N/A	0.0033@ 25°C	$7.26x10^{-20}$	$6.3x10^{-9}$@ 25°C	NA
Dibenzo(a,h)anthracene	NA	Solid	Crystalline solid	PAH	278.36	6.22	6.28	1.282	524	N/A	0.0015@ 25°C	$7.33x10^{-9}$	Approx. $1x10^{-10}$ @ 20°C	NA
1,4-dichlorobenzene	NA	Solid	White crystals	Benzene	147.01	2.79	3.3	1.458	173.7	N/A	73.8	$2.4x10^{-3}$	1.1	NA
1,2-dichloropropane	NA	Liquid	Colorless liquid	Solvent	112.99	1.64	2.2	1.1583	96.3	N/A	2,800	$2.8x10^{-3}$	50	NA
Fluoranthene	NA	Solid	Colorless crystals	PAH	202.26	4.62	5.22	1.252@ 0°C	375	N/A	0.242@ 25°C	0.0169	$5.0x10^{-4}$@ 25°C	NA
Fluorene	NA	Solid	Small white leaflets or flakes	PAH	166.22	3.70	4.27	1.203@ 0°C	296	N/A	1.68@ 25°C	$2.1x10^{-4}$	0.0006@ 33°C	NA

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Table D-1

Physical and Chemical Properties of Constituents of Potential Concern
Lake Calumet Cluster Sites
Chicago, Illinois
(Continued)

Constituent	Hazard Class	Physical Form	Physical Description	General Chemical Class	Molecular Weight (g/mole)	Log K_{oc}[a]	Log K_{ow}[b]	Density[c] (unitless)	Boiling Point (°C)	Viscosity	Water Solubility (mg/L)	Henry's Law Constant (atm-m³/mol)	Vapor Pressure (mm Hg)	Flash Poin (°C)
Polynuclear Aromatic Hydrocarbons (PAHs) (Continued)														
Indeno(1,2,3-cd)pyrene	NA	Solid	Solid	PAH	276.34	7.49	6.8	NA	536	N/A	0.062	2.96×10^{-20}	1×10^{-10} @ 25°C	NA
Phenanthrene	NA	Solid	Colorless, monoclinic crystals	PAH	178.24	4.22	4.44	1.179 @ 25°C	340	N/A	1.04 @ 25°C	4.7×10^{-5}	6.8×10^{-4} @ 25°C	171
Pyrene	NA	Solid	Colorless solid	PAH	202.26	4.82	5.14	1.271 @ 23°C	398	N/A	0.138 @ 25°C	1.48×10^{-5}	1.6×10^{-6} @ 25°C	NA
Pesticides/PCBs														
Aldrin	NA	Solid	White to tan-brown crystals, odorless to mild chemical odor	Pesticide	364.92	2.61	5.45	1.7 @ 20°C	145°C @ 2 mmHg	NA	0.26 @ 25°C	4.96×10^{-4}	6×10^{-6} @ 25°C	Noncombu tible
Chlordane	NA	Liquid	Colorless, viscous liquid	Pesticide	409.80	5.08	6.6	1.57 @ 60°C	175° @ 2 mmHg	NA	0.056	4.85×10^{-5}	1.0×10^{-5}	NA
Delta-BHC, gamma-BHC, alpha-BHC	NA	Solid	Solid	Pesticide	290.83	3.28	2.80	Approx 1.87	60 @ 0.36 mmHg	NA	26 @ 25°C	2.5×10^{-7}	1.7×10^{-5} @ 20°C	NA
Dieldrin	NA	Solid	Light tan, flaked solid	Pesticide	380.93	4.33	5.4	NA	NA	NA	0.195	1.51×10^{-5}	1.6×10^{-4}	NA
4,4'-DDT	NA	Solid	Colorless crystals to white powder, odorless to slight odor	Pesticide	354.49	5.42	5.91	1.56 @ 15°C	223	NA	0.0024 @ 25°C	3.47×10^{-5}	1.5×10^{-7} @ 25°C	72.2-77.2
DDD	NA	Solid	Colorless crystals	Pesticide	NA	5	5.9	NA	NA	NA	0.09	4×10^{-4}	8.7×10^{-7}	NA
DDE	NA	Solid	Colorless crystals	Pesticide	NA	6.65	6.0	NA	NA	NA	0.12	2.1×10^{-5}	5.7×10^{-4}	NA
Endosulfan II	NA	Solid	Colorless to brown crystals w/sulfuric dioxide odor	Pesticide	406.92	3.31	3.55	1.745 @ 20°C	NA	NA	0.530 @ 25°C	1.01×10^{-4} @ 25°C	1×10^{-5} @ 25°C	NA
Endosulfan sulfate	NA	Solid	Solid	Pesticide	422.92	3.37	3.66	NA	NA	NA	0.117	NA	NA	NA

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Table D-1

Physical and Chemical Properties of Constituents of Potential Concern
Lake Calumet Cluster Sites
Chicago, Illinois
(Continued)

Constituent	Hazard Class	Physical Form	Physical Description	General Chemical Class	Molecular Weight (g/mole)	Log K_{oc}[a]	Log K_{ow}[b]	Density[c] (unitless)	Boiling Point (°C)	Viscosity	Water Solubility (mg/L)	Henry's Law Constant (atm-m³/mol)	Vapor Pressure (mm Hg)	Flash Point (°C)
Pesticides/PCBs (Continued)														
Heptachlor epoxide	NA	Liquid	Liquid	Pesticide	389.32	4.32	4.53	NA	NA	NA	0.275@ 25°C	3.25×10^{-5}	2.6×10^{-4}@ 20°C	NA
Methoxychlor	NA	Solid	White, crystalline solid	Pesticide	345.65	4.99	5.7	NA	NA	NA	0.045	1.6×10^{-5}	1.2×10^{-4}	NA
Aroclor 1248; 1254, 1016; 1260; 1232; 1242	Miscellaneous	Liquid	Light yellow, oily liquid	PCB	288 (average)	5.64	6.11	1.41@ 25°C	Distills at 340-375	NA	0.05@ 20°C	0.0035	4.94×10^{-4}@ 25°C	193-196
Inorganics														
Antimony	Compound-specific	Solid	Very brittle, flaky crystalline solid	Metal	121.75	N/A	N/A	6.691	1,950	N/A	Insoluble	N/A	N/A	N/A
Arsenic	Poison	Solid	Gray, brittle, crystalline semimetallic solid	Metal	74.92	N/A	N/A	5.73	613	N/A	Insoluble	N/A	N/A	N/A
Barium	Flammable when wet	Solid	Soft, metallic silvery white solid	Metal	137.33	N/A	N/A	3.51	1,640	N/A	Decomposes	N/A	N/A	N/A
Beryllium	Compound-specific	Solid	Gray solid	Metal	9.01	N/A	N/A	1.85	2,970	N/A	Insoluble (cold water); decomposes (hot water)	N/A	N/A	N/A
Boron	Compound-specific	Solid	Non-mettallic; black, hard, solid; brown, amorphous powder	Metal	10.81	N/A	N/A	2.34	2550	N/A	Insoluble	N/A	N/A	N/A
Cadmium	Poison	Solid	Soft, bluish-white solid	Metal	112.41	N/A	N/A	8.65	765	N/A	Insoluble	N/A	N/A	N/A
Chromium	Compound-specific	Solid	Steel gray, lustrous hard metal	Metal	51.996	N/A	N/A	7.2	2,672	N/A	Insoluble	N/A	N/A	N/A
Cobalt	Compound-specific	Solid	Brittle, hard metal	Metal	58.93	N/A	N/A	8.9	2,870	N/A	Insoluble	N/A	N/A	N/A
Copper	Compound-specific	Solid	Reddish-colored metal	Metal	63.55	N/A	N/A	8.92	2,567	N/A	Insoluble	N/A	N/A	N/A

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Table D-1

Physical and Chemical Properties of Constituents of Potential Concern
Lake Calumet Cluster Sites
Chicago, Illinois
(Continued)

Constituent	Hazard Class	Physical Form	Physical Description	General Chemical Class	Molecular Weight (g/mole)	Log K_{oc}[a]	Log K_{ow}[b]	Density[c] (unitless)	Boiling Point (°C)	Viscosity	Water Solubility (mg/L)	Henry's Law Constant (atm-m³/mol)	Vapor Pressure (mm Hg)	Flash Point (°C)
Inorganics (Continued)														
Iron	Compound-specific	Solid	Silver-white malleable metal	Metal	55.85	N/A	N/A	7.86	3,000	N/A	Insoluble	N/A	1 mm @ 1757°C	N/A
Lead	Compound-specific	Solid	Soft, bluish-white metal	Metal	207.2	N/A	N/A	11.3	1,740	N/A	Insoluble	N/A	N/A	N/A
Manganese	Compound-specific	Solid	Brittle, silvery metal	Metal	54.94	N/A	N/A	7.20	2,097	N/A	Decomposes	N/A	1 mm @ 1292°C	N/A
Mercury	Corrosive	Liquid	Silvery-white liquid metal	Metal	200	N/A	N/A	13.59	357	1.554 @ 20°C	Insoluble	N/A	N/A	N/A
Nickel	Compound-specific	Solid	Hard, malleable, silvery-white metal	Metal	58.69	N/A	N/A	8.90	2,732	N/A	Insoluble	N/A	N/A	N/A
Selenium	Compound-specific	Solid	Metallic gray solid	Metal	78.96	N/A	N/A	4.81	685	N/A	Insoluble	N/A	N/A	N/A
Silver	Compound-specific	Solid	White, lustrous metallic solid	Metal	107.87	N/A	N/A	10.5	2,212	N/A	Insoluble	N/A	N/A	N/A
Thallium	Compound-specific	Solid	Bluish-white, soft metal	Metal	204.38	N/A	N/A	11.85	1,457	N/A	Insoluble	N/A	N/A	N/A
Vanadium	Compound-specific	Solid	Soft, bright white metal	Metal	50.94	N/A	N/A	5.96	3,380	N/A	Insoluble	N/A	N/A	N/A
Zinc	Flammable when wet	Solid	Bluish-white, lustrous, brittle metal	Metal	65.38	N/A	N/A	7.14	907	N/A	Insoluble	N/A	N/A	N/A
Cyanide	Poison	N/A	N/A	Inorganic ion	26.02	N/A	N/A	N/A	N/A	N/A	Compound-specific	N/A	N/A	N/A

NA - Not available.
N/A - Not applicable.

[a] Organic carbon partition coefficient.
[b] Octanol-water partition coefficient.
[c] Density of the compound at 20°C in relation to water at 4°C, unless specified.

[d] Information presented is for 1,1,2,2isomer.
[e] Information presented is for *p* isomer.
[f] Information presented is for 4,5,6isomer.

All information included in this table is referenced in the Reference section of this report.

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Table D-2

Migration Characteristics of Constituents of Potential Concern
Lake Calumet Cluster Sites
Chicago, Illinois

Constituent	Sorption	Biodegradability/Bioconcentration/ Biotransformation	Photodegradation Rates	Hydrolysis Rates	Chemical Transformations
Volatile Organic Compounds					
Acetone	Appreciable adsorption to most soils is not expected; however, there is some evidence that adsorption occurs to natural clay soils at optimum moisture content.	Readily biodegradable under both aerobic and anaerobic conditions/ negligible potential for bioconcentration in fish/no data on biotransformation products.	Average annual photodissociation loss rate at 40 deg. N latitude is $1.0 \times 10^{-7} sec^{-1}$, which corresponds to an average annual half-life of 22 days.	No data.	No data on environmentally significant transformations.
Benzene	Benzene is highly volatile, most of any released on moist soil or in shallow water will be lost to the atmosphere. Slight adsorpotion to soil or sediments.	Benzene is very volatile and most relesed on moist soil will be lost to the atmosphere. Bioconcentration is not expected in aquatic organisms/ no data on biotransformation.	Photodegradation which has a half-life of 17 days could contribute to benzene removal in situations of cold water, poor nutrients, or other conditions less conducive to microbial degradation.	Hydrolysis is not a significant process.	Products of photooxidation include phenol, nitrophenols, nitrobenzene, formic acid, and peroxyacetyl nitrate.
2-Butanone	Very high soil mobility is expected; therefore, sorption is not significant.	Biodegradation has been demonstrated under aerobic and anaerobic conditions/a BCF of 1.0 has been estimated, which indicates that bioconcentration in aquatic organisms should not be significant/no data or biotransformation products.	Reaction with photochemically produced hydroxyl radicals with a half-life of 2.3 days is the dominant atmospheric process; photolysis is possible in the surface layer of water, but rates have not been determined.	Hydrolysis is not a significant fate process.	Acetaldehyde is the primary product of reaction with hydroxyl radicals.

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Table D-2

Migration Characteristics of Constituents of Potential Concern
Lake Calumet Cluster Sites
Chicago, Illinois
(Continued)

Constituent	Sorption	Biodegradability/Bioconcentration/ Biotransformation	Photodegradation Rates	Hydrolysis Rates	Chemical Transformations
Volatile Organic Compounds (Continued)					
Chlorobenzene	Chlorobenzene would have moderate to high mobility in soil and slight to moderate absorption to sediments and suspended solids in water.	Little bioconcentration is expected into fish and food products. Chlorobenzene is fairly volatile, most of any released on moist soil will be lost to the atmosphere. Degradation is generally slow in water and soil but may be significant during warmer weather, when microbial activity is increased. Biodegradation half-life of chlorobenzene is 150 days in river water and 75 days in sediment.	Oxidation by hydroxyl radicals is relatively fast and results in a 5-10% loss/day. The half-life for chlorobenzene vapor reacting with photo-chemically generated hydroxyl radicals is 17 days.	No data.	Reactions with hydroxyl radicals results in the formation of chlorophenols. Chlorobenzene reacted with nitric acid produces chloronitrobenzene and chloronitrophenols, and at slow rates it produces monochlorobiphenyl.
Chloroethane	High soil mobility is expected; therefore, adsorption to soils should not be a significant fate process.	No data is available specifically for chloroethane, but anaerobic biodegradation has been demonstrated for chlorinated ethanes and methanes/the estimated log BCF is 0.67-0.86, which indicates that bioconcentration in aquatic organisms should not be significant/no data on biotransformation products.	Direct photolysis is not expected to occur; vapor phase reaction with photochemically produced hydroxyl radicals in the atmosphere occurs with a half-life of approximately 40 days.	The hydrolysis half-life in water at 25°C has been estimated to be 38 days.	Hydrolysis products are ethanol and HCl; in the atmosphere, formyl chloride is the initial photooxidation product.

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Table D-2

Migration Characteristics of Constituents of Potential Concern
Lake Calumet Cluster Sites
Chicago, Illinois
(Continued)

Constituent	Sorption	Biodegradability/Bioconcentration/ Biotransformation	Photodegradation Rates	Hydrolysis Rates	Chemical Transformations
Volatile Organic Compounds (Continued)					
Chloroform	Chloroform is adsorbed most strongly to peat moss, less strongly to clay, very slightly to dolomite limestone, and not at all to sand.	Slow but substantial biodegradation can occur under aerobic and anaerobic conditions using properly acclimated microbial populations/ little or no tendency to bioconcentrate in aquatic organisms/reductive dechlorination under anaerobic conditions has yielded methylene chloride and unidentified products.	Photodegradation is not significant in aquatic systems; in the atmosphere, reaction with photochemically produced hydroxyl radicals occurs, with a half-life of 80 days.	Negligible.	No data on environmentally significant transformations.
Chloromethane	Little adsorption to soil is expected due to the low log octanol/water partition coefficient.	Not a significant tendency to bioconcentrate in aquatic organisms/ no data on biotransformation.	Direct photolysis is not a significant loss process, reaction occurs with hydroxyl radicals via H-atom abstraction with a half-life of 1 year.	The hydrolysis half-life in water at 25°C and pH 7 has been estimated to be 0.93 years.	No data on environmentally significant transformations.
1,2-Dichloroethane	Little adsorption to soil is expected.	Only limited evidence for biodegradation/bioconcentration is not expected to be significant in aquatic organisms/no data on biotransformation products.	Direct photolysis is not a significant loss process; reaction occurs with hydroxyl radicals in the atmosphere, with a half-life of a little over a month.	Negligible.	Photooxidation products are CO_2 and HCl.
Ethylbenzene	Moderate adsorption to soil is expected.	Fairly rapid biodegradation in water after an acclimation period; slow biodegradation is expected in soils after acclimation/negligible bioconcentration in aquatic organisms/no information on biotransformation products.	Direct photolysis is not expected to occur; vapor-phase reaction with photochemically produced hydroxyl radicals occurs with a half-life of 5.5 hours in summer or 24 hours in winter.	Does not occur.	Photooxidation products include ethylphenol, benzaldehyde, acetophenone, and ethylnitrobenzene.

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Table D-2

Migration Characteristics of Constituents of Potential Concern
Lake Calumet Cluster Sites
Chicago, Illinois
(Continued)

Constituent	Sorption	Biodegradability/Bioconcentration/ Biotransformation	Photodegradation Rates	Hydrolysis Rates	Chemical Transformations
Volatile Organic Compounds (Continued)					
Methylene chloride	Adsorption occurs strongly to peat moss, less strongly to clay, only slightly to dolomite limestone, and not at all to sand.	Readily biodegradable under both aerobic and anaerobic conditions/ bioconcentration is not expected to be significant/biodegradation products include CO_2.	Direct photolysis does not occur in the troposphere; degradation by reaction with hydroxyl radicals does occur with a half-life of several months.	Negligible.	Hydrolysis with subsequent oxidation and reduction produces methyl chloride, methanol, formic acid, and formaldehyde.
Tetrachloroethene	Low to medium mobility in soil is expected; therefore, adsorption should be moderate.	There is no evidence for biodegradation under aerobic conditions, but slow biodegradation occurs under anaerobic conditions if the microbes have been acclimated/bioconcentration is not expected to be significant in aquatic organisms/biodegradation products include trichloroethene, cis- and trans-1,2-dichloroethene, methylene chloride, chloroethene, and vinyl chloride.	Reaction with photochemically produced hydroxyl radicals occurs in the troposphere with an estimated half-life of about 2 months; photooxidation also occurs.	Negligible.	The primary photooxidation product is phosgene.
Toluene	Moderate to very high mobility in soils is expected; therefore, adsorption should not be a significant fate process.	Readily biodegradable/BCFs of 1.67 to 380 have been reported for various aquatic organisms/ biodegradation products include cis-2,3-dihydroxy-2,3-dihydrotoluene, 3-methyl catechol benzyl alcohol, benzaldehyde, benzoic acid, catechol, and carbon dioxide.	Direct photolysis does not occur; photodegradation in natural waters is insignificant; atmospheric reaction occurs with photochemically produced hydroxyl radicals with a half-life of slightly over a day.	Negligible under normal environmental conditions.	Products of reaction with hydroxyl radicals in the atmosphere include nitrophenols, nitrocresols, nitrotoluenes, cresols, benzaldehyde, and benzyl nitrate.

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Table D-2

Migration Characteristics of Constituents of Potential Concern
Lake Calumet Cluster Sites
Chicago, Illinois
(Continued)

Constituent	Sorption	Biodegradability/Bioconcentration/ Biotransformation	Photodegradation Rates	Hydrolysis Rates	Chemical Transformations
Volatile Organic Compounds (Continued)					
Trichloroethene	Very weak adsorption to most soils.	Slow biodegradation in water under most conditions/moderate bioconcentration in aquatic organisms/biodegradation products include cis- and trans-1,2-dichloroethene and vinyl chloride.	Direct photolysis does not occur; reaction occurs with hydroxyl radicals in the atmosphere, with a half-life of 5 days.	Hydrolysis does not occur under normal conditions.	Reaction with hydroxyl radicals in the atmosphere produces phosgene, dichloroacetyl chloride, and formyl chloride.
Vinyl acetate	Adsorption to most soils is expected to be minimal.	Some biodegradation does occur in aerobic conditions. Not a significant tendency to bioconcentrate in aquatic organisms/ no data on biotransformation.	Direct photolysis does not occur; reaction occurs with hydroxyl radicals in the atmosphere, with a half-life of 12 hours.	Hydrolysis half-life in water at 25°C and pH 7 is estimated at 7.3 days. Hydrolysis rate increases as pH increases.	No data on environmentally significant transformations.
Vinyl chloride	Adsorption to most soils is expected to be minimal.	Little data, but indications are that biodegradation does not occur in aerobic systems, but does occur slowly in anaerobic systems/ bioconcentration should be negligible/no data on biotransformation products.	Vapor-phase reaction with photochemically produced hydroxyl radicals occurs with a half-life of 1.5 days.	Negligible.	Products of reaction with hydroxyl radicals in the atmosphere include chloroacetaldehyde, HCl, chloroethylene epoxide, formaldehyde, formyl chloride, formic acid, and CO.

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Table D-2

Migration Characteristics of Constituents of Potential Concern
Lake Calumet Cluster Sites
Chicago, Illinois
(Continued)

Constituent	Sorption	Biodegradability/Bioconcentration/ Biotransformation	Photodegradation Rates	Hydrolysis Rates	Chemical Transformations
Volatile Organic Compounds (Continued)					
Xylenes (total)	Low to moderate adsorption is expected in most soils.	Readily biodegrades under aerobic conditions; biodegradation also occurs under anaerobic conditions, but requires dentrifying conditions/minimal potential for bioconcentration in aquatic organisms/reported biodegradation products include isomers of methylbenzyl alcohol, methylbenzaldehyde, toluic acid, and methyl catechol.	Reaction occurs with hydroxyl radicals in the troposphere with a half-life of less than 1 day.	Does not occur.	Photooxidation products include glyoxal and methylglyoxal.
Semivolatile Organic Compounds					
bis(2-Ethylhexyl)phthalate	Strong tendency to adsorb to soils and sediments.	Rapid biodegradation in aquatic systems following acclimation; biodegradation may occur in soils under aerobic conditions following acclimation/moderate bioconcentration in aquatic organisms is expected/no information on biotransformation products.	The photolysis half-life in water is estimated to be 143 days; it is unknown whether vapor-phase photolysis occurs.	Negligible.	No information on environmentally significant transformations.
m,p-Cresol	Cresol is relatively mobile in most soils; therefore, adsorption is minimal.	Rapid biodegradation in soil, water sewage, and activated sludge; degradation is slower under anaerobic conditions/negligible bioconcentration in fish/the primary bacterial degradation product is protocatechuic acid.	In the atmosphere, cresol reacts principally with photochemically generated hydroxyl radicals with a half-life of approximately 10 hours; the photolysis half-life in pure water is 35 days.	Does not occur.	No information on environmentally significant transformations.

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Table D-2

Migration Characteristics of Constituents of Potential Concern
Lake Calumet Cluster Sites
Chicago, Illinois
(Continued)

Constituent	Sorption	Biodegradability/Bioconcentration/ Biotransformation	Photodegradation Rates	Hydrolysis Rates	Chemical Transformations
Semivolatile Organic Compounds (Continued)					
o-Cresol	Cresol is relatively mobile in most soils; therefore, adsorption is generally minimal, but increases at higher pH levels.	Rapid biodegradation in soil, water, sewage, and activated sludge; degradation is slower under anaerobic conditions/negligible bioconcentration in fish/m-methylcatechol is a possible biodegradation product.	In the atmosphere, cresol reacts principally with photochemically generated hydroxyl radicals with a half-life of approximately 10 hours; the photolysis half-life in pure water is approximately 35 days.	Does not occur.	No information on environmentally significant transformations.
Dibenzofuran	Moderate to strong adsorption to soils is expected.	Rapid biodegradation occurs in soils and water under aerobic conditions with adapted microbes/ significant potential for bioconcentration in aquatic organisms.	Direct photolysis may occur in the atmosphere and in waters, but rates have not been determined; the estimated half-life for vapor-phase reaction with photochemically produced hydroxyl radicals is 11.3 hours.	Does not occur.	No information on environmentally significant transformations.
2,4-dimethylphenol	Moderate adsorption to soil and sediments.	Rapid biodegradation in water, especially rapid using activated sludge or sewage seed. Bioconcentration is negligible in fish.	During daylight hours it reacts with hydroxyl radicals with an estimated half-life of 8 hours. At night it degrades by reaction with nitrate radicals.	Negligible.	No information on environmentally significant transformations.
Di-n-butylphthalate	Moderate adsorption occurs in most soils; a water-soluble complex is formed with fulvic acid which increases mobility in soils.	Readily biodegradable under both aerobic and anaerobic conditions/ negligible bioconcentration in aquatic organisms/biodegradation products include monobutylphthalate and phthalic acid.	The estimated half-life for photolysis in natural water is 144 days; photolysis rates in air have not been determined; vapor-phase reaction with photochemically produced hydroxyl radicals occurs with half-life of 18 hours.	Hydrolysis rates increase significantly at alkaline pHs (estimated half-life at pH 9 is 76 days).	No data on environmentally significant transformations.

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Table D-2

Migration Characteristics of Constituents of Potential Concern
Lake Calumet Cluster Sites
Chicago, Illinois
(Continued)

Constituent	Sorption	Biodegradability/Bioconcentration/ Biotransformation	Photodegradation Rates	Hydrolysis Rates	Chemical Transformations
Semivolatile Organic Compounds (Continued)					
Dichlorobenzene (1,2-,1,3-,1,4-)	Moderate to tight adsorption to soil expected.	Aerobic biodegradation may occur in water; anaerobic biodegradation not expected/biotransformation may occur under aerobic conditions but not under anaerobic conditions/bioconcentration found in fish with BCF values of 270 to 560.	The half-line for the vapor phase reaction with hydroxyl radicals in the atmosphere has been estimated to be 24 days. Direct photolysis is insignificant.	Not expected to undergo significant hydrolysis.	No data on environmentally significant transformation.
Diethylphthalate	Varying KOC values of 526 and 94, show varying adsorption and mobility rate from low to high.	DEP is expected to biodegrade under aerobic conditions with a half-life of 2 days to >2 weeks. Anaerobic biodegradation is very slow or does not occur. BCF values indicate that bioconcentration in aquatic organisms is insignificant.	Reaction with hydroxyl radicals produces an estimated half-life of 22.2 hours. Degradation by direct photolysis not expected to occur.	Not expected to undergo significant hydrolysis.	No data on environmentally significant transformation.
2-Methylnaphthalene	Strong adsorption to soils is expected.	Rapid biodegradation in soils and water is expected after acclimation/bioconcentration is expected to be insignificant.	The aqueous photolysis half-life is estimated to be 54 hours; vapor-phase photolysis rates have not been determined, but the estimated half-life for reaction with photochemically produced hydroxyl radicals is 7.4 hours.	Negligible.	No information on environmentally significant transformations.

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Table D-2

Migration Characteristics of Constituents of Potential Concern
Lake Calumet Cluster Sites
Chicago, Illinois
(Continued)

Constituent	Sorption	Biodegradability/Bioconcentration/ Biotransformation	Photodegradation Rates	Hydrolysis Rates	Chemical Transformations
Semivolatile Organic Compounds (Continued)					
Naphthalene	Moderate adsorption to soils and sediment.	Readily biodegradable in water and sediment under aerobic conditions/ moderate bioconcentration in aquatic organisms/biodegradation products include 1,2-dihydro-1,2-dihydroxynaphthalene, naphthol, and 4-hydroxy-1-tetralene.	The estimated half-life for photolysis in surface water is 71 hours; photolysis rates in it have not been determined,but reaction with photochemically generated hydroxyl radicals has a half-life of < 1 day.	Negligible.	No information on environmentally significant transformations.
Phenol	Low adsorption to soils is reported.	Rapid biodegradation under aerobic conditions; moderate biodegradation under anaerobic conditions/insignificant bioconcentration in aquatic organisms/no information on biotransformation products.	Vapor-phase photolysis may occur, but rates have not been determined; the half-life for reaction with hydroxyl radicals in air is 0.61 days; reactions with photochemically produced hydroxyl and peroxyl radicals in water have half-lives of 100 and 19 hours of sunlight, respectively.	Negligible.	No information on environmentally significant transformations.

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Table D-2

Migration Characteristics of Constituents of Potential Concern
Lake Calumet Cluster Sites
Chicago, Illinois
(Continued)

Constituent	Sorption	Biodegradability/Bioconcentration/ Biotransformation	Photodegradation Rates	Hydrolysis Rates	Chemical Transformations
Polynuclear Aromatic Hydrocarbons (PAHs)					
Polynuclear aromatic hydrocarbons (PAHs)	In general, the lower molecular weight PAHs have a moderate potential to be adsorbed to soils and sediments, while the higher molecular weight PAHs have a strong potential; sorption increases with increasing soil organic carbon content.	In general, significant biodegradation can occur under aerobic conditions in both soils and water/PAHs generally have a moderate potential for bioconcentration in aquatic organisms, although higher molecular weight compounds have a higher potential than lower molecular weight compounds; many aquatic organisms have been shown to metabolize PAHs to some extent, which would limit bioconcentration/cis- and trans-dihydrodiols are major biodegradation products.	Photochemical oxidation of a number of PAHs in the atmosphere has been reported, with half-lives ranging from 7 to 30 days; photooxidation is also an important aquatic fate process, but rates vary widely among the different PAH compounds and depending on specific environmental conditions.	Insignificant.	Aqueous photooxidation products include peroxides, quinones, and diones.
Pesticides/PCBs					
Aldrin	Strong adsorption to soil is expected.	Slow biodegradation under most conditions; bioconcentration is expected to be significant; no information on biotransformation reactions.	Photogradation may occur in both air and water, but is not expected to be significant.	Negligible.	Major photodegradation products are dieldrin, photoaldrin, and photodieldrin.
Chlordane	Strong adsorption to soil and sediments is expected.	Very slow biodegradation in most conditions; bioconcentration is expected to be significant/ biotransformation is expected to be very slow.	If released to water, chlordane is not expected to undergo significant hydrolysis, oxidation, or direct photolysis.	Negligible.	May be biodegraded to dichlordene, oxychlordene, heptachlor, chlordene, chlorohydrin, 3-hydroxy-trans-chlordane.

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Table D-2

Migration Characteristics of Constituents of Potential Concern
Lake Calumet Cluster Sites
Chicago, Illinois
(Continued)

Constituent	Sorption	Biodegradability/Bioconcentration/ Biotransformation	Photodegradation Rates	Hydrolysis Rates	Chemical Transformations
Pesticides/PCBs (Continued)					
Delta-BHC, gamma-BHC, alpha-BHC	Fairly strong adsorption to soils and sediments is expected.	No information on delta-BHC, but gamma-BHC has been shown to biodegrade in soils and water under aerobic and anaerobic conditions (anaerobic degradation is more extensive)/alpha- and gamma-BHC have been shown to bioconcentrate to a moderate degree/no information on biotransformation products.	No data for delta-BHC, but for gamma-BHC, photolysis half-lives in natural waters of 169 to 1791 hours have been reported; no data on vapor-phase photolysis rates, but reaction of gamma-BHC with photochemically produced hydroxyl radicals in the atmosphere has a half-life of about 2.3 days.	No information for delta-BHC, but half-lives of 92 to 771 hours have been reported for gamma-BHC in natural waters.	No information on environmentally significant transformations.
Dieldrin	Strong adsorption to soil is expected.	Highly resistant to biodegradation; moderate to significant bioconcentration expected; no information on biotransformation reactions.	Photodegradation may occur in both air and water, but is not expected to be significant.	Negligible.	Major photodegradation product is photodieldrin.
Endosulfan I/Endosulfan sulfate	Strong adsorption to soil is expected.	Significant biodegradation is expected in the environment; bioconcentration is expected to be significant; the major biodegradation product of endosulfan is endosulfan sulfate.	Photolysis may be important, but little information is available.	Hydrolysis occurs readily under alkaline conditions, move slowly under neutral and acidic conditions (x-endosulfan hydrolysis half-line = 35 days at pH 7).	Interconversion of x-endosulfan and B-endosulfan occurs; endosulfan may be biodegraded to endosulfan sulfate.
Heptachlor epoxide	Strong adsorption to soil.	Highly resistant to biodegradation; extensive bioconcentration expected; no information on biotransformation reactions.	Vapor-phase reaction with photochemically-produced hydroxyl radicals has an estimated half-life of 1.5 days.	Negligible.	No information available.

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Table D-2

Migration Characteristics of Constituents of Potential Concern
Lake Calumet Cluster Sites
Chicago, Illinois
(Continued)

Constituent	Sorption	Biodegradability/Bioconcentration/ Biotransformation	Photodegradation Rates	Hydrolysis Rates	Chemical Transformations
Pesticides/PCBs (Continued)					
4,4'-DDT, 4,4'-DDD, 4,4'-DDE	4,4'- DDT exhibits extensive adsorption to soil. Appreciable units may remain in the soil for long periods of time, therefore it tends not to leach to groundwater.	Will bioconcentrate in aquatic organisms. May biodegrade in water.	Reacts with hydroxyl radicals with an estimated half-life of two days.	No information available.	Under simulated atmospheric conditions, 4,4' DDT decomposes to carbon dioxide and hydrochloric acid.
Methoxychlor	Remains in the upper layer of soil and does not leach significantly in soil. Adsorbs significantly to suspended solids and sediments in water.	Biodegradation increases with a decrease in oxygen availability. May bioconcentrate in aquatic organics.	Reacts with hydroxyl radicals with an estimated half-life of 6.75 hours.	Aquatic hydrolysis is relatively slow.	Major degradation products include dechlorinated methoxychlor (DMDD), and mono- and di- hydroxy derivatives of methoxychlor and DMDD.
Polychlorinated biphenyls (PCBs)	Strongly adsorbed to soils and sediments, especially those with high organic carbon content.	Slow biodegradation occurs in soils and water under both aerobic and anaerobic conditions/significant bioconcentration in aquatic organisms; bioaccumulation within the food chain also occurs.	Vapor-phase reaction with photochemically produced hydroxyl radicals has a half-life of approximately 40 to 80 days; aqueous photolysis occurs but rates have not been determined.	Negligible.	No information.
Inorganics					
Antimony	Antimony is expected to have little affinity for organic carbon, but does adsorb to clay minerals in soils.	Insignificant bioconcentration in aquatic organisms and small mammals/antimony can be reduced and methylated by microorganisms in the aquatic environment.	N/A	N/A	Antimony forms ionic complexes in the +3 and +5 oxidation states, although Sb(+5) is the more common species; antimony can change oxidation states via oxidation/reduction reactions.

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Table D-2

Migration Characteristics of Constituents of Potential Concern
Lake Calumet Cluster Sites
Chicago, Illinois
(Continued)

Constituent	Sorption	Biodegradability/Bioconcentration/ Biotransformation	Photodegradation Rates	Hydrolysis Rates	Chemical Transformations
Inorganics (Continued)					
Arsenic	Many arsenic compounds tend to adsorb to soils and sediments.	Moderate bioconcentration has been observed in some aquatic organisms/aquatic microorganisms may reduce arsenate to arsenite and a variety of methylated arsenicals.	N/A	N/A	Arsenic in water can undergo oxidation-reduction reactions, ligand exchange, and biotransformation; similar transformations occur in soils, with As (+5) predominating in aerobic soils, As (+3) in slightly reduced soils, and arsine, methylated arsenic, and elemental arsenic in very reduced conditions.
Barium	Strong adsorption in soils with high cation exchange capacity (i.e. fine textured mineral soils or soils with high organic matter content).	Significant bioconcentration has been observed in marine plants; low to moderate bioconcentration has been observed in other marine organisms.	N/A	N/A	Forms salts of low solubility with carbonate, arsenate, chromate, fluoride, oxalate, and phosphate ions; and soluble salts with chloride, hydroxide, nitrate, and acetate ions.
Beryllium	Beryllium is expected to be tightly adsorbed to most soils.	Negligible potential for bioconcentration/no data on biotransformation.	N/A	Soluble salts in soils and water are hydrolyzed to form insoluble beryllium hydroxide.	Beryllium undergoes anion exchange reactions by which one salt is converted to another, and complexation reactions with ligands present in soil.

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Migration Characteristics of Constituents of Potential Concern
Lake Calumet Cluster Sites
Chicago, Illinois
(Continued)

Constituent	Sorption	Biodegradability/Bioconcentration/ Biotransformation	Photodegradation Rates	Hydrolysis Rates	Chemical Transformations
Inorganics (Continued)					
Boron	Many boron compounds tend to absorb to soil and sediments depending on the pH of the water or the composition of the soil. The adsorption of boron may not be reversible in some soils.	Studies show that boron can be bioconcentrated but it is not a significant removal process. No evidence that boron is transformed or degraded in soil, water, or air.	N/A	N/A	Atmospheric boron may be in the form of particulate matter or aersols as borides, boron oxides, borates, boranes, organoboron compounds, trihalide boron compounds or borazines.
Cadmium	Little information is available, but some degree of adsorption is expected, depending on soil properties such as cation exchange capacity, pH, clay content, organic carbon content, etc.	Significant potential for bioconcentration in aquatic organisms, especially invertebrates; bioaccumulation occurs at all levels of the food chain.	N/A	N/A	Cadmium exists only in the +2 oxidation state; it commonly forms ionic complexes with several inorganic anions.
Chromium	Degree of sorption to soil depends primarily on the clay content of the soil; chromium is present in soil mainly as insoluble oxide, and therefore, is relatively immobile.	Negligible potential for bioconcentration in aquatic organisms.	N/A	N/A	Chromium undergoes oxidation-reduction reactions between the +3 and +6 oxidation states.

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Table D-2

Migration Characteristics of Constituents of Potential Concern
Lake Calumet Cluster Sites
Chicago, Illinois
(Continued)

Constituent	Sorption	Biodegradability/Bioconcentration/ Biotransformation	Photodegradation Rates	Hydrolysis Rates	Chemical Transformations
Inorganics (Continued)					
Cobalt	Cobalt is retained by oxides such as iron and manganese oxide, crystalline materials such as aluminosilicate and geothite, and natural organic substances in soil; in clay soils, adsorption may be due to ion exchange; in general, mobility of cobalt decreases at higher soil pH, probably due to formation of hydroxide or carbonate.	Negligible to moderate bioconcentration in various freshwater and marine organisms; molluscs, crustacea, and other bottom feeders can accumulate high levels.	N/A	N/A	Speciation in soils and water depends on pH, Eh, and concentrations of chelating/ complexing agents. Cobalt forms a very stable complex with EDTA.
Copper	No information.	No information.	N/A	N/A	Copper has two principle oxidation states: +1 and +2; it forms ionic compounds in both oxidation states.
Iron	No information.	No information.	N/A	N/A	Iron has two principle oxidation states: +2 and +3.
Lead	Lead is sorbed strongly to organic matter in soil; lead complexes generally become more soluble at acidic pHs.	Moderate to high bioconcentration in aquatic organisms; biomagnification has not been detected; lead is toxic to all aquatic biota/tetramethyl lead may form as a result of biological alkylation of lead compounds by microorganisms in anaerobic lake sediments.	N/A	N/A	Lead forms compounds of low solubility with the major anions found in natural waters; in the environment, Pb (+2) is the stable ionic species.

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Table D-2

Migration Characteristics of Constituents of Potential Concern
Lake Calumet Cluster Sites
Chicago, Illinois
(Continued)

Constituent	Sorption	Biodegradability/Bioconcentration/ Biotransformation	Photodegradation Rates	Hydrolysis Rates	Chemical Transformations
Inorganics (Continued)					
Manganese	Degree of sorption to the soil depends on organic content and ion exchange capacity ofthe soil. The soil adsorption constants for Mn (+2) span 5 orders of magnitude.	No information.	N/A	N/A	Manganese has 4 oxidation states (+2, +3, +4, and +7).
Mercury	Nonvolatile mercury compounds adsorb to soils and sediments; the degree of adsorption is related to the organic matter content of the soil.	Inorganic mercury can be methylated by microorganisms indigenous to soils, fresh water, and salt water/methyl mercury is rapidly accumulated by aquatic organisms and is also biomagnified within the food chain.	Organomercurials in the atmosphere are subject to direct photolysis, but rates have not been determined.	N/A	Elemental mercury oxidizes to mercury (II) oxide; mercury forms ionic compounds in the +1 and +2 oxidation states.
Nickel	In general, nickel is strongly adsorbed by soils; the degree of adsorption is affected by soil properties such as pH, organic matter content, type, and amount of clay minerals, etc.	Negligible bioconcentration in aquatic organisms/nickel in insoluble precipitates may be remobilized by microbial action under anaerobic conditions.	N/A	N/A	Soluble nickel in water may be removed from solution by precipitation or coprecipitation reactions; in both water and soils, nickel ferrite is the most stable solid compound.

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Table D-2

Migration Characteristics of Constituents of Potential Concern
Lake Calumet Cluster Sites
Chicago, Illinois
(Continued)

Constituent	Sorption	Biodegradability/Bioconcentration/ Biotransformation	Photodegradation Rates	Hydrolysis Rates	Chemical Transformations
Inorganics (Continued)					
Selenium	Sorption to soils is dependent on pH and Eh; metal selenides and selenium sulfides, which are insoluble, predominate in acidic soils; in alkaline soils, selenates, which have high solubility and little tendency to sorb onto soil particles, are the major selenium species.	Bioconcentration and bioaccumulation can occur in aquatic organisms; there is also some evidence of biomagnification in aquatic organisms/elemental and inorganic selenium can be methylated by microorganisms and subsequently volatilized to the atmosphere.	N/A	N/A	Under acidic conditions, selenite can be reduced to elemental selenium; in general, the more soluble and more mobile forms of selenium dominate under aerobic and alkaline conditions.
Silver	No information.	No information.	N/A	N/A	The silver ion forms ionic compounds with several common anions.
Thallium	Limited information, but thallium may partition from water onto soils and sediments.	Low to moderate bioconcentration in aquatic organisms/no evidence of biotransformation.	N/A	N/A	Exists in water primarily as a monovalent ion; Tl (+) forms complexes in solution with halogens, oxygen, and sulfur.
Tin	Tin cations are adsorbed to soils to some extent, depending on soil characteristics.	Low to moderate potential for bioconcentration of inorganic tin, higher bioconcentration potential for organic tin compounds; slow biodegradation of organic tin compounds may occur.	N/A	N/A	Tin forms inorganic and organic compounds in the +2 and +4 oxidation states.

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Migration Characteristics of Constituents of Potential Concern
Lake Calumet Cluster Sites
Chicago, Illinois
(Continued)

Constituent	Sorption	Biodegradability/Bioconcentration/ Biotransformation	Photodegradation Rates	Hydrolysis Rates	Chemical Transformations
Inorganics (Continued)					
Vanadium	Relative to other metals, vanadium is fairly mobile in neutral or alkaline soils, but its mobility decreases in acidic soils; it is sorbed onto organic matter and manganese oxide and ferric hydroxide.	Some marine (e.g., ascidians) and terrestrial (e.g., certain legumes and mushrooms) organisms have been shown to be vanadium accumulators.	N/A	N/A	Transformation occurs primarily between various inorganic compounds.
Zinc	Zinc is likely to be strongly sorbed in soil; however, sorption is dependent on the solubilities of the species present and on soil properties such as sorption potential, pH, and salinity.	Negligible to significant bioconcentration in various aquatic species.	N/A	N/A	Transformation reactions include oxidation/reduction of organic and inorganic complexes, cation exchange, and ligand interactions.
Cyanide	Adsorption is not expected to be a significant fate process, although it may be more important for metal cyanides than for hydrogen cyanide.	Negligible bioconcentration in aquatic organisms.	Hydrogen cyanide gas reacts with photochemically generated hydroxyl radicals in the atmosphere (residence time is about 2 years).	Negligible.	Some metal cyanides in water may decompose to the cyanide ion by photodissociation and subsequently form hydrogen cyanide.
Sulfate	Adsorption to soils has been demonstrated.	Sulfate reduction to sulfide occurs in anaerobic soils.	N/A	No information available.	No information on environmentally significant transformation other than reduction.
Sulfide	No information.	No information.	N/A	N/A	Oxidation to sulfate occurs in natural waters.

N/A = Not applicable.

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APPENDIX E

SITE PHOTOGRAPHS

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Photo No.: 1
Date: 5-29-97
Direction: Northwest
Description: Paxton Lagoons;
Land & Lakes
#3 in background

Photo No.: 2
Date: 5-29-97
Direction: Southeast
Description: Unnamed Parcel

Photo No.: 3
Date: 5-29-97
Direction: South
Description: Gun club pond

Photo No.: 4
Date: 5-29-97
Direction: South
Description: U.S. Drum II

Photo No.: 5
Date: 5-29-97
Direction: South
Description: Gravel pile at southern boundary of U.S. Drum II

Photo No.: 6
Date: 5-29-97
Direction: East
Description: Pond at Alburn Incinerator

Photo No.: 7
Date: 5-29-97
Di on: Northwest
Description: Paxton I in foreground;
Paxton II in background

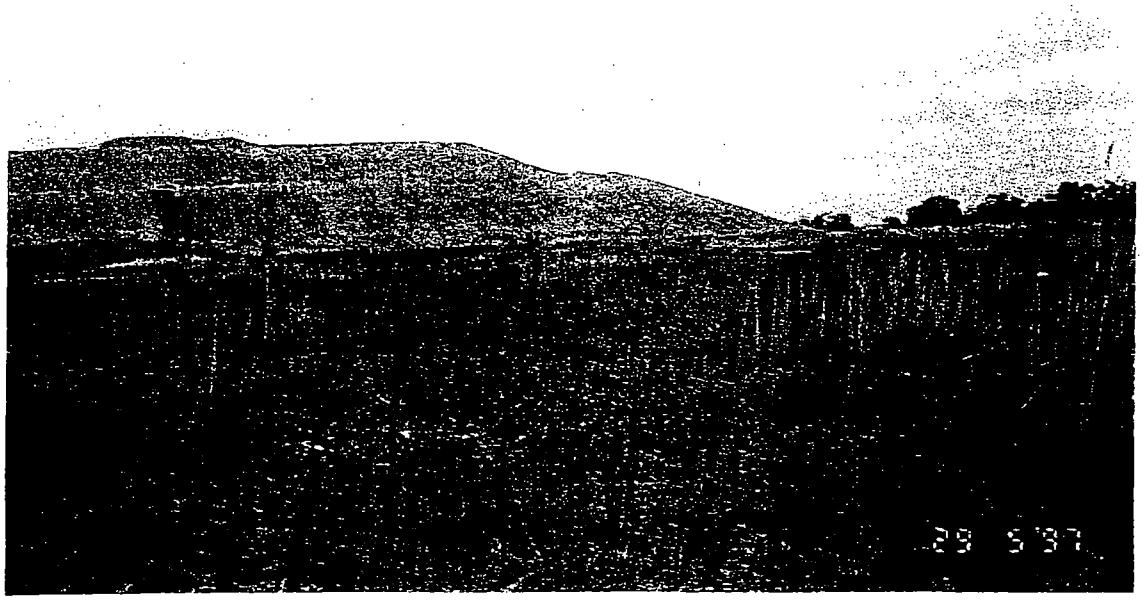

Photo No.: 8
Date: 5-29-97
Direction: Northeast
Description: LHL#1 pond

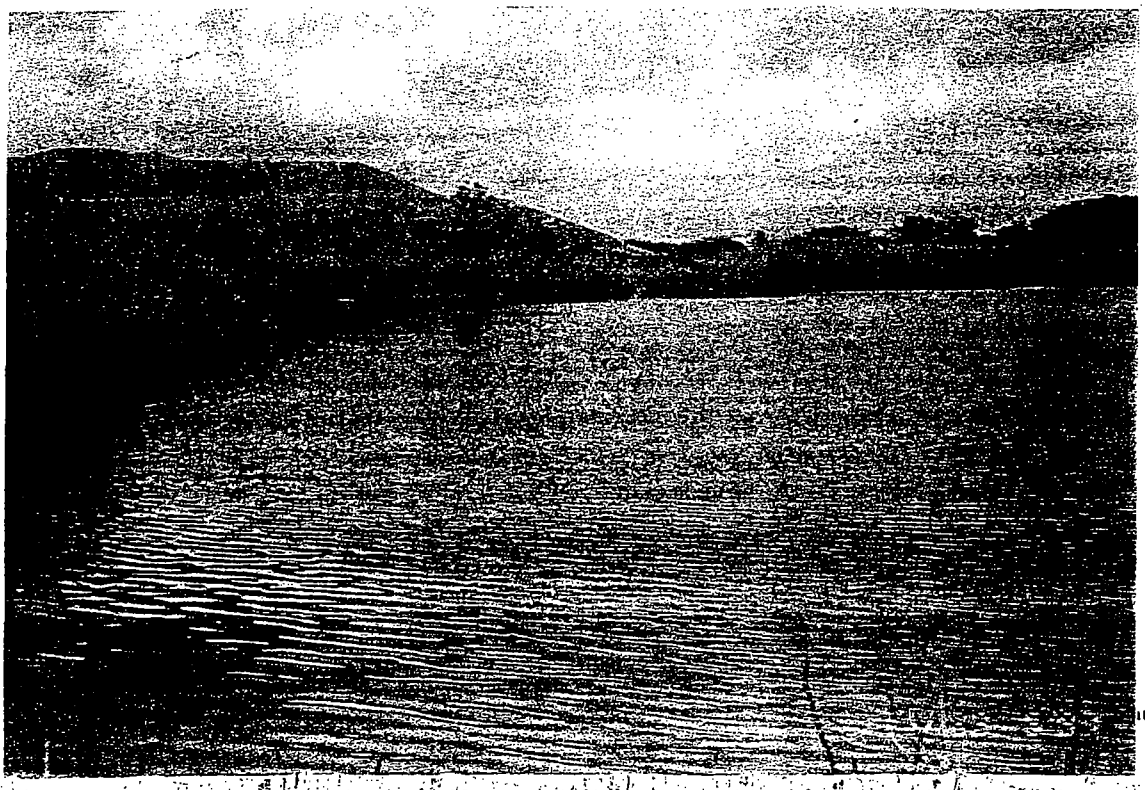

Photo No.: 9
Date: 5-29-97
D' ion: Northeast
Description: Top of Paxton II;
Lhl#1 pond in background
and Indian Ridge Mars pond further east.

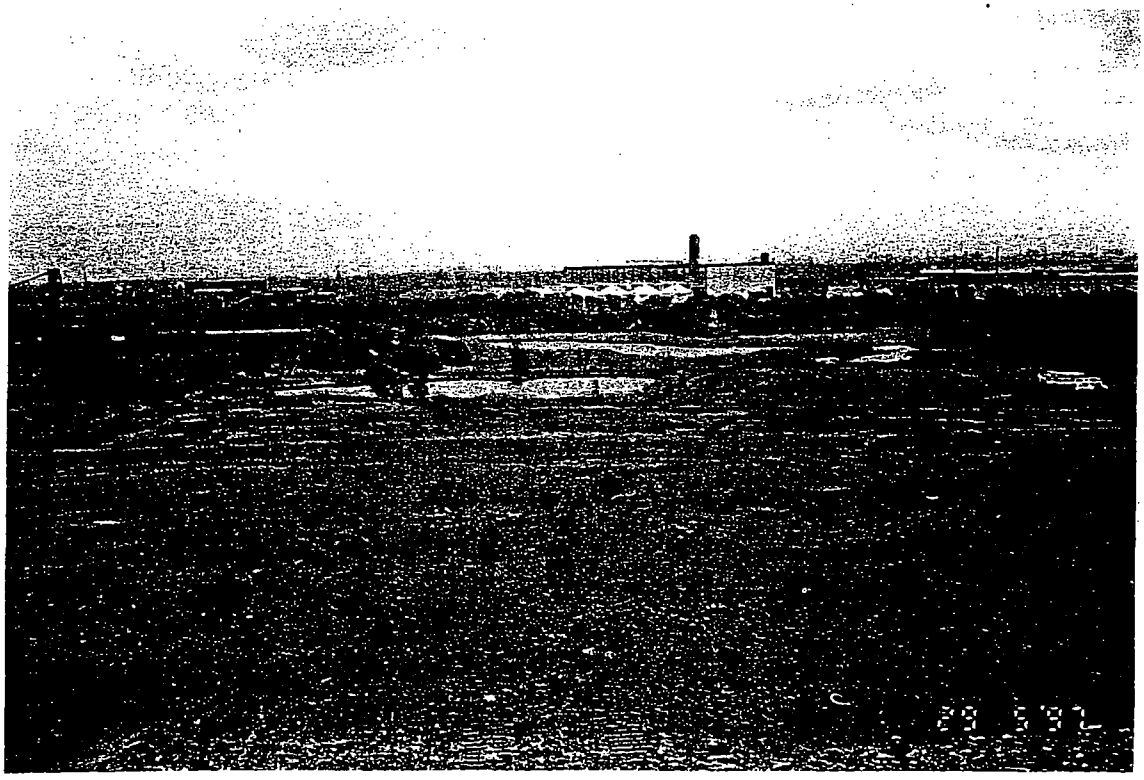

Photo No.: 10
Date: 5-29-97
Direction: Northwest
Description: Top of Paxton II; Leachate sump in foreground;
Big Marsh in background to the east;
Lake Calumet in background to the west.

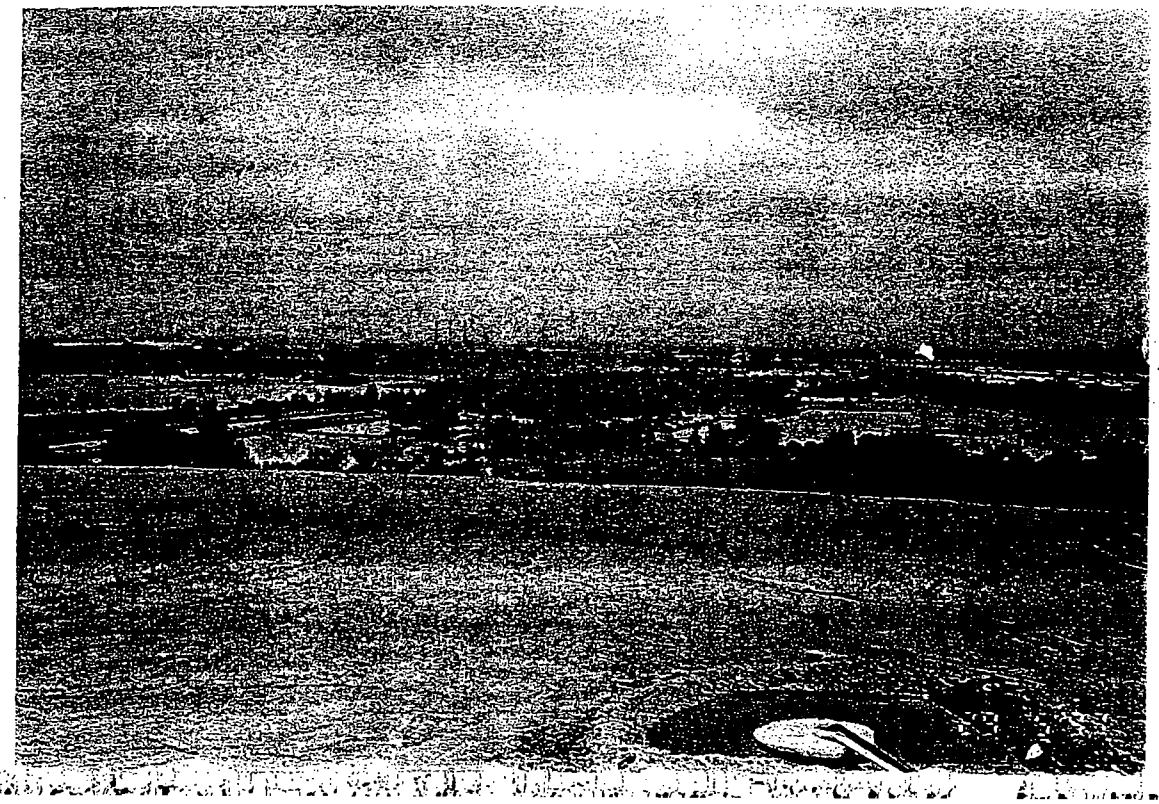

Photo No.: 11
Date: 5-29-97
Direction: North
Description: Top of Paxton II; Big Marsh in background

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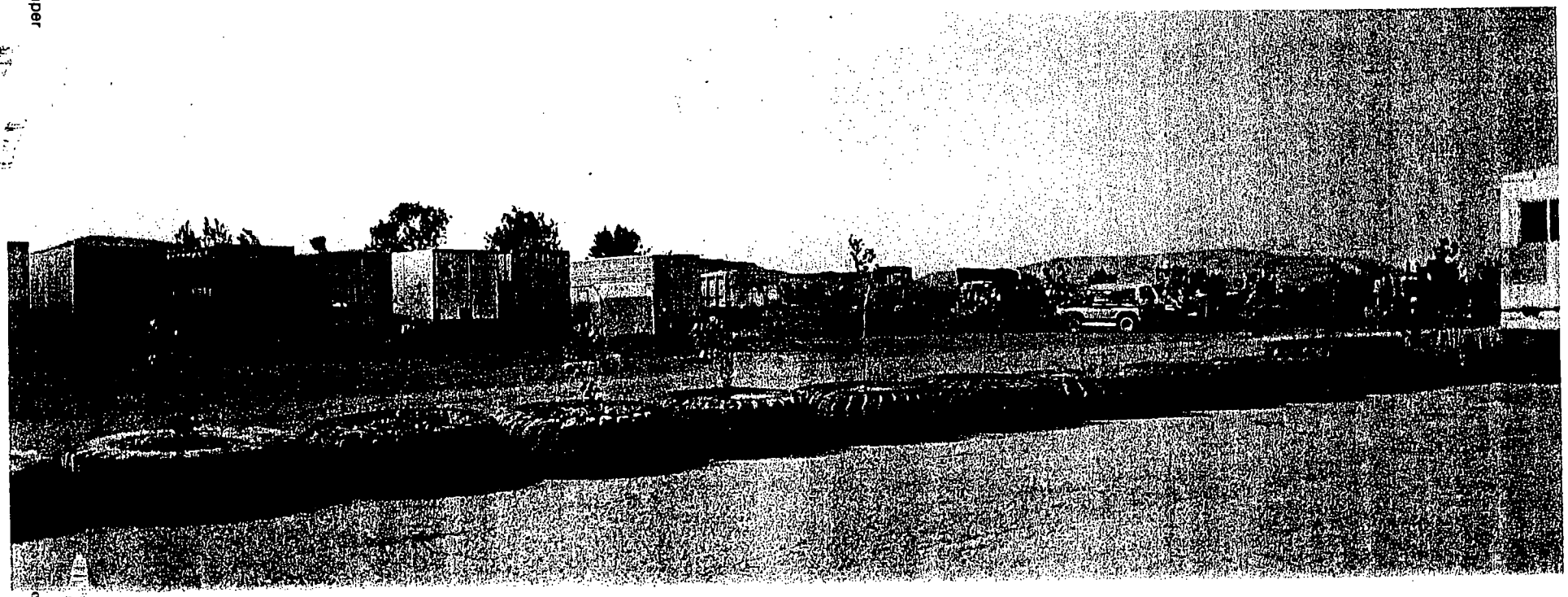
Photo No.: 12
Date: 8-25-97
Direction: Northwest
Description: Entrance to Paxton Landfill;
Paxton II in background



recycled paper

ecology and environment

Photo No.: 13
Date: 8-25-97
Direction: South
Description: Crandon Ave through gun club property

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Photo No.: 14
Date: 8-25-97
Direction: South
Description: Gun Club pond

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Photo No.: 15
Date: 8-25-97
Direction: West
Description: Second pond on gun club property

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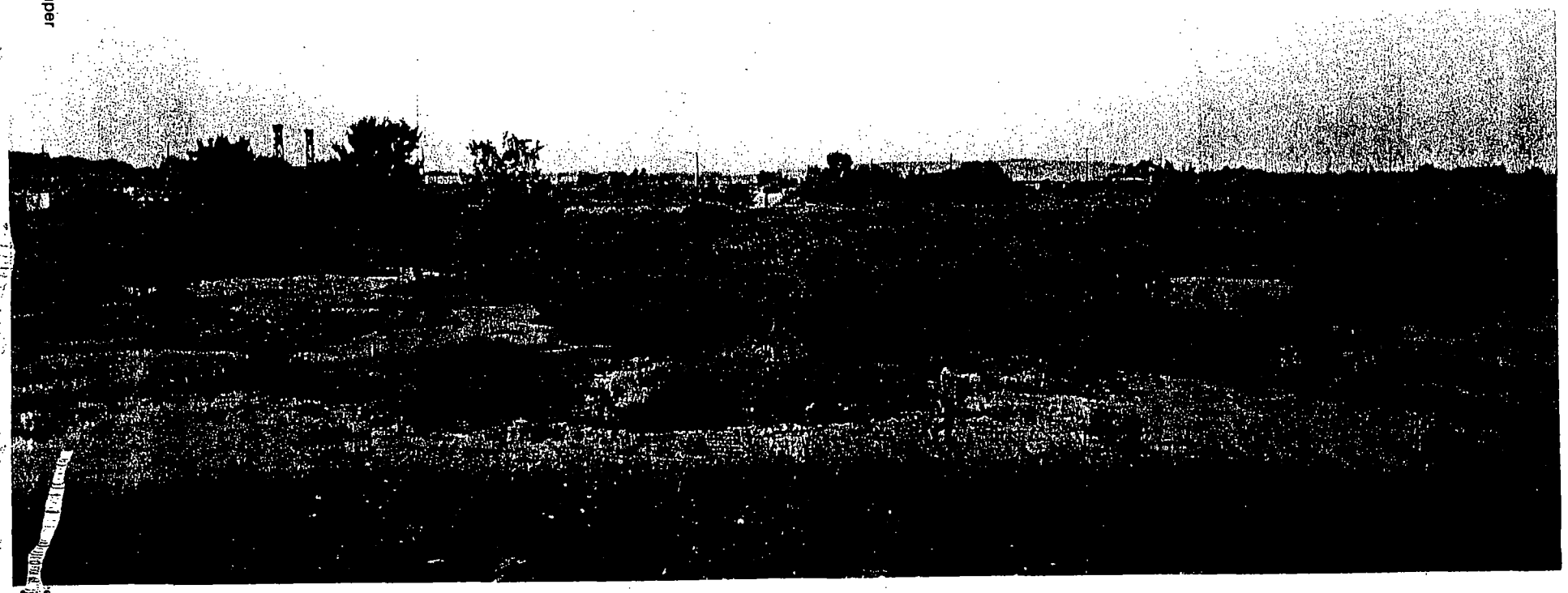
ology and environment

Photo No.: 16
Date: 8-25-97
Direction: Southeast
Description: Unnamed parcel



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ecology and environment

Photo No.: 17
Date: 8-25-97
Direction: Northwest
Description: Pond at LHL#2;
Paxton II in background

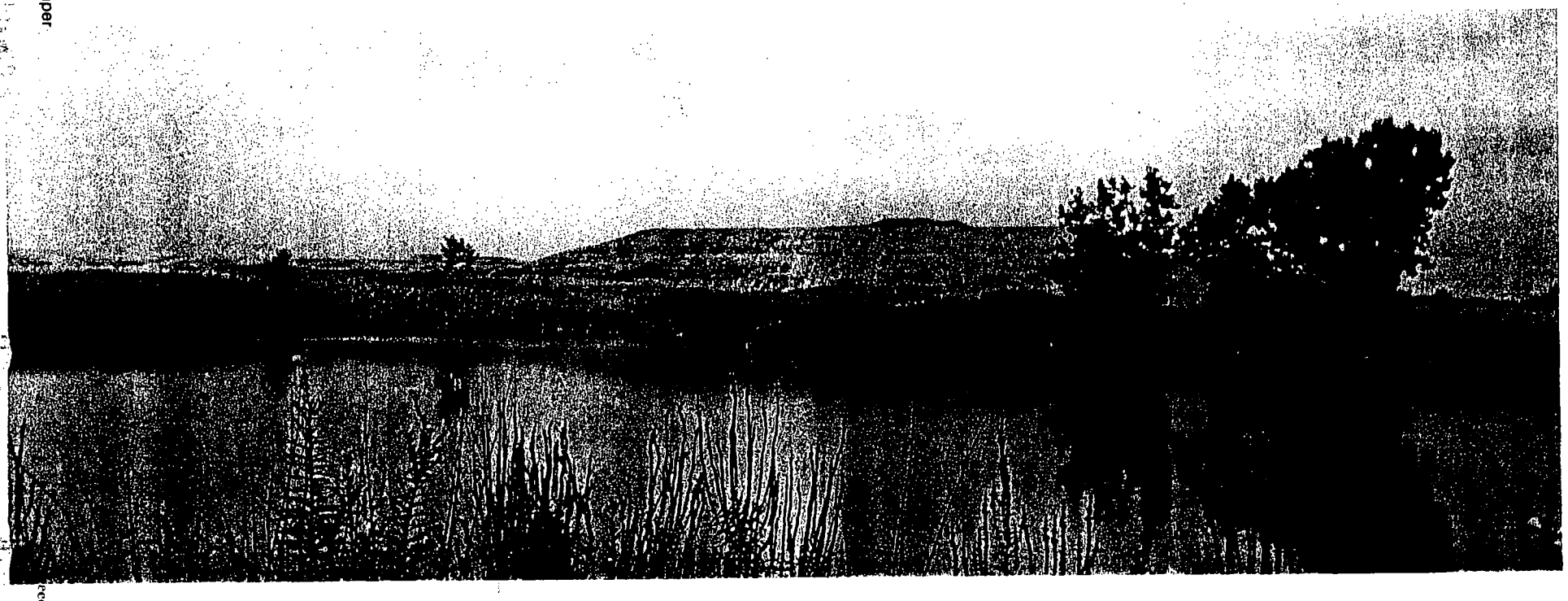

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Photo No.: 18
Date: 8-25-97
Direction: Southeast
Description: Alburn Incinerator, dilapidated incinerator and buildings in background

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Photo No.: 19
Date: 8-25-97
Direction: North
Description: Paxton Lagoons;
Paxton II in background;
Land & Lakes #3 to the west

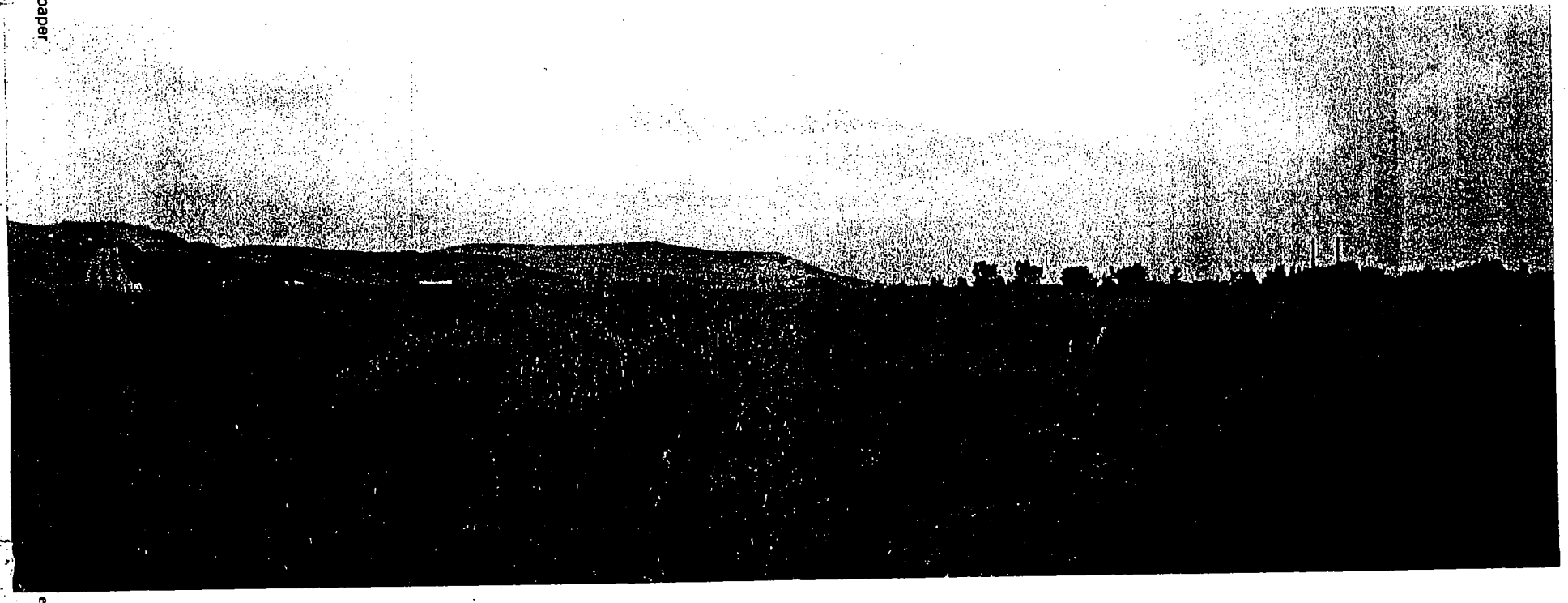

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Photo No.: 20
Date: 8-25-97
Direction: Northwest
Description: U.S. Drum II

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Photo No.: 21
Date: 8-25-97
Direction: East
Description: From top of Paxton II;
Looking over Paxton I

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Photo No.: 22
Date: 8-25-97
Direction: Southeast
Description: From top of Paxton II;
Looking over LHL #2 pond

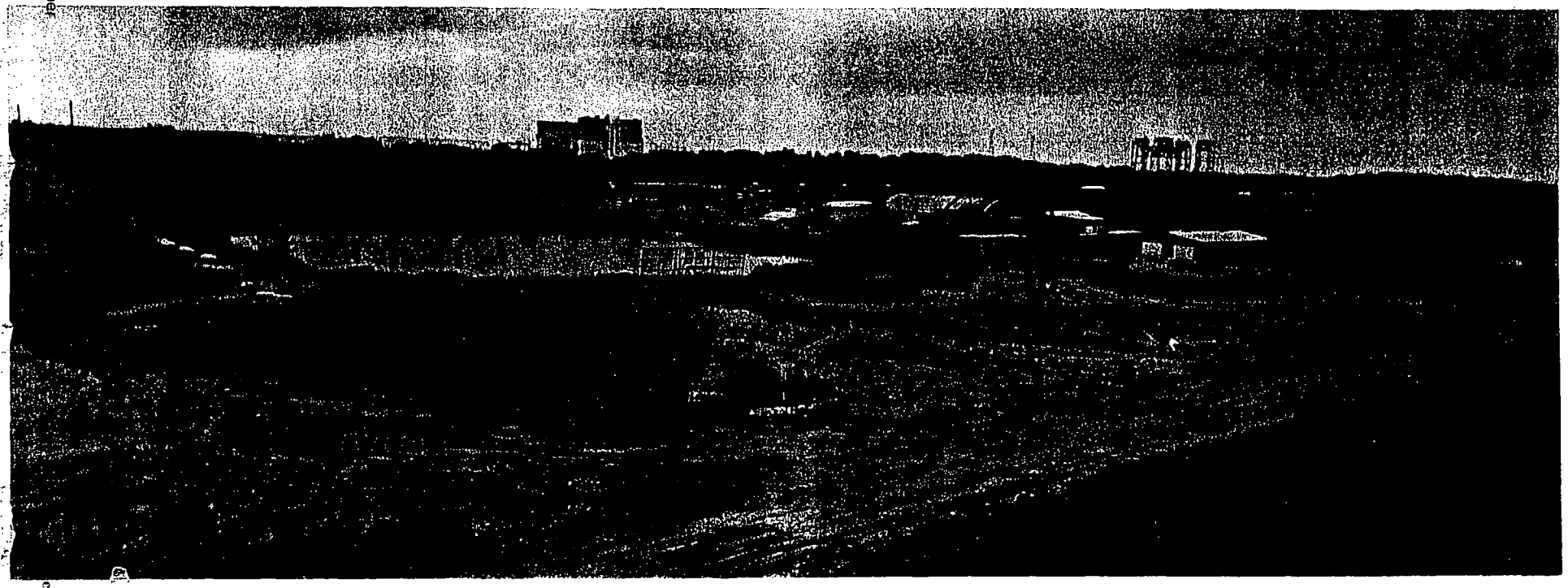

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Photo No.: 23
Date: 8-25-97
Direction: South
Description: From top of Pazton II;
Land and Lakes #3 to the west

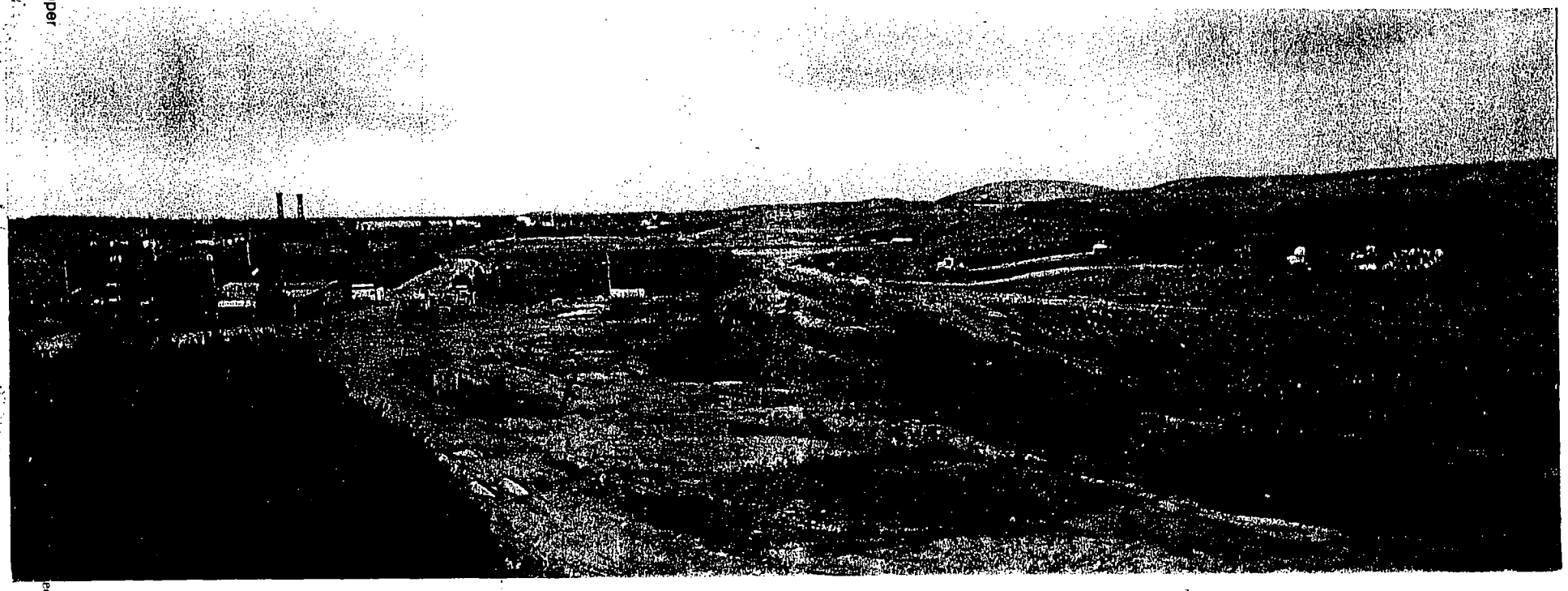

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Photo No.: 24
Date: 8-25-97
Direction: Northwest
Description: East-facing slope of Paxton II

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APPENDIX F

FLORISTIC QUALITY ASSESSMENT

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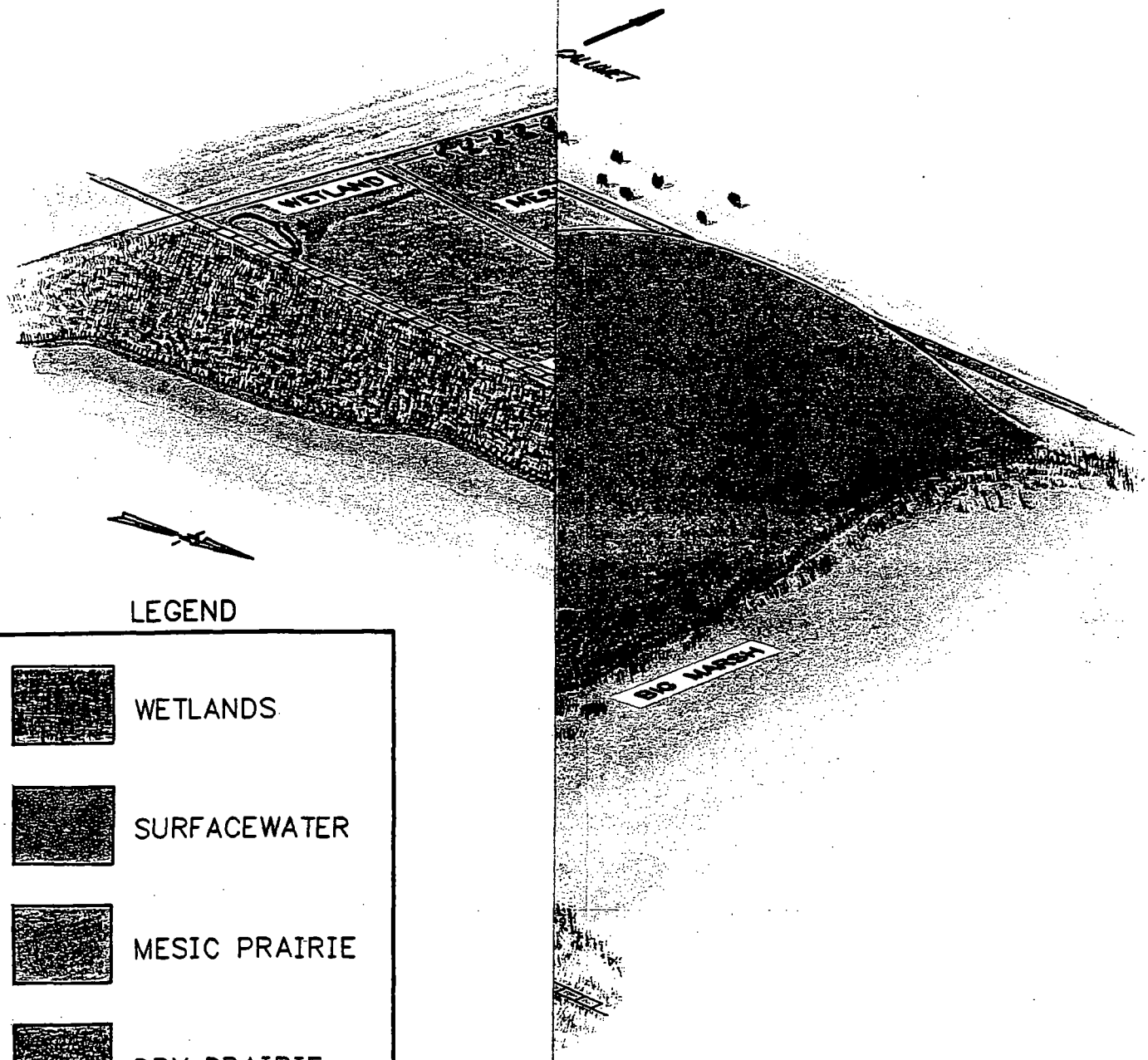

LEGEND

- WETLANDS
- SURFACEWATER
- MESIC PRAIRIE
- DRY PRAIRIE

Lake Calumet Cluster Site

Floristic Quality Assessment

The following is a summary of the data collected on August 25, 1997. The floristic quality assessment (FQA) and plant lists were generated using *Floristic Quality Assessment in the Chicago Region and Application Computer Programs* (Wilhelm and Masters 1996). Plant nomenclature follows *Plants of the Chicago Region* (Swink and Wilhelm 1994). The inventoried sites include Paxton I (LH1 & LHL2), Paxton II Landfill, U.S. Drum (east), U.S. Drum (west), Alburn Incinerator, Paxton Lagoons, west of the entry road, and the Gun Club. The last list combines the inventories from all of the sites.

Table 1 is an analysis of the quality of the site. It shows the total number of species present, the mean coefficient of conservatism (MEAN C), the floristic quality index (FQI), and the mean wetness (MEAN W) followed by the average National Wetland Indicator Status for the site. These values are calculated once for native species only, and a second time including adventive species (W/Adventives), where the C values are defaulted to zero. Adventive species (shown in ALL CAPS in the inventory) entered the region since settlement and, therefore, are not integral to any presettlement plant communities.

The MEAN C is the average coefficient of conservatism for the site. The FQI is derived by multiplying the MEAN C by the square root of the number of species present. In general, if the mean C is 3.5 or higher, or the FQI registers in the middle thirties or higher, it is relatively certain that there is sufficient native character in the site to be important in terms of a regional natural area perspective. The vast majority of land in the region registers FQI values less than 20 and essentially has no significance from a natural area perspective. Areas with FQI values in the fifties or higher are extremely rare and of paramount importance; they represent less than 0.5% of the land area in the Chicago region.

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Table 2 summarizes the physiognomic character of the site. It shows the number and percent of species in each physiognomic group

Table 3 is a list of plant species recorded from the site. The inventory is arranged alphabetically by scientific name, with each species preceded by its database acronym and coefficient of conservatism (C = 0 to 10, weedy to conservative), and followed by its wetness coefficient (W = -5 to +5, wet to dry), corresponding National Wetland Indicator Status (OBL = obligate wetland species, FAC = facultative species, UPL = upland species), physiognomy (A = annual, B = biennial, P = perennial, H = herbaceous, W = woody), and common name.

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Paxton I (LHL1 & LHL2)

Table 1. Floristic Quality Data

31	NATIVE SPECIES
63	Total Species
1.42	NATIVE MEAN C
0.70	W/Adventives
7.90	NATIVE FQI
5.54	W/Adventives
0.1	NATIVE MEAN W
1.0	W/Adventives
AVG:	FACULTATIVE

Table 2. Physiognomic Summary

NATIVE		49.2%	ADVENTIVE		50.8%
2	Tree	3.2%	2	Tree	3.2%
2	Shrub	3.2%	1	Shrub	1.6%
1	W-Vine	1.6%	0	W-Vine	0.0%
0	H-Vine	0.0%	0	H-Vine	0.0%
15	P-Forb	23.8%	11	P-Forb	17.5%
3	B-Forb	4.8%	6	B-Forb	9.5%
4	A-Forb	6.3%	8	A-Forb	12.7%
1	P-Grass	1.6%	4	P-Grass	6.3%
3	A-Grass	4.8%	0	A-Grass	0.0%
0	P-Sedge	0.0%	0	P-Sedge	0.0%
0	A-Sedge	0.0%	0	A-Sedge	0.0%

Table 3. Species Inventory

C	SCIENTIFIC NAME	W	WETNESS	PHYSIOGNOMY	COMMON NAME
*	AGROPYRON REPENS	3	FACU	Ad P-GRASS	QUACK GRASS
*	AGROSTIS ALBA	-3	FACW	Ad P-GRASS	REDTOP
*	AILANTHUS ALTISSIMA	5	UPL	Ad TREE	TREE OF HEAVEN
0	Ambrosia artemisiifolia elatior	3	FACU	Nt A-FORB	COMMON RAGWEED
*	ARCTIUM MINUS	5	UPL	Ad B-FORB	COMMON BURDOCK
*	ARTEMISIA VULGARIS	5	UPL	Ad P-FORB	MUGWORT
0	Asclepias syriaca	5	UPL	Nt P-FORB	COMMON MILKWEED
1	Asclepias verticillata	5	UPL	Nt P-FORB	WHORLED MILKWEED
0	Aster pilosus	2	FACU+	Nt P-FORB	HAIRY ASTER
*	ASTER SUBULATUS	3	[FACU]	Ad A-FORB	EXPRESSWAY ASTER
*	ATRIPLEX PATULA	-2	FACW-	Ad A-FORB	COMMON ORACH
*	BARBAREA VULGARIS	0	FAC	Ad B-FORB	YELLOW ROCKET
5	Bidens comosa	-5	[OBL]	Nt A-FORB	SWAMP TICKSEED
*	BRASSICA NIGRA	5	UPL	Ad A-FORB	BLACK MUSTARD
*	CHENOPODIUM GLAUCUM	-3	FACW	Ad A-FORB	OAK-LEAVED GOOSEFOOT
*	CIRSIUM ARVENSE	5	UPL	Ad P-FORB	FIELD THISTLE
2	Cirsium discolor	5	UPL	Nt B-FORB	PASTURE THISTLE
*	CONIUM MACULATUM	-3	FACW	Ad B-FORB	POISON HEMLOCK
*	CONVOLVULUS ARVENSIS	5	UPL	Ad P-FORB	FIELD BINDWEED
1	Convolvulus sepium	0	FAC	Nt P-FORB	HEDGE BINDWEED
*	DAUCUS CAROTA	5	UPL	Ad B-FORB	QUEEN ANNE'S LACE
0	Echinochloa crusgalli	-3	FACW	Nt A-GRASS	BARNYARD GRASS
0	Erigeron annuus	1	FAC-	Nt B-FORB	ANNUAL FLEABANE
0	Eupatorium altissimum	3	[FACU]	Nt P-FORB	TALL BONESET
0	Eupatorium serotinum	-1	FAC+	Nt P-FORB	LATE BONESET
0	Euphorbia supina	4	FACU-	Nt A-FORB	SPOTTED CREEPING SPURGE
1	Fragaria virginiana	1	FAC-	Nt P-FORB	WILD STRAWBERRY
*	GLECHOMA HEDERACEA	3	FACU	Ad P-FORB	CREEPING CHARLIE
*	HELIANTHUS ANNUUS	1	FAC-	Ad A-FORB	GARDEN SUNFLOWER
2	Helianthus grosseserratus	-2	FACW-	Nt P-FORB	SAWTOOTH SUNFLOWER
*	HEMEROCALLIS FULVA	5	UPL	Ad P-FORB	ORANGE DAY LILY
*	HORDEUM JUBATUM	-1	FAC+	Ad P-GRASS	SQUIRREL-TAIL GRASS
*	HYPERICUM PERFORATUM	5	UPL	Ad P-FORB	COMMON ST. JOHN'S WORT
0	Lepidium virginicum	4	FACU-	Nt A-FORB	COMMON PEPPERCRESS
*	LYCHNIS ALBA	5	UPL	Ad A-FORB	WHITE CAMPION
1	Lycopus asper	-3	[FACW]	Nt P-FORB	ROUGH WATER HOREHOUND
*	LYTHRUM SALICARIA	-5	OBL	Ad P-FORB	PURPLE LOOSESTRIFE
*	MELILOTUS ALBA	3	FACU	Ad B-FORB	WHITE SWEET CLOVER
*	MORUS ALBA	0	FAC	Ad TREE	WHITE MULBERRY
*	NEPETA CATARIA	1	FAC-	Ad P-FORB	CATNIP
0	Oenothera biennis	3	FACU	Nt B-FORB	COMMON EVENING PRIMROSE

1	Panicum capillare	0	FAC	Nt	A-GRASS	OLD WITCH GRASS
1	Phragmites australis	-4	FACW+	Nt	P-GRASS	COMMON REED
*	POA COMPRESSA	2	FACU+	Ad	P-GRASS	CANADA BLUE GRASS
4	Polygonum amphibium stipulaceum	-5	OBL	Nt	P-FORB	WATER KNOTWEED
*	POLYGONUM PERSICARIA	1	[FAC-]	Ad	A-FORB	LADY'S THUMB
2	Populus deltoides	-1	FAC+	Nt	TREE	EASTERN COTTONWOOD
*	RHAMNUS CATHARTICA	3	FACU	Ad	SHRUB	COMMON BUCKTHORN
*	RUMEX CRISPUS	-1	FAC+	Ad	P-FORB	CURLY DOCK
5	Salix amygdaloides	-3	FACW	Nt	TREE	PEACH-LEAVED WILLOW
1	Salix interior	-5	OBL	Nt	SHRUB	SANDBAR WILLOW
1	Sambucus canadensis	-2	FACW-	Nt	SHRUB	ELDERBERRY
1	Solidago altissima	3	FACU	Nt	P-FORB	TALL GOLDENROD
1	Solidago canadensis	3	FACU	Nt	P-FORB	CANADA GOLDENROD
4	Solidago graminifolia	-2	FACW-	Nt	P-FORB	GRASS-LEAVED GOLDENROD
*	SOLIDAGO SEMPERVIRENS	3	[FACU]	Ad	P-FORB	SEASIDE GOLDENROD
*	SONCHUS ULIGINOSUS	1	FAC-	Ad	P-FORB	COMMON SOW THISTLE
1	Sporobolus neglectus	5	UPL	Nt	A-GRASS	SMALL RUSH GRASS
3	Teucrium occidentale	-3	FACW	Nt	P-FORB	GERMANDER
*	VERBASCUM THAPSUS	5	UPL	Ad	B-FORB	COMMON MULLEIN
4	Verbena hastata	-4	FACW+	Nt	P-FORB	BLUE VERVAIN
2	Vitis riparia	-2	FACW-	Nt	W-VINE	RIVERBANK GRAPE
*	XANTHIUM STRUMARIUM	0	FAC	Ad	A-FORB	COCKLEBUR

Paxton II Landfill

Table 1. Floristic Quality Data

11	NATIVE SPECIES
36	Total Species
0.64	NATIVE MEAN C
0.19	W/Adventives
2.11	NATIVE FQI
1.17	W/Adventives
1.3	NATIVE MEAN W
2.1	W/Adventives
AVG:	FACULTATIVE (-)

Table 2. Physiognomic Summary

NATIVE	30.6%	ADVENTIVE	69.4%
2 Tree	5.6%	1 Tree	2.8%
0 Shrub	0.0%	0 Shrub	0.0%
0 W-Vine	0.0%	0 W-Vine	0.0%
0 H-Vine	0.0%	0 H-Vine	0.0%
2 P-Forb	5.6%	6 P-Forb	16.7%
1 B-Forb	2.8%	4 B-Forb	11.1%
3 A-Forb	8.3%	8 A-Forb	22.2%
1 P-Grass	2.8%	2 P-Grass	5.6%
2 A-Grass	5.6%	4 A-Grass	11.1%
0 P-Sedge	0.0%	0 P-Sedge	0.0%
0 A-Sedge	0.0%	0 A-Sedge	0.0%

Table 3. Species Inventory

C	SCIENTIFIC NAME	W	WETNESS	PHYSIOGNOMY	COMMON NAME
*	ABUTILON THEOPHRASTI	4	FACU-	Ad A-FORB	VELVETLEAF
*	AILANTHUS ALTISSIMA	5	UPL	Ad TREE	TREE OF HEAVEN
0	Amaranthus hybridus	5	UPL	Nt A-FORB	GREEN AMARANTH
*	ARTEMISIA VULGARIS	5	UPL	Ad P-FORB	MUGWORT
0	Aster pilosus	2	FACU+	Nt P-FORB	HAIRY ASTER
*	ATRIPLEX PATULA	-2	FACW-	Ad A-FORB	COMMON ORACH
*	BROMUS JAPONICUS	3	FACU	Ad A-GRASS	JAPANESE CHESS
*	CICHORIUM INTYBUS	5	UPL	Ad P-FORB	CHICORY
*	CIRSIUM VULGARE	4	FACU-	Ad B-FORB	BULL THISTLE
*	CONVOLVULUS ARVENSIS	5	UPL	Ad P-FORB	FIELD BINDWEED
*	DAUCUS CAROTA	5	UPL	Ad B-FORB	QUEEN ANNE'S LACE
*	DIPLACHNE ACUMINATA	0	[FAC]	Ad A-GRASS	SALT-MEADOW GRASS
*	DIPLOTAXIS MURALIS	5	UPL	Ad A-FORB	WALL ROCKET
0	Echinochloa crusgalli	-3	FACW	Nt A-GRASS	BARNYARD GRASS
0	Erigeron canadensis	1	FAC-	Nt A-FORB	HORSEWEED
2	Gleditsia triacanthos	0	FAC	Nt TREE	HONEY LOCUST
*	HELIANTHUS ANNUUS	1	FAC-	Ad A-FORB	GARDEN SUNFLOWER
*	HORDEUM JUBATUM	1	FAC+	Ad P-GRASS	SQUIRREL-TAIL GRASS
*	KOCHIA SCOPARIA	4	FACU-	Ad A-FORB	BURNING BUSH
*	LACTUCA SERRIOLA	0	FAC	Ad B-FORB	PRICKLY LETTUCE
*	MEDICAGO LUPULINA	1	FAC-	Ad A-FORB	BLACK MEDICK
*	MELILOTUS ALBA	3	FACU	Ad B-FORB	WHITE SWEET CLOVER
0	Oenothera biennis	3	FACU	Nt B-FORB	COMMON EVENING PRIMROSE
1	Phragmites australis	-4	FACW+	Nt P-GRASS	COMMON REED
*	POLYGONUM ARENASTRUM	5	UPL	Ad A-FORB	SIDEWALK KNOTWEED
2	Populus deltoides	-1	FAC+	Nt TREE	EASTERN COTTONWOOD
*	PUCCINELLIA DISTANS	3	[FACU]	Ad P-GRASS	ALKALI GRASS
*	RUMEX CRISPUS	-1	FAC+	Ad P-FORB	CURLY DOCK
*	SETARIA FABERI	2	FACU+	Ad A-GRASS	GIANT FOXTAIL
*	SETARIA VIRIDIS	1	[FAC-]	Ad A-GRASS	GREEN FOXTAIL
1	Solidago altissima	3	FACU	Nt P-FORB	TALL GOLDENROD
*	SOLIDAGO SEMPERVIRENS	3	[FACU]	Ad P-FORB	SEASIDE GOLDENROD
*	SONCHUS ULIGINOSUS	1	FAC-	Ad P-FORB	COMMON SOW THISTLE
1	Sporobolus neglectus	5	UPL	Nt A-GRASS	SMALL RUSH GRASS
0	Verbena bracteata	3	FACU	Nt A-FORB	CREEPING VERVAIN
*	XANTHIUM STRUMARIUM	0	FAC	Ad A-FORB	COCKLEBUR

U.S. Drum (East)

Table 1. Floristic Quality Data

15	NATIVE SPECIES
29	Total Species
1.47	NATIVE MEAN C
0.76	W/Adventives
5.68	NATIVE FQI
4.09	W/Adventives
-0.1	NATIVE MEAN W
1.0	W/Adventives
AVG:	FACULTATIVE

Table 2. Physiognomic Summary

NATIVE	51.7%	ADVENTIVE	48.3%
0 Tree	0.0%	0 Tree	0.0%
0 Shrub	0.0%	0 Shrub	0.0%
0 W-Vine	0.0%	0 W-Vine	0.0%
0 H-Vine	0.0%	0 H-Vine	0.0%
8 P-Forb	27.6%	4 P-Forb	13.8%
3 B-Forb	10.3%	3 B-Forb	10.3%
0 A-Forb	0.0%	3 A-Forb	10.3%
0 P-Grass	0.0%	4 P-Grass	13.8%
1 A-Grass	3.4%	0 A-Grass	0.0%
3 P-Sedge	10.3%	0 P-Sedge	0.0%
0 A-Sedge	0.0%	0 A-Sedge	0.0%

Table 3. Species Inventory

C	SCIENTIFIC NAME	W	WETNESS	PHYSIOGNOMY	COMMON NAME
*	ABUTILON THEOPHRASTI	4	FACU-	Ad A-FORB	VELVETLEAF
*	AGROPYRON REPENS	3	FACU	Ad P-GRASS	QUACK GRASS
*	ARTEMISIA VULGARIS	5	UPL	Ad P-FORB	MUGWORT
0	Asclepias syriaca	5	UPL	Nt P-FORB	COMMON MILKWEED
1	Asclepias verticillata	5	UPL	Nt P-FORB	WHORLED MILKWEED
*	BARBAREA VULGARIS	0	FAC	Ad B-FORB	YELLOW ROCKET
*	BRASSICA NIGRA	5	UPL	Ad A-FORB	BLACK MUSTARD
*	CARDUUS NUTANS	5	UPL	Ad B-FORB	MUSK THISTLE
*	CIRSIUM ARVENSE	5	UPL	Ad P-FORB	FIELD THISTLE
*	CIRSIUM VULGARE	4	FACU-	Ad B-FORB	BULL THISTLE
1	Convolvulus sepium	0	FAC	Nt P-FORB	HEDGE BINDWEED
0	Cyperus esculentus	-1	[FAC+]	Nt P-SEDGE	FIELD NUT SEDGE
0	Echinochloa crusgalli	-3	FACW	Nt A-GRASS	BARNYARD GRASS
2	Eleocharis erythropoda	-5	OBL	Nt P-SEDGE	RED-ROOTED SPIKE RUSH
0	Erigeron annuus	1	FAC-	Nt B-FORB	ANNUAL FLEABANE
0	Eupatorium altissimum	3	[FACU]	Nt P-FORB	TALL BONESET
*	FESTUCA ELATIOR	2	FACU+	Ad P-GRASS	TALL FESCUE
2	Gaura biennis pitcheri	4	FACU-	Nt B-FORB	COMMON GAURA
*	HELIANTHUS ANNUUS	1	FAC-	Ad A-FORB	GARDEN SUNFLOWER
*	HORDEUM JUBATUM	-1	FAC+	Ad P-GRASS	SQUIRREL-TAIL GRASS
*	LYTHRUM SALICARIA	-5	OBL	Ad P-FORB	PURPLE LOOSESTRIFE
*	NEPETA CATARIA	1	FAC-	Ad P-FORB	CATNIP
0	Oenothera biennis	3	FACU	Nt B-FORB	COMMON EVENING PRIMROSE
*	POA PRATENSIS	1	FAC-	Ad P-GRASS	KENTUCKY BLUE GRASS
4	Polygonum coccineum	-5	OBL	Nt P-FORB	WATER HEARTSEASE
4	Scirpus fluviatilis	-5	OBL	Nt P-SEDGE	RIVER BULRUSH
1	Solidago canadensis	3	FACU	Nt P-FORB	CANADA GOLDENROD
3	Teucrium occidentale	-3	FACW	Nt P-FORB	GERMANDER
4	Verbena hastata	-4	FACW+	Nt P-FORB	BLUE VERVAIN

U.S. Drum (West)

Table 1. Floristic Quality Data

14	NATIVE SPECIES
34	Total Species
1.43	NATIVE MEAN C
0.59	W/Adventives
5.35	NATIVE FQI
3.43	W/Adventives
-0.4	NATIVE MEAN W
0.9	W/Adventives
AVG:	FACULTATIVE

Table 2. Physiognomic Summary

NATIVE	41.2%	ADVENTIVE	58.8%
0 Tree	0.0%	1 Tree	2.9%
0 Shrub	0.0%	1 Shrub	2.9%
1 W-Vine	2.9%	1 W-Vine	2.9%
0 H-Vine	0.0%	0 H-Vine	0.0%
8 P-Forb	23.5%	3 P-Forb	8.8%
1 B-Forb	2.9%	6 B-Forb	17.6%
2 A-Forb	5.9%	3 A-Forb	8.8%
1 P-Grass	2.9%	3 P-Grass	8.8%
0 A-Grass	0.0%	2 A-Grass	5.9%
1 P-Sedge	2.9%	0 P-Sedge	0.0%
0 A-Sedge	0.0%	0 A-Sedge	0.0%

Table 3. Species Inventory

C	SCIENTIFIC NAME	W	WETNESS	PHYSIOGNOMY	COMMON NAME
*	AGROPYRON REPENS	3	FACU	Ad P-GRASS	QUACK GRASS
0	Ambrosia artemisiifolia elatior	3	FACU	Nt A-FORB	COMMON RAGWEED
*	ARTEMISIA VULGARIS	5	UPL	Ad P-FORB	MUGWORT
0	Aster pilosus	2	FACU+	Nt P-FORB	HAIRY ASTER
3	Aster simplex	-5	OBL	Nt P-FORB	PANICLED ASTER
*	BARBAREA VULGARIS	0	FAC	Ad B-FORB	YELLOW ROCKET
*	BROMUS TECTORUM	5	UPL	Ad A-GRASS	DOWNY BROME
*	CARDUUS NUTANS	5	UPL	Ad B-FORB	MUSK THISTLE
4	Carex pellita	-5	OBL	Nt P-SEDGE	BROAD-LEAF WOOLLY SEDGE
*	CONIUM MACULATUM	-3	FACW	Ad B-FORB	POISON HEMLOCK
1	Convolvulus sepium	0	FAC	Nt P-FORB	HEDGE BINDWEED
*	DAUCUS CAROTA	5	UPL	Ad B-FORB	QUEEN ANNE'S LACE
0	Erigeron annuus	1	FAC-	Nt B-FORB	ANNUAL FLEABANE
0	Eupatorium altissimum	3	[FACU]	Nt P-FORB	TALL BONESET
0	Euphorbia supina	4	FACU-	Nt A-FORB	SPOTTED CREEPING SPURGE
*	FESTUCA ELATIOR	2	FACU+	Ad P-GRASS	TALL FESCUE
*	HELIANTHUS ANNUUS	1	FAC-	Ad A-FORB	GARDEN SUNFLOWER
2	Helianthus grosseserratus	-2	FACW-	Nt P-FORB	SAWTOOTH SUNFLOWER
*	LACTUCA SERRIOLA	0	FAC	Ad B-FORB	PRICKLY LETTUCE
*	LYTHRUM SALICARIA	-5	OBL	Ad P-FORB	PURPLE LOOSESTRIFE
*	MELILOTUS ALBA	3	FACU	Ad B-FORB	WHITE SWEET CLOVER
*	MORUS ALBA	0	FAC	Ad TREE	WHITE MULBERRY
*	NEPETA CATARIA	1	FAC-	Ad P-FORB	CATNIP
1	Phragmites australis	-4	FACW+	Nt P-GRASS	COMMON REED
*	POA PRATENSIS	1	FAC-	Ad P-GRASS	KENTUCKY BLUE GRASS
*	RHAMNUS CATHARTICA	3	FACU	Ad SHRUB	COMMON BUCKTHORN
*	SETARIA VIRIDIS	1	[FAC-]	Ad A-GRASS	GREEN FOXTAIL
*	SISYMBRIUM ALTISSIMUM	3	FACU	Ad A-FORB	TUMBLE MUSTARD
*	SOLANUM DULCAMARA	0	FAC	Ad W-VINE	BITTERSWEET NIGHTSHADE
3	Solidago graminifolia nuttallii	0	[FAC]	Nt P-FORB	GRASS-LEAVED GOLDENROD
2	Vitis riparia	-2	FACW-	Nt W-VINE	RIVERBANK GRAPE

Alburn Incinerator

Table 1. Floristic Quality Data

11	NATIVE SPECIES
22	Total Species
1.09	NATIVE MEAN C
0.55	W/Adventives
3.62	NATIVE FQI
2.56	W/Adventives
-0.7	NATIVE MEAN W
0.2	W/Adventives
AVG:	FACULTATIVE (+)

Table 2. Physiognomic Summary

NATIVE	50.0%	ADVENTIVE	50.0%
1 Tree	4.5%	0 Tree	0.0%
0 Shrub	0.0%	0 Shrub	0.0%
0 W-Vine	0.0%	1 W-Vine	4.5%
0 H-Vine	0.0%	0 H-Vine	0.0%
4 P-Forb	18.2%	3 P-Forb	13.6%
1 B-Forb	4.5%	2 B-Forb	9.1%
2 A-Forb	9.1%	4 A-Forb	18.2%
1 P-Grass	4.5%	1 P-Grass	4.5%
1 A-Grass	4.5%	0 A-Grass	0.0%
0 P-Sedge	0.0%	0 P-Sedge	0.0%
1 A-Sedge	4.5%	0 A-Sedge	0.0%

Table 3. Species Inventory

C	SCIENTIFIC NAME	W	WETNESS	PHYSIOGNOMY	COMMON NAME
*	ARTEMISIA VULGARIS	5	UPL	Ad P-FORB	MUGWORT
0	Aster pilosus	2	FACU+	Nt P-FORB	HAIRY ASTER
*	CARDUUS NUTANS	5	UPL	Ad B-FORB	MUSK THISTLE
*	CENTAURIUM PULCHELLUM	4	FACU-	Ad A-FORB	SHOWY CENTAURY
*	CHENOPODIUM GLAUCUM	-3	FACW	Ad A-FORB	OAK-LEAVED GOOSEFOOT
2	Cyperus ferruginescens	-5	OBL	Nt A-SEDGE	RUSTY NUT SEDGE
0	Echinochloa crusgalli	-3	FACW	Nt A-GRASS	BARNYARD GRASS
0	Eupatorium altissimum	3	[FACU]	Nt P-FORB	TALL BONESET
0	Euphorbia supina	4	FACU-	Nt A-FORB	SPOTTED CREEPING SPURGE
*	HELIANTHUS ANNUUS	1	FAC-	Ad A-FORB	GARDEN SUNFLOWER
*	HORDEUM JUBATUM	-1	FAC+	Ad P-GRASS	SQUIRREL-TAIL GRASS
4	Juncus dudleyi	0	[FAC]	Nt P-FORB	DUDLEY'S RUSH
*	LYTHRUM SALICARIA	-5	OBL	Ad P-FORB	PURPLE LOOSESTRIFE
*	MELILOTUS ALBA	3	FACU	Ad B-FORB	WHITE SWEET CLOVER
0	Oenothera biennis	3	FACU	Nt B-FORB	COMMON EVENING PRIMROSE
1	Phragmites australis	-4	FACW+	Nt P-GRASS	COMMON REED
0	Polygonum lapathifolium	-4	FACW+	Nt A-FORB	HEARTSEASE
*	POLYGONUM PERSICARIA	1	[FAC-]	Ad A-FORB	LADY'S THUMB
2	Populus deltoides	-1	FAC+	Nt TREE	EASTERN COTTONWOOD
*	SOLANUM DULCAMARA	0	FAC	Ad W-VINE	BITTERSWEET NIGHTSHADE
*	SOLIDAGO SEMPERVIRENS	3	[FACU]	Ad P-FORB	SEASIDE GOLDENROD
3	Teucrium occidentale	-3	FACW	Nt P-FORB	GERMANDER

Paxton Lagoons

Table 1. Floristic Quality Data

14	NATIVE SPECIES
41	Total Species
1.14	NATIVE MEAN C
0.39	W/Adventives
4.28	NATIVE FQI
2.50	W/Adventives
1.0	NATIVE MEAN W
2.0	W/Adventives
AVG:	FACULTATIVE (-)

Table 2. Physiognomic Summary

NATIVE	34.1%	ADVENTIVE	65.9%
1 Tree	2.4%	0 Tree	0.0%
0 Shrub	0.0%	0 Shrub	0.0%
0 W-Vine	0.0%	1 W-Vine	2.4%
0 H-Vine	0.0%	0 H-Vine	0.0%
5 P-Forb	12.2%	9 P-Forb	22.0%
2 B-Forb	4.9%	6 B-Forb	14.6%
4 A-Forb	9.8%	4 A-Forb	9.8%
1 P-Grass	2.4%	5 P-Grass	12.2%
0 A-Grass	0.0%	2 A-Grass	4.9%
1 P-Sedge	2.4%	0 P-Sedge	0.0%
0 A-Sedge	0.0%	0 A-Sedge	0.0%

Table 3. Species Inventory

C	SCIENTIFIC NAME	W	WETNESS	PHYSIOGNOMY	COMMON NAME
*	ABUTILON THEOPHRASTI	4	FACU-	Ad A-FORB	VELVETLEAF
*	ACHILLEA MILLEFOLIUM	3	FACU	Ad P-FORB	YARROW
*	AGROPYRON REPENS	3	FACU	Ad P-GRASS	QUACK GRASS
0	Ambrosia artemisiifolia elatior	3	FACU	Nt A-FORB	COMMON RAGWEED
0	Ambrosia trifida	-1	FAC+	Nt A-FORB	GIANT RAGWEED
*	ARCTIUM MINUS	5	UPL	Ad B-FORB	COMMON BURDOCK
0	Aster pilosus	2	FACU+	Nt P-FORB	HAIRY ASTER
*	BARBAREA VULGARIS	0	FAC	Ad B-FORB	YELLOW ROCKET
*	BROMUS INERMIS	5	UPL	Ad P-GRASS	HUNGARIAN BROME
*	BROMUS JAPONICUS	3	FACU	Ad A-GRASS	JAPANESE CHESS
*	CARDUUS NUTANS	5	UPL	Ad B-FORB	MUSK THISTLE
0	Cyperus esculentus	-1	[FAC+]	Nt P-SEDGE	FIELD NUT SEDGE
*	DACTYLIS GLOMERATA	3	FACU	Ad P-GRASS	ORCHARD GRASS
*	DAUCUS CAROTA	5	UPL	Ad B-FORB	QUEEN ANNE'S LACE
3	Echinacea purpurea	5	UPL	Nt P-FORB	PURPLE CONEFLOWER
0	Erigeron annuus	1	FAC-	Nt B-FORB	ANNUAL FLEABANE
0	Erigeron canadensis	1	FAC-	Nt A-FORB	HORSEWEED
0	Eupatorium altissimum	3	[FACU]	Nt P-FORB	TALL BONESET
*	HELIANTHUS ANNUUS	1	FAC-	Ad A-FORB	GARDEN SUNFLOWER
5	Lemna minuscula	-5	OBL	Nt A-FORB	DINKY DUCKWEED
*	LEPIDIUM CAMPESTRE	5	UPL	Ad B-FORB	FIELD CRESS
*	LINUM PERENNE	5	UPL	Ad P-FORB	PERENNIAL FLAX
*	LYCHNIS ALBA	5	UPL	Ad A-FORB	WHITE CAMPION
*	LYTHRUM SALICARIA	-5	OBL	Ad P-FORB	PURPLE LOOSESTRIFE
*	MEDICAGO SATIVA	5	UPL	Ad P-FORB	ALFALFA
*	MELILOTUS ALBA	3	FACU	Ad B-FORB	WHITE SWEET CLOVER
*	NEPETA CATARIA	1	FAC-	Ad P-FORB	CATNIP
0	Oenothera biennis	3	FACU	Nt B-FORB	COMMON EVENING PRIMROSE
*	PHALARIS ARUNDINACEA	-4	FACW+	Ad P-GRASS	REED CANARY GRASS
1	Phragmites australis	-4	FACW+	Nt P-GRASS	COMMON REED
4	Physalis virginiana	5	UPL	Nt P-FORB	LANCE-LEAF GROUND CHERRY
*	POA PRATENSIS	1	FAC-	Ad P-GRASS	KENTUCKY BLUE GRASS
*	POLYGONUM PERSICARIA	1	[FAC-]	Ad A-FORB	LADY'S THUMB
2	Populus deltoides	-1	FAC+	Nt TREE	EASTERN COTTONWOOD
*	RATIBIDA COLUMNIFERA	5	UPL	Ad P-FORB	LONG-HEADED CONEFLOWER
*	RUMEX CRISPUS	-1	FAC+	Ad P-FORB	CURLY DOCK
*	SETARIA VIRIDIS	1	[FAC-]	Ad A-GRASS	GREEN FOXTAIL
*	SOLANUM DULCAMARA	0	FAC	Ad W-VINE	BITTERSWEET NIGHTSHADE
1	Solidago altissima	3	FACU	Nt P-FORB	TALL GOLDENROD
*	SOLIDAGO SEMPERVIRENS	3	[FACU]	Ad P-FORB	SEASIDE GOLDENROD
*	TRIFOLIUM PRATENSE	5	UPL	Ad P-FORB	RED CLOVER

West side of entry road

Table 1. Floristic Quality Data

15	NATIVE SPECIES
37	Total Species
0.73	NATIVE MEAN C
0.30	W/Adventives
2.84	NATIVE FQI
1.81	W/Adventives
0.5	NATIVE MEAN W
1.8	W/Adventives
AVG:	FACULTATIVE (-)

Table 2. Physiognomic Summary

NATIVE	40.5%	ADVENTIVE	59.5%
2 Tree	5.4%	1 Tree	2.7%
1 Shrub	2.7%	1 Shrub	2.7%
1 W-Vine	2.7%	1 W-Vine	2.7%
0 H-Vine	0.0%	0 H-Vine	0.0%
4 P-Forb	10.8%	5 P-Forb	3.5%
1 B-Forb	2.7%	3 B-Forb	8.1%
3 A-Forb	8.1%	9 A-Forb	24.3%
1 P-Grass	2.7%	1 P-Grass	2.7%
2 A-Grass	5.4%	1 A-Grass	2.7%
0 P-Sedge	0.0%	0 P-Sedge	0.0%
0 A-Sedge	0.0%	0 A-Sedge	0.0%

Table 3. Species Inventory

C	SCIENTIFIC NAME	W	WETNESS	PHYSIOGNOMY		COMMON NAME
0	Ambrosia artemisiifolia elatior	3	FACU	Nt	A-FORB	COMMON RAGWEED
*	ARTEMISIA VULGARIS	5	UPL	Ad	P-FORB	MUGWORT
0	Asclepias syriaca	5	UPL	Nt	P-FORB	COMMON MILKWEED
0	Aster pilosus	2	FACU+	Nt	P-FORB	HAIRY ASTER
*	ATRIPLEX PATULA	-2	FACW-	Ad	A-FORB	COMMON ORACH
1	Bidens frondosa	-3	FACW	Nt	A-FORB	COMMON BEGGAR'S TICKS
*	BRASSICA NIGRA	5	UPL	Ad	A-FORB	BLACK MUSTARD
*	BROMUS TECTORUM	5	UPL	Ad	A-GRASS	DOWNY BROME
*	CARDUUS NUTANS	5	UPL	Ad	B-FORB	MUSK THISTLE
*	CIRSIUM ARVENSE	5	UPL	Ad	P-FORB	FIELD THISTLE
*	DAUCUS CAROTA	5	UPL	Ad	B-FORB	QUEEN ANNE'S LACE
*	DIPLOTAXIS MURALIS	5	UPL	Ad	A-FORB	WALL ROCKET
0	Echinochloa crusgalli	-3	FACW	Nt	A-GRASS	BARNYARD GRASS
0	Eupatorium altissimum	3	[FACU]	Nt	P-FORB	TALL BONESET
2	Gleditsia triacanthos	0	FAC	Nt	TREE	HONEY LOCUST
*	HELIANTHUS ANNUUS	1	FAC-	Ad	A-FORB	GARDEN SUNFLOWER
*	HORDEUM JUBATUM	-1	FAC+	Ad	P-GRASS	SQUIRREL-TAIL GRASS
*	KOCHIA SCOPARIA	4	FACU-	Ad	A-FORB	BURNING BUSH
*	LACTUCA SERRIOLA	0	FAC	Ad	B-FORB	PRICKLY LETTUCE
*	LEONURUS CARDIACA	5	UPL	Ad	P-FORB	MOTHERWORT
0	Lepidium virginicum	4	FACU-	Nt	A-FORB	COMMON PEPPERCRESS
*	MORUS ALBA	0	FAC	Ad	TREE	WHITE MULBERRY
*	NEPETA CATARIA	1	FAC-	Ad	P-FORB	CATNIP
0	Oenothera biennis	3	FACU	Nt	B-FORB	COMMON EVENING PRIMROSE
1	Panicum capillare	0	FAC	Nt	A-GRASS	OLD WITCH GRASS
1	Phragmites australis	-4	FACW+	Nt	P-GRASS	COMMON REED
*	POLYGONUM CONVOLVULUS	1	FAC-	Ad	A-FORB	BLACK BINDWEED
*	POLYGONUM PERSICARIA	1	[FAC-]	Ad	A-FORB	LADY'S THUMB
2	Populus deltoides	-1	FAC+	Nt	TREE	EASTERN COTTONWOOD
*	RHAMNUS CATHARTICA	3	FACU	Ad	SHRUB	COMMON BUCKTHORN
1	Sambucus canadensis	-2	FACW-	Nt	SHRUB	ELDERBERRY
*	SISYMBRIUM ALTISSIMUM	3	FACU	Ad	A-FORB	TUMBLE MUSTARD
*	SOLANUM DULCAMARA	0	FAC	Ad	W-VINE	BITTERSWEET NIGHTSHADE
1	Solidago altissima	3	FACU	Nt	P-FORB	TALL GOLDENROD
*	SOLIDAGO SEMPERVIRENS	3	[FACU]	Ad	P-FORB	SEASIDE GOLDENROD
*	THLASPI ARVENSE	5	UPL	Ad	A-FORB	PENNY CRESS
2	Vitis riparia	-2	FACW-	Nt	W-VINE	RIVERBANK GRAPE

Gun Club

Table 1. Floristic Quality Data

25	NATIVE SPECIES
60	Total Species
1.28	NATIVE MEAN C
0.53	W/Adventives
6.27	NATIVE FQI
4.11	W/Adventives
-0.5	NATIVE MEAN W
0.9	W/Adventives
AVG:	FACULTATIVE

Table 2. Physiognomic Summary

NATIVE	40.7%	ADVENTIVE	59.3%
1 Tree	1.7%	4 Tree	6.8%
3 Shrub	5.1%	1 Shrub	1.7%
1 W-Vine	1.7%	1 W-Vine	1.7%
0 H-Vine	0.0%	0 H-Vine	0.0%
8 P-Forb	13.6%	8 P-Forb	13.6%
0 B-Forb	0.0%	6 B-Forb	10.2%
8 A-Forb	11.9%	7 A-Forb	11.9%
1 P-Grass	1.7%	5 P-Grass	8.5%
0 A-Grass	0.0%	3 A-Grass	5.1%
2 P-Sedge	3.4%	0 P-Sedge	0.0%
1 A-Sedge	1.7%	0 A-Sedge	0.0%

Table 3. Species Inventory

C	SCIENTIFIC NAME	W	WETNESS	PHYSIOGNOMY	COMMON NAME
*	ACHILLEA MILLEFOLIUM	3	FACU	Ad P-FORB	YARROW
*	AILANTHUS ALTISSIMA	5	UPL	Ad TREE	TREE OF HEAVEN
0	Amaranthus hybridus	5	UPL	Nt A-FORB	GREEN AMARANTH
0	Ambrosia artemisiifolia elatior	3	FACU	Nt A-FORB	COMMON RAGWEED
0	Ambrosia trifida	-1	FAC+	Nt A-FORB	GIANT RAGWEED
*	ARCTIUM LAPPA	5	UPL	Ad B-FORB	GREAT BURDOCK
*	ARCTIUM MINUS	5	UPL	Ad B-FORB	COMMON BURDOCK
*	ARTEMISIA VULGARIS	5	UPL	Ad P-FORB	MUGWORT
0	Aster pilosus	2	FACU+	Nt P-FORB	HAIRY ASTER
*	ATRIPLEX PATULA	-2	FACW-	Ad A-FORB	COMMON ORACH
1	Bidens frondosa	-3	FACW	Nt A-FORB	COMMON BEGGAR'S TICKS
*	BRASSICA NIGRA	5	UPL	Ad A-FORB	BLACK MUSTARD
*	BROMUS TECTORUM	5	UPL	Ad A-GRASS	DOWNY BROME
*	CARDUUS NUTANS	5	UPL	Ad B-FORB	MUSK THISTLE
*	CHENOPODIUM GLAUCUM	-3	FACW	Ad A-FORB	OAK-LEAVED GOOSEFOOT
*	CIRSIUM ARVENSE	5	UPL	Ad P-FORB	FIELD THISTLE
*	CIRSIUM VULGARE	4	FACU-	Ad B-FORB	BULL THISTLE
1	Convolvulus sepium	0	FAC	Nt P-FORB	HEDGE BINDWEED
2	Cyperus ferruginescens	-5	OBL	Nt A-SEDGE	RUSTY NUT SEDGE
*	DAUCUS CAROTA	5	UPL	Ad B-FORB	QUEEN ANNE'S LACE
*	DIGITARIA SANGUINALIS	3	FACU	Ad A-GRASS	HAIRY CRAB GRASS
*	DIPLACHNE ACUMINATA	0	[FAC]	Ad A-GRASS	SALT-MEADOW GRASS
0	Echinochloa crusgalli	-3	FACW	Nt A-GRASS	BARNYARD GRASS
2	Eleocharis erythropoda	-5	OBL	Nt P-SEDGE	RED-ROOTED SPIKE RUSH
0	Eupatorium altissimum	3	[FACU]	Nt P-FORB	TALL BONESET
*	EUPHORBIA DENTATA	5	UPL	Ad A-FORB	TOOTHED SPURGE
*	FESTUCA ELATIOR	2	FACU+	Ad P-GRASS	TALL FESCUE
1	Fragaria virginiana	1	FAC-	Nt P-FORB	WILD STRAWBERRY
*	HELIANTHUS ANNUUS	1	FAC-	Ad A-FORB	GARDEN SUNFLOWER
2	Helianthus grosseserratus	-2	FACW-	Nt P-FORB	SAWTOOTH SUNFLOWER
*	HORDEUM JUBATUM	-1	FAC+	Ad P-GRASS	SQUIRREL-TAIL GRASS
0	Lepidium virginicum	4	FACU-	Nt A-FORB	COMMON PEPPERCRESS
1	Lycopus asper	-3	[FACW]	Nt P-FORB	ROUGH WATER HOREHOUND
*	MUHLENBERGIA ASPERIFOLIA	-3	FACW	Ad P-GRASS	SCRATCH GRASS
*	NEPETA CATARIA	1	FAC-	Ad P-FORB	CATNIP
1	Parthenocissus inserta	3	FACU	Nt W-VINE	THICKET CREEPER
*	PASTINACA SATIVA	5	UPL	Ad B-FORB	WILD PARSNIP
1	Phragmites australis	-4	FACW+	Nt P-GRASS	COMMON REED
0	Plantago rugelii	0	FAC	Nt A-FORB	RED-STALKED PLANTAIN
*	POA COMPRESSA	2	FACU+	Ad P-GRASS	CANADA BLUE GRASS
*	POA PRATENSIS	1	FAC-	Ad B-GRASS	KENTUCKY BLUE

*	POLYGONUM PERSICARIA	1	[FAC-]	Ad	A-FORB	LADY'S THUMB
2	Populus deltoides	-1	FAC+	Nt	TREE	EASTERN COTTONWOOD
*	PORTULACA OLERACEA	1	FAC-	Ad	A-FORB	PURSLANE
*	RHAMNUS CATHARTICA	3	FACU	Ad	SHRUB	COMMON BUCKTHORN
7	Ribes americanum	-3	FACW	Nt	SHRUB	WILD BLACK CURRANT
*	RUMEX CRISPUS	-1	FAC+	Ad	P-FORB	CURLY DOCK
*	SALIX ALBA	-3	FACW	Ad	TREE	WHITE WILLOW
1	Salix interior	-5	OBL	Nt	SHRUB	SANDBAR WILLOW
1	Sambucus canadensis	-2	FACW-	Nt	SHRUB	ELDERBERRY
5	Scirpus pungens	-5	OBL	Nt	P-SEDGE	CHAIRMAKER'S RUSH
*	SOLANUM DULCAMARA	0	FAC	Ad	W-VINE	BITTERSWEET NIGHTSHADE
1	Solidago altissima	3	FACU	Nt	P-FORB	TALL GOLDENROD
3	Solidago graminifolia nuttallii	0	[FAC]	Nt	P-FORB	GRASS-LEAVED GOLDENROD
*	SOLIDAGO SEMPERVIRENS	3	[FACU]	Ad	P-FORB	SEASIDE GOLDENROD
*	SONCHUS ULIGINOSUS	1	FAC-	Ad	P-FORB	COMMON SOW THISTLE
*	ULMUS PUMILA	5	UPL	Ad	TREE	SIBERIAN ELM
0	Verbena bracteata	3	FACU	Nt	A-FORB	CREEPING VERVAIN

Total Inventory

Table 1. Floristic Quality Data

60	NATIVE SPECIES
143	Total Species
1.83	NATIVE MEAN C
0.77	W/Adventives
14.20	NATIVE FQI
9.20	W/Adventives
-0.5	NATIVE MEAN W
1.2	W/Adventives
AVG:	FACULTATIVE (+)

Table 2. Physiognomic Summary

NATIVE	42.0%	ADVENTIVE	58.0%
4 Tree	2.8%	5 Tree	3.5%
3 Shrub	2.1%	2 Shrub	1.4%
2 W-Vine	1.4%	1 W-Vine	0.7%
0 H-Vine	0.0%	0 H-Vine	0.0%
24 P-Forb	16.8%	21 P-Forb	14.7%
4 B-Forb	2.8%	14 B-Forb	9.8%
13 A-Forb	9.1%	22 A-Forb	15.4%
1 P-Grass	0.7%	12 P-Grass	8.4%
3 A-Grass	2.1%	6 A-Grass	4.2%
5 P-Sedge	3.5%	0 P-Sedge	0.0%
1 A-Sedge	0.7%	0 A-Sedge	0.0%

Table 3. Species Inventory

C	SCIENTIFIC NAME	W	WETNESS	PHYSIOGNOMY	COMMON NAME
*	ABUTILON THEOPHRASTI	4	FACU-	Ad A-FORB	VELVETLEAF
0	Acer negundo	-2	FACW-	Nt TREE	BOX ELDER
*	ACHILLEA MILLEFOLIUM	3	FACU	Ad P-FORB	YARROW
*	AGROPYRON REPENS	3	FACU	Ad P-GRASS	QUACK GRASS
*	AGROSTIS ALBA	-3	FACW	Ad P-GRASS	REDTOP
*	AILANTHUS ALTISSIMA	5	UPL	Ad TREE	TREE OF HEAVEN
0	Amaranthus hybridus	5	UPL	Nt A-FORB	GREEN AMARANTH
0	Ambrosia artemisiifolia elatior	3	FACU	Nt A-FORB	COMMON RAGWEED
0	Ambrosia trifida	-1	FAC+	Nt A-FORB	GIANT RAGWEED
2	Apocynum sibiricum	-1	FAC+	Nt P-FORB	PRAIRIE INDIAN HEMP
*	ARCTIUM LAPPA	5	UPL	Ad B-FORB	GREAT BURDOCK
*	ARCTIUM MINUS	5	UPL	Ad B-FORB	COMMON BURDOCK
*	ARTEMISIA VULGARIS	5	UPL	Ad P-FORB	MUGWORT
0	Asclepias syriaca	5	UPL	Nt P-FORB	COMMON MILKWEED
1	Asclepias verticillata	5	UPL	Nt P-FORB	WHORLED MILKWEED
0	Aster pilosus	2	FACU+	Nt P-FORB	HAIRY ASTER
3	Aster simplex	-5	OBL	Nt P-FORB	PANICLED ASTER
*	ASTER SUBULATUS	3	[FACU]	Ad A-FORB	EXPRESSWAY ASTER
*	ATRIPLEX PATULA	-2	FACW-	Ad A-FORB	COMMON ORACH
*	BARBAREA VULGARIS	0	FAC	Ad B-FORB	YELLOW ROCKET
5	Bidens comosa	-5	[OBL]	Nt A-FORB	SWAMP TICKSEED
1	Bidens frondosa	-3	FACW	Nt A-FORB	COMMON BEGGAR'S TICKS
*	BRASSICA NIGRA	5	UPL	Ad A-FORB	BLACK MUSTARD
*	BROMUS INERMIS	5	UPL	Ad P-GRASS	HUNGARIAN BROME
*	BROMUS JAPONICUS	3	FACU	Ad A-GRASS	JAPANESE CHESS
*	BROMUS TECTORUM	5	UPL	Ad A-GRASS	DOWNY BROME
*	CARDUUS NUTANS	5	UPL	Ad B-FORB	MUSK THISTLE
4	Carex pellita	-5	OBL	Nt P-SEDGE	BROAD-LEAVED WOOLLY SEDGE
*	CENTAUREA MACULOSA	5	UPL	Ad B-FORB	SPOTTED KNAPWEED
*	CHENOPODIUM ALBUM	1	FAC-	Ad A-FORB	LAMB'S QUARTERS
*	CHENOPODIUM GLAUCUM	-3	FACW	Ad A-FORB	OAK-LEAVED GOOSEFOOT
*	CICHORIUM INTYBUS	5	UPL	Ad P-FORB	CHICORY
*	CIRSIUM ARVENSE	5	UPL	Ad P-FORB	FIELD THISTLE
2	Cirsium discolor	5	UPL	Nt B-FORB	PASTURE THISTLE
*	CIRSIUM VULGARE	4	FACU-	Ad B-FORB	BULL THISTLE
*	CONIUM MACULATUM	-3	FACW	Ad B-FORB	POISON HEMLOCK
*	CONVOLVULUS ARVENSIS	5	UPL	Ad P-FORB	FIELD BINDWEED
1	Convolvulus sepium	0	FAC	Nt P-FORB	HEDGE BINDWEED
*	CORONILLA VARIA	5	UPL	Ad P-FORB	CROWN VETCH
0	Cyperus esculentus	-1	[FAC+]	Nt P-SEDGE	FIELD NUT SEDGE
2	Cyperus ferruginescens	-5	OBL	Nt A-SEDGE	RUSTY NUT SEDGE

*	DACTYLIS GLOMERATA	3	FACU	Ad	P-GRASS	ORCHARD GRASS
*	DAUCUS CAROTA	5	UPL	Ad	B-FORB	QUEEN ANNE'S LACE
*	DIGITARIA SANGUINALIS	3	FACU	Ad	A-GRASS	HAIRY CRAB GRASS
*	DIPLACHNE ACUMINATA	0	[FAC]	Ad	A-GRASS	SALT-MEADOW GRASS
*	DIPLOTAXIS MURALIS	5	UPL	Ad	A-FORB	WALL ROCKET
3	Echinacea purpurea	5	UPL	Nt	P-FORB	PURPLE CONEFLOWER
0	Echinochloa crusgalli	-3	FACW	Nt	A-GRASS	BARNYARD GRASS
2	Eleocharis erythropoda	-5	OBL	Nt	P-SEDGE	RED-ROOTED SPIKE RUSH
0	Erigeron annuus	1	FAC-	Nt	B-FORB	ANNUAL FLEABANE
0	Erigeron canadensis	1	FAC-	Nt	A-FORB	HORSEWEED
*	ERYSIMUM CHEIRANTHOIDES	-3	FACW	Ad	A-FORB	WORMSEED MUSTARD
0	Eupatorium altissimum	3	[FACU]	Nt	P-FORB	TALL BONESET
4	Eupatorium maculatum	-5	OBL	Nt	P-FORB	SPOTTED JOE PYE WEED
0	Eupatorium serotinum	-1	FAC+	Nt	P-FORB	LATE BONESET
*	EUPHORBIA DENTATA	5	UPL	Ad	A-FORB	TOOTHED SPURGE
0	Euphorbia supina	4	FACU-	Nt	A-FORB	SPOTTED CREEPING SPURGE
*	FESTUCA ELATIOR	2	FACU+	Ad	P-GRASS	TALL FESCUE
1	Fragaria virginiana	1	FAC-	Nt	P-FORB	WILD STRAWBERRY
1	Galium aparine	3	FACU	Nt	A-FORB	ANNUAL BEDSTRAW
2	Gaura biennis pitcheri	4	FACU-	Nt	B-FORB	COMMON GAURA
*	GLECHOMA HEDERACEA	3	FACU	Ad	P-FORB	CREEPING CHARLIE
2	Gleditsia triacanthos	0	FAC	Nt	TREE	HONEY LOCUST
*	HELIANTHUS ANNUUS	1	FAC-	Ad	A-FORB	GARDEN SUNFLOWER
2	Helianthus grosseserratus	-2	FACW-	Nt	P-FORB	SAWTOOTH SUNFLOWER
*	HEMEROCALLIS FULVA	5	UPL	Ad	P-FORB	ORANGE DAY LILY
*	HORDEUM JUBATUM	-1	FAC+	Ad	P-GRASS	SQUIRREL-TAIL GRASS
*	HYPERICUM PERFORATUM	5	UPL	Ad	P-FORB	COMMON ST. JOHN'S WORT
0	Juncus tenuis	2	[FACU+]	Nt	P-FORB	PATH RUSH
*	KOCHIA SCOPARIA	4	FACU-	Ad	A-FORB	BURNING BUSH
*	LACTUCA SERRIOLA	0	FAC	Ad	B-FORB	PRICKLY LETTUCE
5	Lemna minuscula	-5	OBL	Nt	A-FORB	DINKY DUCKWEED
*	LEONURUS CARDIACA	5	UPL	Ad	P-FORB	MOTHERWORT
*	LEPIDIUM CAMPESTRE	5	UPL	Ad	B-FORB	FIELD CRESS
0	Lepidium virginicum	4	FACU-	Nt	A-FORB	COMMON PEPPERCRESS
*	LINUM PERENNE	5	UPL	Ad	P-FORB	PERENNIAL FLAX
*	LOTUS CORNICULATUS	1	FAC-	Ad	P-FORB	BIRD'S FOOT TREFOIL
*	LYCHNIS ALBA	5	UPL	Ad	A-FORB	WHITE CAMPION
1	Lycopus asper	-3	[FACW]	Nt	P-FORB	ROUGH WATER HOREHOUND
*	LYTHRUM SALICARIA	-5	OBL	Ad	P-FORB	PURPLE LOOSESTRIFE
*	MEDICAGO LUPULINA	1	FAC-	Ad	A-FORB	BLACK MEDICK
*	MEDICAGO SATIVA	5	UPL	Ad	P-FORB	ALFALFA
*	MELILOTUS ALBA	3	FACU	Ad	B-FORB	WHITE SWEET CLOVER
*	MELILOTUS OFFICINALIS	3	FACU	Ad	B-FORB	YELLOW SWEET CLOVER
*	MORUS ALBA	0	FAC	Ad	TREE	WHITE MULBERRY
*	MUHLENBERGIA ASPERIFOLIA	-3	FACW	Ad	P-GRASS	SCRATCH GRASS
*	NEPETA CATARIA	1	FAC-	Ad	P-FORB	CATNIP
0	Oenothera biennis	3	FACU	Nt	B-FORB	COMMON EVENING PRIMROSE
1	Panicum capillare	0	FAC	Nt	A-GRASS	OLD WITCH GRASS
1	Parthenocissus inserta	3	FACU	Nt	W-VINE	THICKET CREEPER
*	PASTINACA SATIVA	5	UPL	Ad	B-FORB	WILD PARSNIP
*	PHALARIS ARUNDINACEA	-4	FACW+	Ad	P-GRASS	REED CANARY GRASS
*	PHLEUM PRATENSE	3	FACU	Ad	P-GRASS	TIMOTHY
1	Phragmites australis	-4	FACW+	Nt	P-GRASS	COMMON REED
4	Physalis virginiana	5	UPL	Nt	P-FORB	LANCE-LEAF GROUND CHERRY
0	Plantago rugelii	0	FAC	Nt	A-FORB	RED-STALKED PLANTAIN
*	POA COMPRESSA	2	FACU+	Ad	P-GRASS	CANADA BLUE GRASS
*	POA PRATENSIS	1	FAC-	Ad	P-GRASS	KENTUCKY BLUE GRASS
4	Polygonum amphibium stipulaceum	-5	OBL	Nt	P-FORB	WATER KNOTWEED
*	POLYGONUM ARENASTRUM	5	UPL	Ad	A-FORB	SIDEWALK KNOTWEED
4	Polygonum coccineum	-5	OBL	Nt	P-FORB	WATER HEARTSEASE
*	POLYGONUM CONVOLVULUS	1	FAC-	Ad	A-FORB	BLACK BINDWEED

0	Polygonum lapathifolium	-4	FACW+	Nt	A-FORB	HEARTSEASE
*	POLYGONUM PERSICARIA	1	[FAC-]	Ad	A-FORB	LADY'S THUMB
*	POPULUS CANESCENS	5	UPL	Ad	TREE	GRAY POPLAR
2	Populus deltoides	-1	FAC+	Nt	TREE	EASTERN COTTONWOOD
*	PORTULACA OLERACEA	1	FAC-	Ad	A-FORB	PURSLANE
7	Potamogeton foliosus	-5	OBL	Nt	P-FORB	LEAFY PONDWEED
*	PUCCINELLIA DISTANS	3	[FACU]	Ad	P-GRASS	ALKALI GRASS
*	RATIBIDA COLUMNIFERA	5	UPL	Ad	P-FORB	LONG-HEADED CONEFLOWER
*	RHAMNUS CATHARTICA	3	FACU	Ad	SHRUB	COMMON BUCKTHORN
7	Ribes americanum	-3	FACW	Nt	SHRUB	WILD BLACK CURRANT
*	RUMEX CRISPUS	-1	FAC+	Ad	P-FORB	CURLY DOCK
*	SALIX ALBA	-3	FACW	Ad	TREE	WHITE WILLOW
5	Salix amygdaloides	-3	FACW	Nt	TREE	PEACH-LEAVED WILLOW
1	Salix interior	-5	OBL	Nt	SHRUB	SANDBAR WILLOW
*	SALSOLA KALI TENUIFOLIA	3	FACU	Ad	A-FORB	RUSSIAN THISTLE
1	Sambucus canadensis	-2	FACW-	Nt	SHRUB	ELDERBERRY
4	Scirpus fluviatilis	-5	OBL	Nt	P-SEDGE	RIVER BULRUSH
5	Scirpus pungens	-5	OBL	Nt	P-SEDGE	CHAIRMAKER'S RUSH
*	SETARIA FABERI	2	FACU+	Ad	A-GRASS	GIANT FOXTAIL
*	SETARIA VIRIDIS	1	[FAC-]	Ad	A-GRASS	GREEN FOXTAIL
*	SISYMBRIUM ALTISSIMUM	3	FACU	Ad	A-FORB	TUMBLE MUSTARD
*	SOLANUM DULCAMARA	0	FAC	Ad	W-VINE	BITTERSWEET NIGHTSHADE
1	Solidago altissima	3	FACU	Nt	P-FORB	TALL GOLDENROD
1	Solidago canadensis	3	FACU	Nt	P-FORB	CANADA GOLDENROD
4	Solidago graminifolia	-2	FACW-	Nt	P-FORB	GRASS-LEAVED GOLDENROD
3	Solidago graminifolia nuttallii	0	[FAC]	Nt	P-FORB	GRASS-LEAVED GOLDENROD
*	SOLIDAGO SEMPERVIRENS	3	[FACU]	Ad	P-FORB	SEASIDE GOLDENROD
*	SONCHUS ASPER	3	[FACU]	Ad	A-FORB	SPINY SOW THISTLE
*	SONCHUS ULIGINOSUS	1	FAC-	Ad	P-FORB	COMMON SOW THISTLE
1	Sporobolus neglectus	5	UPL	Nt	A-GRASS	SMALL RUSH GRASS
*	TARAXACUM OFFICINALE	3	FACU	Ad	P-FORB	COMMON DANDELION
3	Teucrium occidentale	-3	FACW	Nt	P-FORB	GERMANDER
*	THLASPI ARVENSE	5	UPL	Ad	A-FORB	PENNY CRESS
*	TRIFOLIUM PRATENSE	5	UPL	Ad	P-FORB	RED CLOVER
*	ULMUS PUMILA	5	UPL	Ad	TREE	SIBERIAN ELM
*	VERBASCUM THAPSUS	5	UPL	Ad	B-FORB	COMMON MULLEIN
0	Verbena bracteata	3	FACU	Nt	A-FORB	CREEPING VERVAIN
4	Verbena hastata	-4	FACW+	Nt	P-FORB	BLUE VERVAIN
*	VIBURNUM OPULUS	3	[FACU]	Ad	SHRUB	HIGHBUSH CRANBERRY
2	Vitis riparia	-2	FACW-	Nt	W-VINE	RIVERBANK GRAPE
*	XANTHIUM STRUMARIUM	0	FAC	Ad	A-FORB	COCKLEBUR

APPENDIX G
RESPONSE TO COMMENTS

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RESPONSE TO COMMENTS
Phase I Ecological Reclamation Study
Lake Calumet Cluster Site
Chicago, Illinois

Comments on the Draft Phase I Ecological Restoration Study were received from various state agencies, businesses, and community groups in November and December 1997. These comments have been grouped into general categories, and the responses are provided below. The Final Phase I Ecological Restoration Study (now titled the Final Phase I Ecological Reclamation Study) has been revised to addressed these comments, where applicable.

Comments were received from the following organizations:

A - Walter J. Marcisz, Chicago, Illinois, 10 November 1997.
B - Keith Harley, Director, Environmental Law Program, Chicago Legal Clinic, Inc., Chicago, Illinois, 11 November 1997.
C - Ted Peltier, Northwestern University, Evanston, Illinois, 12 November 1997.
D - Lynne M. Cunningham, Southeast Chicago Development Commission, 11 November 1997.
E - James A. Jansen, P.E., Illinois Environmental Protection Agency, Maywood, Illinois, 17 November 1997.
F - Mary Margaret Cowhey, Land and Lakes, Park Ridge, Illinois, 18 November 1997.
G - Dr. James E. Landing, Lake Calumet Study Committee, Chicago, Illinois, 20 November 1997.
H - George Roadcap, Illinois State Water Survey, Champaign, Illinois, 19 November 1997.
I - Ders Anderson, Openlands Project, Chicago, Illinois, 20 November 1997.
J - James J. Cowhey, Jr., Land and Lakes, Park Ridge, Illinois, 3 December 1997.

Specific Comments by General Categories

1. End Use of the Sites
   A-1; A-2; A-3; B-4; C-2; C-7b; C-9b; D-2; D-3; F-9; F-40; G-44; G-47; G-48

Most commenters prefer that the end use of the Cluster Site be passive recreation (i.e., nature observation), wildlife habitat, and open space. These end uses have been incorporated into the revised document, and references to active recreation have been removed from the text.

2. Gun Club
   A-4; B-6; C-8d; G-2

Several commenters suggested that the Gun Club not be included in the Ecological Reclamation Study, since it provides habitat to the state-endangered black-crowned night heron. The Gun Club has been retained in the report because of the history of a drum

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release on the property, the potential for lead-contaminated sediments, and the ecological importance of the site.

3. Cluster Site Evaluation:
   B-1; D-1; G-3; F-11

Several commenters advocate that any reclamation activities for the site consider the sites as a cluster, rather than as individual sites, and that the development of the reclamation plan also consider neighboring sensitive areas. The revised document has been expanded to discuss the value of addressing the sites together rather than individually.

4. Phase II
   B-2; D-1

Commenters have indicated that they support the U.S. EPA proceeding with Phase II of the Ecological Reclamation Study for the Cluster Site.

5. Wetland Creation
   B-5; H-5

Wetland creation on the sites has been proposed by some commenters. As part of the terrestrial reclamation plan, development of dry to wet prairie is proposed for the Cluster Site. The term "wet prairie" is equivalent to wetland. Areas of the site that are currently wet would be planted with wetland species, though wetland creation is not proposed in the Ecological Reclamation Plan. Wetland creation would require earthmoving activities that could potentially breach the integrity of any existing or planned cap, resulting in subsurface contaminants being brought to the surface. In addition, dry to mesic prairies are more effective in capturing and retaining precipitation than a wetland system, which is already in a saturated state.

6. Extent of Capping/Extent of Contamination
   B-7; B-8; C-3; C-4; H-2; H-4; C-8a; C-8c; C-10e; C-11a; E-13

The extent of contamination and extent of the cap on portions of the site is seen as a data gap by many commenters. A list of data gaps associated with each individual site has been provided at end of Section 4. Sections 6 and 7 have also been expanded, providing more detail on the data gaps and recommendations to address data gaps has been provided in the revised text.

7. Off-site Migration/Groundwater Concerns
   B-8; C-7a; C-9a; C-11b; C-12c; H-1; F-4; F-5; F-6; F-21; F-31; F-33; F-35; F-37; F-38

Several commenters have raised concerns about the potential for off-site migration of contaminants, primarily through the groundwater pathway. Section 2 has been revised to indicate the improvements made by Land and Lakes #3. Section 5 (Fate and Transport)

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has been revised to include information from Land and Lakes on the inward flow of shallow groundwater on their property. The potential for shallow groundwater to impact Indian Ridge Marsh is discussed as a data gap in Section 4 and shallow groundwater sampling is proposed in Section 7.

8. Paxton Lagoons - has this site been completely remediated?
   B-9

One commenter asked about the conditions at Paxton Lagoons. The discussion on the lagoons will be revised to indicate that this site has been completely remediated. The fence is present to restrict illegal dumping on the property, and would be removed as part of reclamation activities.

9. Land and Lakes Conditions
   C-1; C-8b; I-2

Several commenters asked about current conditions at Land and Lakes #3. The current conditions at Land and Lakes #3 have been updated based on input received from Land and Lakes Company.

10. Bioaccumulation/Burning/Prairie Vegetation/Reed Grass Control
    C-5; C-12b; C-12c; C-12e; C-13b; C-13c; H-8; I-3; I-5; I-7; F-24; F-45

Commenters have raised concerns on the potential of site contaminants to bioaccumlate in plants, the potential for contaminant release through burning, the proposed planting of prairie vegetation, and the method proposed for common reed grass control. Additional discussion on these topics has been added to the text. In addition, elements of the proposed reclamation plan are somewhat experimental, and test plots are proposed for the Cluster Site, especially for examining methods to improve soil conditions.

11. State of Site Versus Ecological Reclamation
    C-6

A commenter stated that a large data gap exists between the state of the site and the proposed reclamation plan. Data gaps for each parcel have been listed in Section 4, and the description of the data gaps and recommended action items has been expanded in Section 7

12. Fill Material
    C-9c

A commenter suggested a source for more information on fill material present at the site. Slag is the primary fill material used in the Lake Calumet region. A discussion of the properties of steel slag have been added to Section 4 (Nature and Extent of Contamination).

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13. Background
C-10a; C-10b; H-3; F-33

The term *background* has been removed from the report, since the locations identified as *background* in the Expands Site Investigation (ESI) reports do not represent natural or ambient conditions. The term *background* has been replaced with *off-site upgradient/ sidegradient* locations, and the off-site locations for soil, surface water, and sediment have been added to the bottom of the tables in Section 4.

14. Active Remediation
C-10c; C-6; C-12a; C-12c; H-4

Comments on whether active remediation will occur at the site were received. The data gaps and recommendations in Section 6.2 and Section 7 describe those areas/media that may require active remediation. Sites such as Paxton Lagoons and Land and Lakes #3 would not require any remediation, and the reclamation plan could be implemented on these properties at any time.

15. Fish, Wildlife, and Air Pathways
C-10d; E-1; H-7; I-6

Several commenters asked why the fish and wildlife ingestion and dust inhalation pathways were not addressed in this report. Quantification of risk associated with consumption of contaminated fish and waterfowl and inhalation of dusts was not performed in the screening risk assessments for the sites due to the lack of data and the limited potential for exposure to dust in relation to the other exposure pathways. A determination of the contribution of the Cluster Site to contaminants in Lake Calumet is difficult make. None of the ponds on the Cluster Site are anticipated to support a sport fishery, and hunting is illegal within the city limits. In the data gaps and recommendations in Section 7, an evaluation of the available information on the fish consumption pathway is proposed. The Tier I objectives used to evaluate the extent of contamination consider the inhalation pathway. By establishing a vegetative cover on the Cluster Site (and possibly capping certain parts of the site), the inhalation pathway is not expected to pose a significant risk.

These exposure pathways are discussed in more detail in Section 4, and are also considered as a data gap that would be addressed during Phase II of the ERS.

16. Paxton Concerns
C-12d; E-1; H-7; I-6

Several commenters asked about the current conditions at Paxton Landfill. The IEPA has provided updated information on studies that they are conducting at this site, and this information has been added to the revised report.

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17. Flood Control/Traffic
C-12f; D-3; I-8

Several commenters raised concerns on flooding and traffic increases in the area. Native prairie plants will capture more water than the existing vegetation. Other reclamation activities that may help alleviate flooding problems include improved leachate collection, grading site, etc. The proposed end use of the site (i.e., wildlife habitat, nature observation, open space) may slightly increase traffic in the area; however, access can be regulated to limit this increase, and it is anticipated most increases in traffic will occur on weekends.

18. Sediment Contamination
C-12g

One commenter noted that sediment quality could affect the ability to establish diverse aquatic species in the ponds. Due to the physical conditions of the ponds, they are not expected to support a sport fishery. Exceeding an ecological benchmark does not necessarily indicate that aquatic organisms have been adversely impacted. In Section 7 (Data Gaps and Recommendations), fish and benthic community monitoring, as well as additional sediment and surface water sampling, are proposed as a means to establish whether the aquatic community has been impacted by site-related contamination. Habitat also plays a major role in the establishment of a healthy aquatic community. Enhancement techniques have been proposed that will improve habitat within the ponds.

19. Funding
C-13a

One commenter stated that funding/cost issues were not adequately addressed. No further discussion of funding alternatives is proposed for the revised document. It is proposed that this topic will be evaluated in more detail during Phase II of the study.

20. Similar Projects
C-13d

One commenter asked if examples of similar projects could be discussed in the report. *This project is* unique evaluation of an alternative method for addressing contamination concerns at a cluster of adjacent sites. The closest similar projects may include strip mine reclamation studies, slag reclamation studies; phytoremediation studies.

21. *Restoration* versus *Reclamation*
E-1; G-1

Several commenters have proposed that the term *restoration* be changed to *reclamation*, since restoration connotes that the site will be returned to pre-settlement conditions, while reclamation connotes that the site quality will be improved over current conditions. This change has been made to the document.

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22. IEPA Tier I Commercial/Industrial Remediation Objectives
E-3

One commenter questioned why IEPA Tier I commercial/industrial remediation objectives were used. Since the sites are not expected to be developed for residential land use in the future, commercial/industrial remediation objectives more accurately portray future site conditions. Under the data gaps and recommendations (Section 7), a focused risk assessment, which will evaluate future recreational use, is proposed for any additional data collected as part of Phase II activities,

23. General Corrections
E-4; E-5; E-6; E-7; E-8; E-9; E-10; E-11; E-12; E-13; E-14; I-1; F-1; F-2; F-3; F-4; F-5; F-6; F-7
F-10; F-12; F-14; F-15; F-16; F-17; F-18; F-19; F-20; F-22; F-23; F-24; F-25; F-26; F-27;F-28; F-29; F-30; F-34; F-36; F-39; F-41; F-42; F-43; F-46; F-49; F-50

Several commenters noted general errors that needed correction. The text was revised as appropriate to correct the errors made.

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Appendix D

U.S. Census Data

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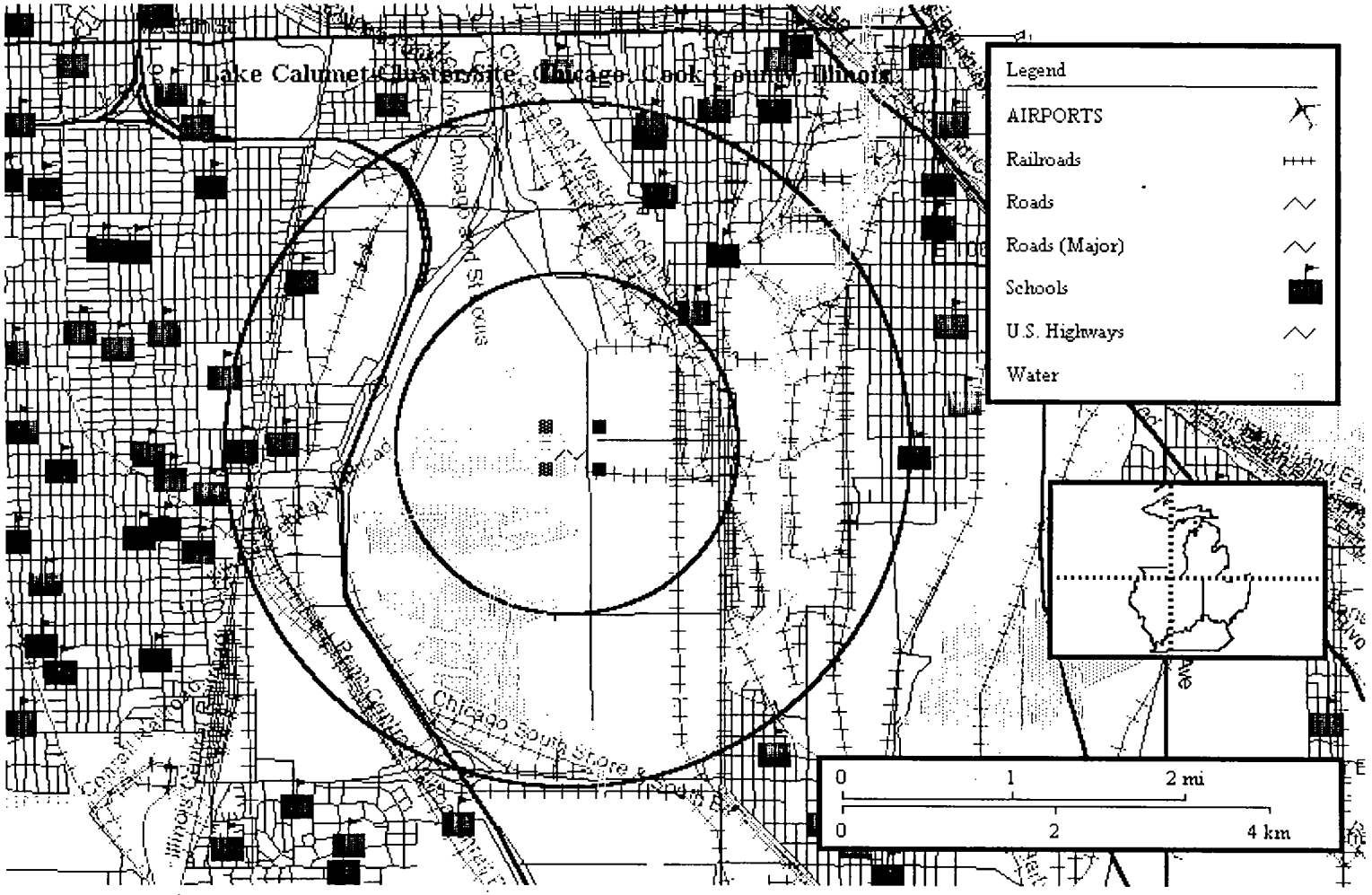
Lake Calumet Cluster Site, Chicago, Cook County, Illinois
Legend
AIRPORTS
Railroads
Roads
Roads (Major)
Schools
U.S. Highways
Water
0
1
2 mi
0
2
4 km

American Indian:	0
Asian/Pacific Islander:	0
Black Population:	0
Hispanic Population:	1
LOCATION:	41.682810, -87.569946
Land Area (sq. Miles):	0.20
METHOD:	Block Group Proration method.
Median Household Income:	0
Minority Population:	1
Number Of Families:	0
Number Of Households:	0
Number Of Persons:	1
Number Of Persons (stf3):	3
Number of Housing Units:	0
Other Race:	0
Percent Asian:	0.0
Percent Bachelors degree:	0.0
Percent Below Poverty:	0.0
Percent Black:	0.0
Percent High School grad.:	0.0
Percent Hispanic:	100.0
Percent Indian:	0.0
Percent Minority:	100.0
Percent Other Race:	0.0
Percent Rural Population:	0.0
Percent Urban:	0.0
Percent White:	100.0
Persons Below Poverty:	0
RADIUS:	0.25 miles
SOURCE:	Summary of 1 Block Groups
School Enrollment:	0
Water Area (sq. Miles):	0.0
White Population:	1

Census Data for Lake Calumet Cluster, Cook County, IL

American Indian:	0
Asian/Pacific Islander:	0
Black Population:	0
Hispanic Population:	3
LOCATION:	41.682810, -87.569946
Land Area (sq. Miles):	0.79
METHOD:	Block Group Proration method.
Median Household Income:	0
Minority Population:	3
Number Of Families:	2
Number Of Households:	3
Number Of Persons:	7
Number Of Persons (stf3):	15
Number of Housing Units:	0
Other Race:	1
Percent Asian:	0.0
Percent Bachelors degree:	0.0
Percent Below Poverty:	0.0
Percent Black:	0.0
Percent High School grad.:	0.0
Percent Hispanic:	42.9
Percent Indian:	0.0
Percent Minority:	42.9
Percent Other Race:	14.3
Percent Rural Population:	0.0
Percent Urban:	0.0
Percent White:	71.4
Persons Below Poverty:	0
RADIUS:	0.50 miles
SOURCE:	Summary of 2 Block Groups
School Enrollment:	0
Water Area (sq. Miles):	0.0
White Population:	5

Census Data for Lake Calumet Cluster, Cook County, IL

American Indian:	5
Asian/Pacific Islander:	0
Black Population:	505
Hispanic Population:	408
LOCATION:	41.682810, -87.569946
Land Area (sq. Miles):	3.14
METHOD:	Block Group Proration method.
Median Household Income:	0
Minority Population:	916
Number Of Families:	257
Number Of Households:	356
Number Of Persons:	1060
Number Of Persons (stf3):	1141
Number of Housing Units:	0
Other Race:	282
Percent Asian:	0.0
Percent Bachelors degree:	0.0
Percent Below Poverty:	51.4
Percent Black:	47.6
Percent High School grad.:	0.0
Percent Hispanic:	38.5
Percent Indian:	0.5
Percent Minority:	86.4
Percent Other Race:	26.6
Percent Rural Population:	0.0
Percent Urban:	0.0
Percent White:	25.1
Persons Below Poverty:	545
RADIUS:	1.00 miles
SOURCE:	Summary of 3 Block Groups
School Enrollment:	0
Water Area (sq. Miles):	0.0
White Population:	266

American Indian:	52
Asian/Pacific Islander:	73
Black Population:	8432
Hispanic Population:	5543
LOCATION:	41.682810, -87.569946
Land Area (sq. Miles):	12.57
METHOD:	Block Group Proration method.
Median Household Income:	0
Minority Population:	14004
Number Of Families:	6104
Number Of Households:	8190
Number Of Persons:	23737
Number Of Persons (stf3):	23552
Number of Housing Units:	0
Other Race:	3137
Percent Asian:	0.3
Percent Bachelors degree:	0.0
Percent Below Poverty:	21.0
Percent Black:	35.5
Percent High School grad.:	0.0
Percent Hispanic:	23.4
Percent Indian:	0.2
Percent Minority:	59.0
Percent Other Race:	13.2
Percent Rural Population:	0.0
Percent Urban:	0.0
Percent White:	50.7
Persons Below Poverty:	4982
RADIUS:	2.00 miles
SOURCE:	Summary of 36 Block Groups
School Enrollment:	0
Water Area (sq. Miles):	0.0
White Population:	12042

Census Data for Lake Calumet Cluster, Cook County, IL

American Indian:	144
Asian/Pacific Islander:	288
Black Population:	61599
Hispanic Population:	14127
LOCATION:	41.682810, -87.569946
Land Area (sq. Miles):	28.27
METHOD:	Block Group Proration method.
Median Household Income:	0
Minority Population:	75809
Number Of Families:	24742
Number Of Households:	32457
Number Of Persons:	100283
Number Of Persons (stf3):	100330
Number of Housing Units:	0
Other Race:	7711
Percent Asian:	0.3
Percent Bachelors degree:	0.0
Percent Below Poverty:	20.7
Percent Black:	61.4
Percent High School grad.:	0.0
Percent Hispanic:	14.1
Percent Indian:	0.1
Percent Minority:	75.6
Percent Other Race:	7.7
Percent Rural Population:	0.0
Percent Urban:	0.0
Percent White:	30.5
Persons Below Poverty:	20747
RADIUS:	3.00 miles
School Enrollment:	0
Water Area (sq. Miles):	0.0
White Population:	30540

Census Data for Lake Calumet Cluster, Cook County, IL

American Indian:	331
Asian/Pacific Islander:	725
Black Population:	163084
Hispanic Population:	29137
LOCATION:	41.682810, -87.569946
Land Area (sq. Miles):	50.27
METHOD:	Block Group Proration method.
Median Household Income:	0
Minority Population:	192088
Number Of Families:	61741
Number Of Households:	80988
Number Of Persons:	248557
Number Of Persons (stf3):	248595
Number of Housing Units:	0
Other Race:	15899
Percent Asian:	0.3
Percent Bachelors degree:	0.0
Percent Below Poverty:	17.3
Percent Black:	65.6
Percent High School grad.:	0.0
Percent Hispanic:	11.7
Percent Indian:	0.1
Percent Minority:	77.3
Percent Other Race:	6.4
Percent Rural Population:	0.0
Percent Urban:	0.0
Percent White:	27.6
Persons Below Poverty:	43043
RADIUS:	4.00 miles
School Enrollment:	0
Water Area (sq. Miles):	0.0
White Population:	68517

Appendix E

Site Assessment Status Report: Results of Phase I Sampling Activities for Lake Calumet Cluster Site

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SITE ASSESSMENT STATUS REPORT: RESULTS OF PHASE I SAMPLING ACTIVITIES FOR LAKE CALUMET CLUSTER SITE CHICAGO, ILLINOIS

TDD: S05-9806-008
PAN: 8N0801SIXX

March 10, 1999

Prepared for:

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
77 West Jackson Boulevard
Chicago, Illinois 60604

Prepared by: _____ Date: 3/10/99
Damon Sinars, START Project Manager

Reviewed by: _____ Date: 3/10/99
M. J. Ripp, Assistant START Program Manager

Approved by: _____ Date: 3/10/99
Thomas Kouris, START Program Manager

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March 10, 1999

Ms. Rosita Clarke-Moreno
Remedial Project Manager
U.S. Environmental Protection Agency
77 West Jackson Boulevard, 6th Floor
Chicago, IL 60604-3690

Re: Lake Calumet Cluster Site
Chicago, Cook County, Illinois
TDD: S05-9806-008
PAN: 8N0801SIXX

Dear Ms. Clarke-Moreno:

The Ecology and Environment, Inc. (E & E), Superfund Technical Assessment and Response Team (START) has been tasked by the United States Environmental Protection Agency (U.S. EPA) under Technical Direction Document (TDD) S05-9806-008 to perform a site assessment for the Lake Calumet Cluster Site in Cook County, Chicago, Illinois. The report that follows summarizes the activities and findings to date. Introduction, site background, methods, results, discussion, and recommendations for further actions are presented.

Sincerely,

Damon M Sinars

Damon Sinars
START Project Manager

Thomas Kouris
START Program Manager

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INTRODUCTION

In April 1996, several local community groups approached U.S. EPA through the Chicago Legal Clinic, requesting that eight disposal sites in the Indian Ridge Marsh area be clustered together for two purposes: ranking as a single cluster site by the Hazardous Ranking System (HRS) for potential listing on the National Priorities List, and for remediation and long-term responses. The community groups' concerns about these sites include the potential impact on human health from prior disposal of hazardous materials as the sites, as well as the potential impact of contamination on the sensitive ecological resources in the area.

U.S. EPA has deferred decisions to undertake formal Superfund action under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) in favor of an alternative approach. U.S. EPA has been working as a facilitator in conjunction with community groups to complete an Environmental Reclamation Study (ERS) as the first step in the evaluation of potential health and ecological impact in the Lake Calumet area. The ERS Report was prepared by compiling and summarizing information regarding the existing conditions of the individual sites. No sampling was conducted for the ERS. The ERS Report, finalized by Roy F. Weston in February 1998, determined that ecological reclamation of these individual disposal sites would be possible as a single cluster site. A public meeting was held in June 1998. Detailed sampling was recommended to address data gaps and to focus on the ecological reclamation design. As a result, E & E was tasked by U.S. EPA to perform site assessment activities at the Lake Calumet Cluster Site to address the data gaps.

The ERS and E & E site assessment activities are the first steps of the planning process that will further promote the coalition of local interests and will pursue the voluntary implementation of an ecological reclamation plan for the area. It is envisioned that over the long term, other adjacent properties may voluntarily join this cluster site initiative, improving the ecological resources in the Lake Calumet area.

SITE BACKGROUND

The Lake Calumet Cluster Site is a group of several landfills and waste storage/disposal facilities located in southeastern Chicago, Cook County, Illinois (41° 41' 15.0 North and 87° 34' 35.0 West at Paxton II). The site is approximately 200 acres in size and is bordered by the Interlake/Big Marsh property to the north, Stony Island Avenue to the west, the Norfolk and Western Railroad right-of-way to the east, and 122nd Street to the south. The cluster includes the following individual sites: Paxton I, Paxton II, Paxton Lagoons, Alburn Incinerator (Alburn), U.S. Drum II (U.S. Drum), Land and Lakes #3, MSD #4 (south of 122nd Street), and an unnamed parcel (Unnamed Parcel). A site location map is presented in Attachment A, Figure A-1, and an aerial photograph of the site with area features is presented in Attachment A, Figure A-2.

Paxton I operated from 1971 through 1976. The landfill accepted general refuse, industrial wastes, and sludges under special waste permits authorized by the Illinois Environmental Protection Agency (IEPA). Special wastes, listed as hazardous and nonhazardous, were accepted at Paxton I. Two ponds, LHL1 and LHL2, are located on the Paxton I property.

Alburn operated as a landfill from 1967 through 1977. Wastes were disposed in excavated pits and trenches. No details are available on the types and quantities of wastes buried during this period. In 1977, Alburn initiated hazardous waste incineration and hazardous waste storage/transfer operations. In 1979, U.S. EPA issued a Resource Conservation and Recovery Act (RCRA) permit to Alburn for the operation of an incinerator. Alburn incinerated/stored hazardous wastes and sludges, including paints, thinners, varnishes, chlorinated solvents, styrene, ink, adhesives, waste oils, antifreeze, petroleum, naphtha, coal tar, and waste solvents. Site storage and disposal methods included landfilling,

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incineration, operation of a surface impoundment, and bulk liquid waste storage. In 1982, Alburn had their permit revoked due to several RCRA violations. Alburn continued to accept bulk waste until January 1983. On July 5, 1985, two on-site drums exploded from heat expansion and a subsequent chemical reaction. U.S. EPA ordered an immediate removal action of all visible sources of hazardous materials from the site, including bulk storage tanks, drums, 5-gallon pails, and lagoon sludge. In addition, the top 6 inches of soil, assumed to be the most contaminated, were excavated.

Since the 1940s, U.S. Drum and adjacent areas were used as a dump for municipal and industrial wastes. During the mid to late 1970s, the site was used as a hazardous waste transfer and petroleum recovery facility, until a fire occurred in July 1975. Operations at the facility were abandoned temporarily in 1976. In 1979, a waste drum temporary storage and transfer facility operated at the site. The waste transfer facility was shut down in 1979. An estimated 34,100 gallons of liquid and semisolid wastes were removed between October and December 1979. An estimated 1,750 drums were left on site inside earthen berms. A U.S. EPA removal action occurred at the site from December 1984 through July 1985. During construction of a new access road, approximately 1,500 buried drums were discovered. The drums had their ends cut off or punctured to allow the contents to drain into the ground prior to or at the time of burial. All observable drums, 435 cubic yards of contaminated soil, and 62,000 gallons of standing water were removed.

The Unnamed Parcel is approximately 38 acres in size and is located south and west of Alburn. No previous removal actions or studies have been conducted on this property. Sampling will enable the Unnamed Parcel to be related to the other sites and will assist in gaining a better understanding of the general quality of the property.

Paxton II, Land and Lakes #3, Paxton Lagoon, and MSD #4 were not sampled and are therefore, not included in detail in this report.

METHODS

Based on the E & E 1998 sampling plan, the sampling was planned to occur in phases: Phase I was planned to be initial multimedia sampling excluding groundwater; Phase II was planned to be installation and sampling of groundwater monitoring wells; and Phase III was planned to be followup sampling to address any questions raised by Phase I. This report discusses the results of Phase I. A work plan detailing Phase II is being finalized by E & E. Phase III is discussed in the Recommendations for Further Action section of this report.

Phase I sampling activities were conducted from August 24, 1998, through September 3, 1998, and included determining the location of site features and potential sample locations using global positioning systems (GPS), screening metals concentrations in surface soils using X-ray fluorescence (XRF), and collecting samples of various environmental media sampling. The following media were sampled throughout the site (excluding Alburn): surface soils, subsurface soils, sediments, surface water, groundwater, and macroinvertebrates. Alburn was not included in Phase I due to a locked fence that prohibited access; a key could not be obtained at the time of sampling. Additionally, original plans included taking soil samples in 1-acre intervals. This strategy was not followed (see below) due to measuring difficulties and physical constraints, including rough terrain, extremely thick vegetation (especially *Phragmites*), and fencing.

The sampling team consisted of personnel from the following agencies: E & E START; U.S. EPA; and IEPA. E & E provided the majority of the sampling equipment and IEPA provided the XRF, GPS, Geoprobe, and boat.

The geographic locations of site features (parking lot, roads, fence lines) and potential sample locations were determined by IEPA using GPS. Approximately 140 potential sample locations were demarcated with flags. These locations were selected based on 1) geography - locations spread

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throughout site; 2) potential contamination - locations in areas where vegetation was absent, where runoff flowed, or where moss grew (potential metal contamination indicator); 3) accessibility - locations where tall vegetation and other obstructions did not limit access of personnel and equipment; and 4) diversity - locations in a variety of habitats. GPS data was collected in coordination with the XRF screening.

XRF screening was conducted by IEPA at the same locations as the GPS data. The XRF screened for the following metals: molybdenum, strontium, rubidium, lead, arsenic, mercury, zinc, copper, nickel, cobalt, manganese, and chromium.

Approximately 68% of the locations screened by XRF were chosen as actual soil sample locations. Specific sample locations were selected based on 1) geography - locations throughout the site; 2) diversity - locations in a variety of habitats; and 3) potential contamination - locations in areas where XRF readings of metals were relatively high as compared to other readings. This selection process attempted to identify the most contaminated areas, not to obtain a random, unbiased representation of site conditions. Sample locations are presented in Attachment A, Figure A-3.

Eighty-four surface soil samples and four duplicates were collected throughout the site, excluding the Alburn property, using stainless steel spoons. Five subsurface soil samples with one duplicate and three groundwater samples were collected using a Geoprobe owned and operated by IEPA. Sediment, surface water, and macroinvertebrate samples were collected from a boat supplied by IEPA: 11 samples of each media were collected from Indian Ridge Pond and 8 from the three ponds located on site. Sediment samples were collected using a Ponar Dredge. Surface water samples were collected by directly immersing the sample jars into the water at the appropriate sample locations. Macroinvertebrate samples were collected either from submerged objects or sieved from sediments collected with the Ponar Dredge. Samples were collected in accordance with E & E START Standard Operating Procedures (SOPs), as described in the site sampling plan.

Inorganic analyses of soils and macroinvertebrate identification were performed by U.S. EPA Region 5 Central Regional Laboratory (CRL). Other analyses were performed by assigned Contract Laboratory Program (CLP) laboratories. The analysis conducted on the samples included the following: total metals, toxicity characteristic leaching procedure (TCLP) metals (soils only), volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, polychlorinated biphenyls (PCBs), and general chemistry parameters.

RESULTS

Data was entered into a database, checked for accuracy, and sorted. Summary tables were created (Attachment B, Tables B-1 through B-6). The results were sorted by media (surface soil, groundwater, etc.) and type of chemical (inorganic and organic). Only chemicals that were detected in at least one sample are included in these tables. The tables list the chemicals detected; the frequency at which they were detected; the minimum, average, and maximum detected concentration; various screening criteria or thresholds (described below); and the frequency with which these criteria were exceeded for each chemical within each media. The chemical concentrations detected in environmental media at the sites were compared to various screening criteria to determine if they could potentially cause adverse effects on human health or ecological receptors. Validated data from the laboratories is tabulated in Appendix C.

Screening criteria were selected based on their acceptance among human health and ecological risk assessors, their relevance to site characteristics, and their completeness. The following criteria were used:

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Soils:

Soil Background Concentrations. The Illinois Pollution Control Board's Concentrations of Inorganic Chemicals in Background Soils for Counties Within Metropolitan Statistical Areas (Illinois Administrative Code: Section 742, Appendix A, Table G) were used as benchmarks for background concentrations of metals in soil.

Human Health Effects. U.S. EPA Region 3 risk-based screening concentrations for soil for commercial or industrial land use were used. These concentrations are based on potential adult worker exposure to soil contaminants through incidental ingestion of soil and inhalation of vapors and airborne particles from the soil, and correspond to a lifetime cancer risk of 1×10^{-6} for carcinogens, or a hazard quotient of 0.1 for noncarcinogens. A hazard quotient is the ratio of the potential average daily dose of a chemical to its reference dose, which is the dose not expected to result in any adverse effects. Screening concentrations are equal to 1/10th of the actual concentrations.

Adult Worker Screening Level. U.S. EPA Region 5 soil lead screening level for adult workers.

RCRA EDQL. U.S. EPA Region 5 Resource Conservation and Recovery Act (RCRA) Division's April 1998 Ecological Data Quality Levels (EDQLs). EDQLs are used by RCRA as a medium-specific screening comparison to site-specific information. Exceedences of these levels trigger concern and warrant further investigation at sites. EDQLs are conservative levels that are obtained from the lowest available federal, state, and in some cases international criteria, protective of ecological receptors, or from toxicological data extrapolated for selected ecological receptors.

Oak Ridge. Oak Ridge National Laboratory's study for the United States Department of Energy developed November 1997 screening benchmarks for the toxicity of chemicals to earthworms and to soil microorganisms and microbial processes.

Sediment:

Sediment Background. National Oceanic and Atmospheric Administration's (NOAA) 1998 Screening Quick Reference Tables (SQRT) freshwater sediment background levels (metals only).

Ontario. 1994 guidelines for the protection and management of aquatic sediment quality in Ontario. The Lowest Effect Level (LEL) indicates the level of contamination that can be tolerated by the majority of the sediment-dwelling organisms. The Severe Effect Level (SEL) indicates the level of contamination at which pronounced disturbance of the sediment-dwelling community can be expected. This is the sediment concentration of a compound that would be detrimental to the majority of benthic species.

RCRA EDQL. U.S. EPA Region 5 Resource Conservation and Recovery Act (RCRA) Division's EDQLs (April 1998). See above for further description.

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Water:

U.S. EPA. Federal Register. U.S. EPA's December 1998 national recommended water quality criteria. The Criterion Continuous Concentration (CCC) is an estimate of the highest concentration of a material in surface water to which an aquatic community can be exposed indefinitely without resulting in an unacceptable effect. The Criteria Maximum Concentration (CMC) is an estimate of the highest concentration of a material in surface water to which an aquatic community can be exposed briefly without resulting in an unacceptable effect.

OSWER Ecotox. U.S. EPA Office of Solid Waste and Emergency Response (OSWER) January 1996 ecotox thresholds.

RCRA EDQL. U.S. EPA Region 5 Resource Conservation and Recovery Act (RCRA) Division's April 1998 EDQLs. See above for further description.

Based on these tables, chemicals of potential concern (COPCs) were identified for each medium and were tabulated with appropriate sample numbers (Attachment B, Tables B-7 through B-23). COPCs were determined based on the percentage of samples detected and the percentage of exceedances for the various criteria. For example, contaminants that were detected in most of the samples and that had several exceedances of higher criteria or many exceedances of lower criteria were identified as COPCs.

DISCUSSION

Tables B-1 through B-6 in Attachment B indicate that for soils, metals and polycyclic aromatic hydrocarbons (PAHs) are the primary COPCs; for subsurface soils, metals are the COPCs; for sediments, metals and PAHs are the COPCs; for surface water, metals and pesticides are the COPCs; and for groundwater, metals are the COPCs.

Surface Soils:

Based on the summary tables, 12 COPCs were identified for surface soils (5 inorganics, 1 VOC, 3 PAHs, 1 PCB, and 2 pesticides). Maps were prepared showing the concentrations of the COPCs in surface soil (Attachment A, Figures A-4 through A-13). In order to make the maps as representative as possible, values reported as not detected at the nominal sample quantitation limit ("U" flagged values) were replaced by ½ of the lowest detected concentration for that chemical. Values rejected in the data validation process ("R" flagged values) were not used. For many of the COPCs, detected concentrations well below the nominal sample quantitation limit were reported as estimated values ("J" flagged values). The lowest "J" flagged value for a chemical was considered to be its practical quantitation limit (PQL).

Concentration contours were created using the linear Kriging method in Surfer, version 6 (Golden Software 1997). The contours were filled with different colors and color intensities to convey the various concentration ranges and their significance:

Shading	Meaning
Gray	Concentration below state-wide background levels for inorganic chemicals, or below the PQL for organic chemicals.

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Green	Concentration above background or the PQL, but below both human health and ecological screening criteria.
Yellow	Concentration above background or the PQL and the ecological screening criteria, but below the human health criteria.
Red	Concentration above background or the PQL and the human health screening criteria.

If the human health and/or ecological screening criteria falls below background or the PQL (as in arsenic, for example), the screening criteria value is indicated by a red or yellow line, respectively, rather than by shading.

For all of the COPCs in surface soil, significantly elevated concentrations were generally limited to a few locations ("hot spots"). Apart from the hot spots, concentrations were generally around or only moderately above background or PQL levels. This pattern is consistent with localized spills and releases of contaminants that are typically associated with the historical use of the area for various waste disposal and/or management activities.

Arsenic (Figure A-4). Arsenic contamination is distributed throughout the site. Relative hotspots exist at sample locations S78 and S64. The areas north and east of sample location S78 were not sampled, so that the contamination hotspot contour is extended to areas where concentrations are unknown, which may overestimate the size of the hotspot. Most concentrations exceeded the Region 3 human health risk-based concentrations, and 59 of the 84 samples exceeded the RCRA EDQL. Both criteria are below the Illinois urban background level.

Barium (Figure A-5). Barium contamination is highest at sample location S64. No samples exceeded the human health threshold and all 84 samples exceeded the EDQL, which is lower than the background level.

Chromium (Figure A-6). Chromium contamination hot spots occur throughout the site. A human health threshold is not available and all 84 samples exceeded the EDQL.

Lead (Figure A-7). Lead hotspots exist at sample locations S64, S66, and S28. None of the samples exceeded the RBC human health threshold, but 3 samples exceeded the adult worker screening level; and 76 samples exceeded the EDQL, which is higher than the background level.

Mercury (Figure A-8). Mercury contamination is highest at sample location S66. None of the samples exceeded the human health threshold and 82 samples exceeded the EDQL, which is higher than background.

Naphthalene (Figure A-9). Naphthalene contamination is highest at sample location S06. None of the samples exceeded the human health threshold and 11 samples exceeded the EDQL.

PAHs (Figure A-10). PAHs are represented by benzo(a)anthracene, benzo(a)pyrene, and dibenz(a,h,)anthracene. The distributions of the three chemicals were similar. For example,

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sample locations S06 and S88 were the two hotspots for all three PAHs. For each of the three PAHs, at least one sample exceeded the human health threshold. The ecological thresholds for benzo(a)anthracene, benzo(a)pyrene, and dibenz(a,h)anthracene are exceeded at 2, 10, and 0 sample locations, respectively. The EDQL for dibenz(a,h)anthracene is 18.4, higher than the human health level.

Aroclor 1254 (Figure A-11). The PCB, Aroclor 1254, contamination is highest at sample location S66. Two samples exceeded the human health threshold, and an ecological threshold is not available.

beta-BHC (Figure A-12). beta-BHC contamination is highest at sample locations S78 and S44. None of the samples exceeded the human health threshold and 31 samples exceeded the ecological threshold.

Dieldrin (Figure A-13). Dieldrin contamination is highest at sample location S66. Two samples exceeded the human health threshold and 19 exceeded the ecological threshold.

Sample locations S64 and S66 are among the highest areas of contamination for the most contaminants, including metals, PCBs, and pesticides. Sample locations S06 and S88 contain the highest amount of PAH contamination. Other samples contain high levels of various contaminants, including sample locations S78, S28, S44, and S71. Sample locations S66, S65, and S71 are near the southwest corner of site and sample locations S06 and S78 are located near the west border of site. Furthermore, sample locations S78 and S88 are located near Alburn, which, based on past reports, may contain more extensive contamination. Other areas with high contaminant levels exist in isolated locations throughout the site. In addition, it is important to note that some of the ecological criteria are lower than the urban background for Illinois; therefore, may be overly conservative.

Subsurface soil:

Only six subsurface soil samples were collected (S21-S25), one of which was a duplicate, (D21). From the summary table, Table B-3, 6 COPCs were identified (5 inorganics and naphthalene). All metals detected in the samples were well above the EDQLs for soil. All chromium values exceeded the Oak Ridge thresholds. For naphthalene, the average of samples S21 and D21 is much greater than the EDQL and the other subsurface samples. In summary, metals contamination appears to be widespread in the subsurface soils and specific organic contamination exists only in isolated locations. Additional subsurface soil sampling would be necessary to better understand the extent of subsurface contamination.

Sediment:

From the summary table, Table B-4, 12 COPCs were identified (8 inorganics and 4 organics). The COPC tables for sediment were refined in a similar fashion as the soil COPC tables. Figure A-14 qualitatively summarizes the location of sediment contamination. The 12 COPCs were reduced to six representative contaminants: arsenic, chromium, lead, manganese, benzo(a)anthracene, and chrysene. Symbols were assigned to each contaminant and placed inside a box next to each sediment sample location. The colors inside each symbol represent the level of contamination. As in the soil maps,

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green shades represent levels of contamination below both thresholds; yellow shades represent levels between the two thresholds; and red shades represent levels that exceed both thresholds.

One can notice that most symbols are shaded yellow; therefore, are between the low and severe thresholds. In general, higher concentrations exist in Indian Ridge Pond: five samples exceeded the SEL for manganese, as indicated by the red circles. In addition, most samples exceeded the LEL for each contaminant. Lower concentrations exist in the LHL ponds. All organic samples in LHL1 were below the LELs. The southeast pond contained moderate levels of contamination.

Surface water:

From the summary table, Table B-5, 6 COPCs were identified (4 inorganics and 2 organics). The COPC tables for surface water were refined in a similar fashion as the soil COPC tables. Figure A-15 qualitatively summarizes the location of surface water contamination. For surface water, only one lower screening criterion was compared with the results of the COPCs. Red shades were used for relatively high values. Barium concentrations exceeded the criteria in all samples. Very high concentrations for barium and manganese exist in Indian Ridge Pond, especially the northern section. The southeast pond contains very high levels of barium and relatively high levels of lead and organics, whereas other areas have relatively low levels of lead and organics. The LHL ponds are low in all six contaminants, except barium.

Macroinvertebrates:

Macroinvertebrates were classified with the results presented in Attachment D. Tolerance values have been developed for different taxonomic levels and are listed next to the classification when available. Tolerance values range from 0 to 10, with 0 being the least tolerant organisms that require pristine conditions and 10 being the most tolerant organisms that can tolerate most water quality conditions. Each sample location is summarized with the total number of taxa found at that location, the total number of organisms, the lowest tolerance value assigned to organisms at that location, and the Family Biotic Index (FBI). The FBI is calculated by multiplying the number of organisms in each taxon by the tolerance value for that taxon, summing the products, and dividing by the total number of organisms in the sample. For taxa with ranges of tolerance values, the average was used, and taxa with no known tolerance value were not included in the equation.

For samples MAC01, MAC02, and MAC13, a Ponar Dredge was used to obtain bottom sediment; however, no identifiable organisms were found. In samples MAC03 through MAC11 (Indian Ridge Pond), the amphipod *Hyalella azteca* was the dominant taxa, but it was absent in the other samples. Based on the lowest TVs and FBIs within a sample, the LHL ponds and the two most northern samples of Indian Ridge Pond are the areas with the lowest water quality. Only five total organisms were found in LHL1 and only two taxa were found in LHL2 (one of these taxa has a TV of 10, the other taxa does not have an available TV).

In conclusion, the macroinvertebrate analysis suggests that organisms with TVs lower than 5 may not be able to survive in the existing sediment and water conditions at the site. Furthermore, the fact that only more tolerant species exist on the site exemplifies the ecological impact that is suggested by the screening level exceedances consistent throughout this report.

Pond Sample Summary:

In summary, the results from the samples collected from the ponds indicated moderate contamination in Indian Ridge Pond, less contamination in the southeast pond, and slight contamination in the LEL ponds. Manganese is high in both sediment and surface water samples from Indian Ridge Pond. Barium is high in the surface water samples throughout site. In addition, most levels are above the LEL in sediments. Samples SED10, SW10, and MAC10, overall, contain the most contamination.

Groundwater:

The site has shallow groundwater that has the potential to discharge to surface water. Only three groundwater samples (GW1, GW2, and GW3) were collected during Phase I. Sample GW2 exceeded the U.S. EPA CMC threshold for copper, lead, and zinc, and all three samples exceeded the OSWER EcoTox threshold for barium, iron, and manganese. None of the three samples exceeded any of the organic contaminant thresholds. The COPCs were determined to be the following four metals: copper, iron, lead, and manganese. Sample GW2, located near the southeast corner of the unsampled Alburn Incinerator area, had the highest levels of contamination for each COPC. Groundwater samples were not filtered, so the samples may have contained small amounts of suspended sediments, which may have artificially increased the amount of contamination in the water.

TCLP:

The toxicity characteristic leachate procedure (TCLP) was conducted on the soil samples for the following contaminants: barium, cadmium, chromium, lead, and silver. No TCLP contamination was detected. These results are not contained in this report, but copies may be obtained from the E & E Chicago office.

Proposed Nature Center Samples:

One sediment sample (SED20), one water sample (SW20), and one macroinvertebrate sample (MAC20) were collected east of the site, in the pond at the northwest corner of Torrence Avenue and 122nd Street, at the site of the proposed nature center. The results are presented in Attachment C, Tables C-6 and C-7. Results indicate that high metals contamination exists at this location. Among the sediment samples, sample SED20 exhibited the highest level detected for the following nine inorganics and one organic compound: aluminum, arsenic, beryllium, copper, iron, lead, nickel, selenium, vanadium, and 4,4'DDD. For the water samples, sample SW20 contained the highest level of all metals, except potassium, sodium, and thallium; and exhibited the highest levels of 4,4'DDD, 4,4'DDE, and 4,4'DDT. Based on the macroinvertebrate analysis, the lowest TV and FBI for sample MAC20 were relatively high. Since many of these contamination levels exceed those found on the Lake Calumet Cluster Site, contamination probably originated from past land use activities at the pond at the northwest corner of Torrence Avenue and 122nd Street.

RECOMMENDATIONS FOR FURTHER ACTION

Based on the findings of this report, additional work is recommended to address the full nature and extent of contamination:

- The Alburn Incinerator area needs to be addressed. Sampling is necessary to fill in the data gaps in this large area in the center of the site. Earlier studies have identified areas within Alburn that are of particular concern, including: the southwest quadrant, northeast of the southwest quadrant, and the area near the office building in the northern portion. Sampling should include sediment and water samples from any large areas of standing water. In addition, subsurface soils should be investigated to determine the depths of contamination.

- Preliminary subsurface soil sampling indicated the potential for metal contamination. Further study of subsurface soils (including Alburn) would better define the vertical extent of contamination.

- Specific site areas repeatedly exhibited higher contamination, including the locations of samples S64 and S66, near the southwest corner of site, and sample locations S06 and S88. Additional samples near these locations would assist in confirming if significant contamination was present, and if so, may identify the extent of contamination.

- Preliminary groundwater sampling indicated the potential for metal contamination. Well sampling would provide more accurate results and determine if contaminated groundwater is leaving the site. Monitoring wells should be installed and sampled as outlined in the draft groundwater monitoring well installation work plan, which is currently being finalized by E & E.

- Another concern raised by the Illinois State Water Survey is that based on historic data, ammonia, cyanide, and/or nitrate/nitrite compounds may be present in the surface water. It is recommended that ponds (especially Indian Ridge Pond) be analyzed for these contaminants.

- Further study of the areas inside the proposed nature center may be warranted. Although not currently part of the scope of this project, sampling of the nature center area could be conducted in coordination with the additional sampling being performed on the Lake Calumet Cluster Site.

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Appendix F

Site Assessment Report: Paxton Landfill Site

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SITE ASSESSMENT REPORT
PAXTON LANDFILL SITE
CHICAGO, COOK COUNTY, ILLINOIS

TDD: S05-9901-004
PAN: 059J0401SIXX
CERCLIS ID: ILD069498186

March 31, 1999

Prepared for:

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Emergency Response Section
77 West Jackson Boulevard
Chicago, Illinois 60604

Prepared by: _____ Date: 3/31/99
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1. Introduction

The Emergency Response Branch (ERB) of the United States Environmental Protection Agency (U.S. EPA) tasked the Ecology and Environment, Inc. (E & E), Superfund Technical Assessment and Response Team (START) to generate a site assessment report for the Paxton Landfill (Paxton) site under Technical Direction Document (TDD) S05-9901-004. START activities included reviewing available site data; evaluating any threats to human health and the environment; and making recommendations to U.S. EPA as to the potential need for a removal action, further investigation, or other appropriate action.

START reviewed historical information from U.S. EPA records compiled for the Paxton site. START also reviewed data generated by Patrick Engineering, Inc. of Springfield, Illinois (PEI), for an evaluation of site conditions on behalf of the Illinois Environmental Protection Agency (IEPA). After reviewing the available site information, START evaluated site conditions based on these data to determine the potential threat to human health and the environment posed by the Paxton site. It should again be noted that this site assessment report was prepared using only historical and file information. No on site evaluation or sample collection was performed by START for the generation of this report.

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2. Site Background

The Paxton Landfill site is a partially fenced, 117-acre landfill facility located at 12201 South Oglesby Street in the City of Chicago, Cook County, Illinois. Currently, no landfilling activities are in progress at the site. However, activities related to an unpermitted leachate recirculation operation and maintenance of intermediate cover slopes are ongoing at the site (Black & Veatch Waste Science, Inc. [BVWS] 1995). The Paxton site is owned by American Bank land trust # 33832. The Paxton Land Fill Corporation (Paxton Corp.) was originally listed as the sole beneficiary of this trust, but was replaced by Stryker International in 1979. The Paxton site is located in the NW ¼ of the NE ¼ of Section 24, Township 37 North, Range 14 East (NE ¼, NW ¼, S24, T37N, R14E), and has geographic coordinates of latitude 41°40'52" N, longitude 87°34'08" W (Figure 2-1). The Paxton site is bordered by Stony Island Avenue to the west; by the Waste Management, Inc. owned Interlake property to the north; by a Norfolk & Western railroad track to the east; by Land and Lakes # 3 Landfill to the southwest; and by the U.S. Drums facility, the Alburn incinerator and open fields to the southeast (Figure 2-2).

Three separate facilities are grouped under the State of Illinois site identification number ILD096949816 as the Paxton site (Figure 2-3). The components of the Paxton site are the Paxton I landfill (Paxton I); the Paxton II landfill (Paxton II); and the LHL landfills (LHL). Other Illinois identification numbers associated with the site are ILD981535669, which was assigned to Paxton II, parcel II, and ILD981535651, which was assigned to parcels I and III of the Paxton II site (E & E 1986). For the purposes of permitting by IEPA, Bureau of Land, the Paxton site is also referenced by identification number LPC 0316000033. The Paxton site is located in a highly industrialized area, with the closest residence located approximately 500 feet northeast of the site. Groundwater flow beneath the Paxton site is believed to flow to the west and Lake Calumet (Walter Flood & Company, Inc. [Flood] 1976). Surface water runoff from the site also discharges to Lake Calumet, which is located less than 0.5 mile west of the Paxton site. Lake Calumet drains into the Little Calumet River, then the

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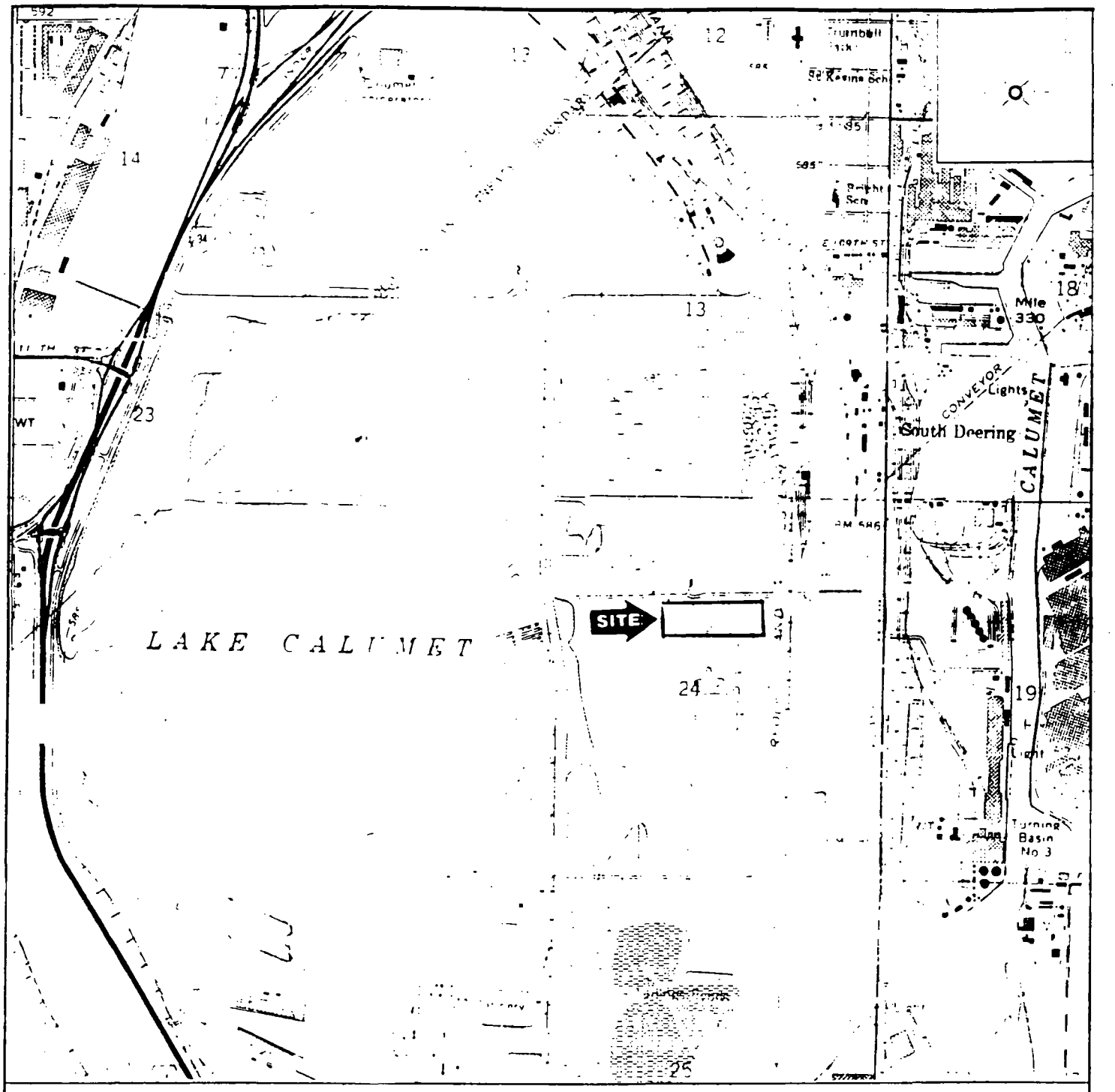

Quadrangle Location

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Superfund Technical Assessment and Response Team

Region 5

33 North Dearborn Street, Suite 900 Chicago, Illinois 60602

TITLE: Site Location Map	FIGURE: 2-1
SITE: Paxton Landfill	SCALE: 1:24,000
CITY: Chicago STATE: Illinois	TDD: S05-9901-004
SOURCE: USGS Topographic Map 7.5 Minute Series - Lake Calumet ILL.-IND. Quadrangle	DATE: 1965
	REVISED: 1975

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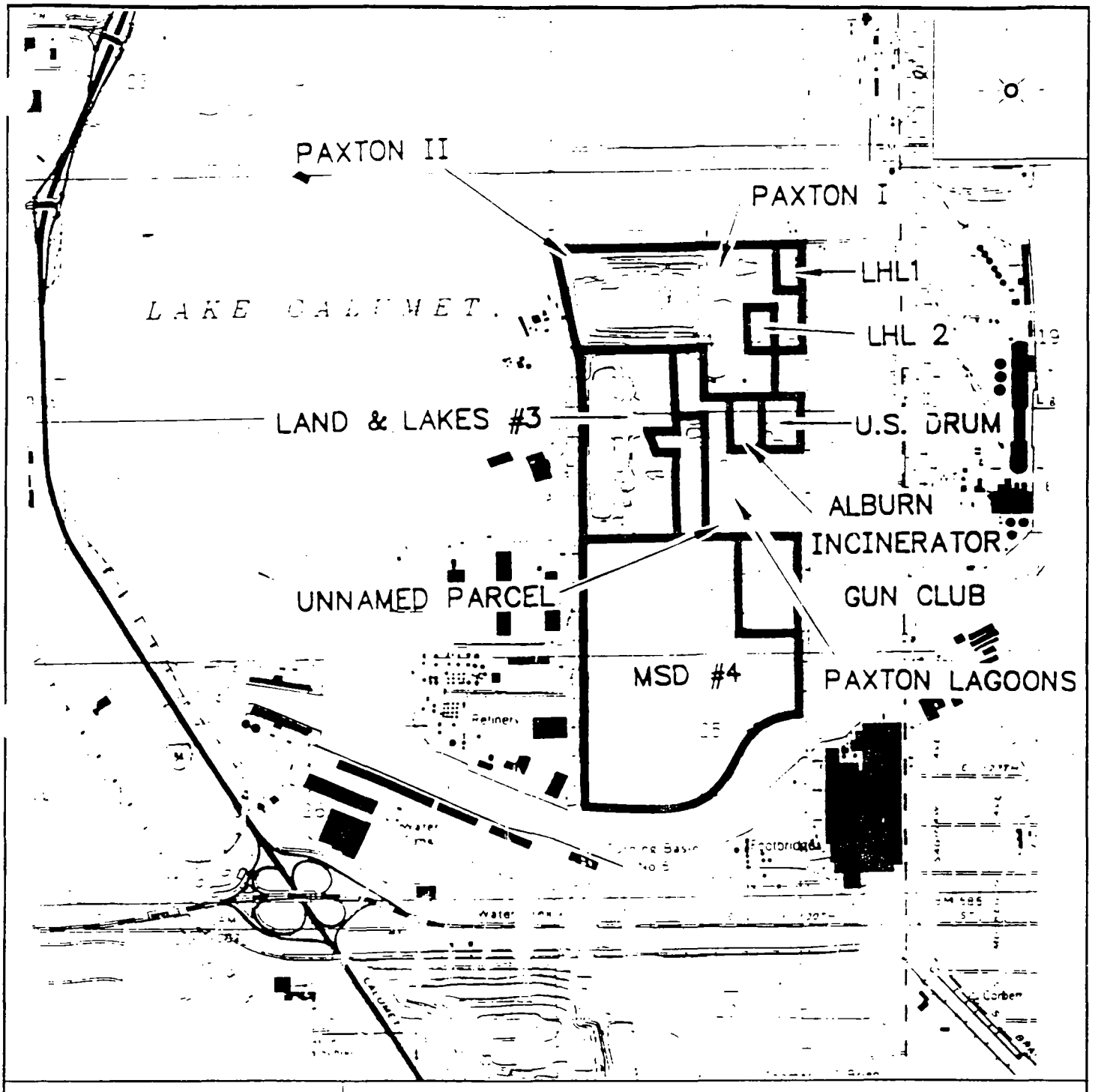

Legend

Site boundary

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Superfund Technical Assessment and Response Team

Region 5

33 North Dearborn Street Suite 9[illegible] Chicago, Illinois 60602

TITLE: Area Features Map	FIGURE: 2-2
SITE: Paxton Landfill	SCALE: 1:24,000
CITY: Chicago STATE: Illinois	TDD: S05-9901-004
SOURCE: Phase I Ecological Reclamation Study, Lake Calumet Cluster Site, Roy F. Weston, Inc	DATE: 1999
	REVISED:

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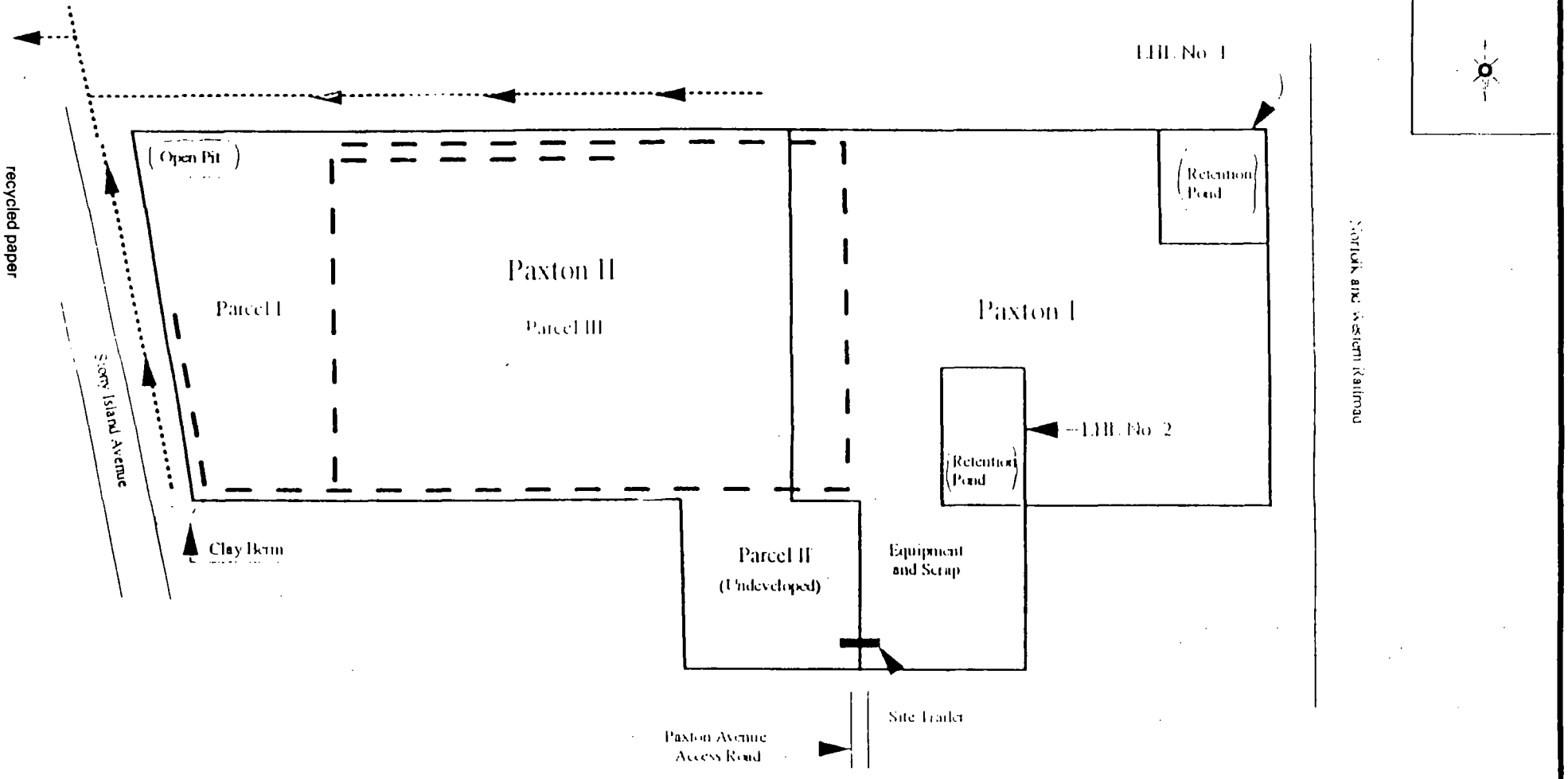

Legend

- Landfill boundary
- Clay cutoff wall
- Drainage ditch with flow direction
- Parcel boundary

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Superfund Technical Assessment and Response Team
Region 5
33 North Dearborn Street, Chicago, Illinois 60602

Title	Site Features Map	Figure	2-3
Site	Paxton Landfill	Scale	Not to scale
City	Chicago	State Illinois	TDD S05-9901-004
Source	Expanded Site Inspection, Black & Veatch Waste Science, Inc.	Date	1999

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Calumet Sag Channel. The Illinois Department of Conservation (IDOC) has classified Lake Calumet, the Little Calumet River and the Calumet Sag Channel as fisheries (BVWS 1995).

Documented landfilling activities at the Paxton site began in 1970 at the Paxton I site, even though landfilling allegedly has taken place in the vicinity of the site since the 1930s (CH2M Hill/E & E 1986). The Paxton I site began operating in 1970 before obtaining an operating permit from IEPA, which notified the site of the violation on January 21, 1971. After Paxton Corp. submitted the required permit application, IEPA issued permit # 1971-23 to develop and operate a 47.5-acre solid waste facility on June 28, 1971. One specific permit condition for the site called for prior IEPA approval before acceptance of any liquid wastes at the Paxton I site. On November 3, 1972, IEPA subsequently issued permit # 1972-13 to Paxton Corp. authorizing the Paxton I site to accept select liquid wastes after meeting specific conditions. These conditions included having an IEPA approved groundwater monitoring system installed within 120 days of receiving the permit, and submitting background groundwater analytical data to IEPA by July 6, 1973. These and other conditions were not complied with. Beginning on October 5, 1973, IEPA notified the Paxton I site of ongoing failures to comply with permit-specified operating procedures, including having inadequate daily and intermediate cover, spreading and compacting refuse downhill, and having ponded surface water on site. The Paxton I site remained operational until 1976, when the permitted capacity of the site was exhausted. The Paxton I site was constructed using a linear trench method. Disposal trenches at the site were constructed by excavating trenches approximately 150 feet wide to depths of approximately 40 feet below ground surface (BGS), or a layer of clay was encountered. The sidewalls of the trenches were then sealed off with clay to minimize groundwater infiltration. During its operation, the Paxton I site accepted general refuse, sludges, liquid wastes, industrial wastes, and wastes with hazardous constituents. The landfilled material at the Paxton I site is covered with 20 to 30 feet of soil cover, bringing the landfill elevation to existing grade (CH2M Hill/E & E 1986).

After the Paxton I site was filled, Paxton Corp. began unpermitted landfilling activities at what would become known as the Paxton II site. IEPA issued several warnings to Paxton Corp. throughout 1976, beginning on January 8, 1976, regarding these unpermitted activities. Paxton Corp. contracted Flood to perform a geological investigation at the site to obtain information for the site's permit application (Flood 1976). This investigation found that geology for the Paxton II site is comprised of fill material above glacial deposits. As a means of determining the stratigraphy beneath the Paxton II site, Flood drilled 5 borings around the site at locations that were selected by Paxton Corp. From these

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borings, it was determined that the overlying fill material consisted of sand; cinders; building debris, including bricks, glass, and wood; a black, clayey loam; and clay mixed with cinders. The fill layer ranges in thickness from 5 to 10 feet, and in density from loosely packed to medium dense. Two types of geological material were found beneath the Paxton II site between the fill material and bedrock: Post-glacial Lake Bottom Sediments and Glacial Tills. A layer of material described as Post-glacial Lake Sediments is typically first encountered at depths of 10 to 21 feet BGS, and is typically between 10 and 15 feet thick. The layer is comprised of fine grained sands with traces of silt, and often is either intermingled with or overlain by a layer of silty clay. Below this layer are 2 types of glacial tills. The first till layer is called the Tinley Moraine, and is a silty clay soil that is typically first encountered at depths of 10 to 21 feet BGS, and extends to 25 to 40 feet BGS. A complex layer of clayey silt or silty clay soils forms the second till layer, which is typically first encountered at depths of 30 to 40 feet BGS, and extends at least to the bottom of the deepest boring (approximately 70 feet BGS). This layer is considered to be a part of the Valparaiso Morainic System, and is called the Valparaiso Till (Flood 1976).

In April 1976, IEPA secured an injunction against Paxton Corp. The injunction sought to stop the unpermitted landfilling activities that were taking place west of the Paxton I site (CH2M Hill/E & E 1986).

On January 27, 1977, Paxton Corp. submitted a permit application for the development and operation of the Paxton II site. This application was determined by IEPA to be incomplete, and was denied on February 1, 1977. On June 22, 1977, IEPA filed a complaint with the Illinois Pollution Control Board alleging that Paxton Corp. was in violation of permit requirements for the Paxton I site by conducting unpermitted landfilling in the area west of the site. The Paxton II site continued unpermitted operations until 1978, when IEPA obtained an injunction forcing the site to temporarily suspend operations until a permit was received. IEPA issued permits # 1978-10-DE/OP and 1978-11-DE/OP to Paxton Corp. for the development and operation of a 58-acre solid waste disposal facility. These permits divided the Paxton II site into three developmental parcels. Parcels I and II of the Paxton II site were to be constructed and operated under the conditions of IEPA permit # 1978-10-DE/OP, which required the construction of double-lined waste disposal cells (CH2M Hill/E & E 1986). Paxton II, parcel II is a 10-acre area which was not developed for landfilling. The western half of Paxton II, parcel II (5 acres) was later sold, while the eastern half was never developed for landfilling. Parcel III of the Paxton II site is the portion of the site that was filled prior to receipt of the permits.

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IEPA permit # 1978-11-DE/OP did not authorize additional landfilling in this portion of the Paxton II site, but required that a clay, cut-off wall be constructed around the area to prevent the migration of leachate between the Paxton I and Paxton II sites. This clay cutoff wall was constructed around the perimeter of Paxton II, parcel III from 1978 to 1984. The cutoff wall was constructed by excavating a trench at least 10 feet wide to a depth of between 30 and 40 feet, then backfilling it with clay. Construction of the wall was to be done so that the cutoff wall was keyed at least 2 feet into the clay barrier at the bottom of the landfill. Except for a 600 foot section along the south boundary, the construction of the cutoff wall was certified by Andrews Environmental Engineering, Inc. as complying with the permit conditions. IEPA personnel periodically observed construction activities during site inspections. A second cut-off wall was built along the northern boundary of Paxton II, parcel III after groundwater contamination was discovered through the IEPA quarterly monitoring program for the Paxton site (IEPA 1980).

Landfilling activities were suspended at the Paxton II site when IEPA obtained a Preliminary Injunction against Paxton Corp. on July 24, 1978, for non-compliant development practices at the site. This injunction closed the site for 45 days. As a result of the second injunction, each parcel was further sub-divided into trenches and segments with IEPA approval required for the construction of each component. Parcel I was initially divided into trenches A, B and C. Trenches A and B were designed to be excavated to depths of 25 feet BGS and 35 feet BGS, respectively (CH2M Hill/E & E 1986). Paxton Corp. submitted an operation permit application on August 8, 1979, for the construction of Parcel I, Trench A, segment 1. This application was denied for construction inadequacies, and was resubmitted by Paxton Corp. in September 1979 (IEPA 1980).

On July 10, 1980, Paxton filed a notification of hazardous waste activity under Section 3010(a) of the Resource Conservation and Recovery Act (RCRA), 42 United States Code (U.S.C.) § 6930(a) to operate a hazardous waste facility (*U.S. v. Paxton Landfill Corporation, et. al.*, 1985). On November 18, 1980, a "Part A" permit application was submitted by Paxton Corp. claiming that the Paxton II site had previously accepted hazardous wastes (IEPA 1986). The application was a proposal to construct and operate a hazardous waste treatment facility, consisting of a distillation column and an incinerator, at the Paxton II site. The information contained in the application was forwarded to U.S. EPA by IEPA, but the site was not formally referred (IEPA 1986). On March 22, 1982, U.S. EPA notified Paxton Corp. that, based the information in the submitted permit application, the Paxton II site met the qualifications for an "interim status" site. U.S. EPA informed Paxton Corp. that the Paxton II site was

required to comply with the applicable federal regulations in Code of Federal Regulations, Title 40, Part 122 (40 CFR § 122), which was later reclassified as Part 270, and 265, as well as any applicable state regulations. Paxton Corp. was informed by U.S. EPA on April 28, 1983, that they were required to submit a "Part B" permit application for the site by October 31, 1983. On August 12, 1983, Paxton Corp. informed U.S. EPA and IEPA that the plans to construct the hazardous waste facility had been abandoned. Paxton also informed IEPA and U.S. EPA that the Paxton II site would not be preparing a "Part B" permit as requested. Paxton Corp. further claimed that the Paxton II site had not accepted any hazardous wastes after November 18, 1980, and did not qualify as a RCRA interim status facility (*U.S. v. Paxton Landfill Corporation, et. al.* 1985). However, documentation exists to dispute that claim. Waste disposal manifests for the site show that after November 19, 1980, the Paxton II site accepted waste materials with hazardous constituents. These wastes include 140 cubic yards (yd^3) of paint sludge containing chromium and lead; 1,400 gallons of ink rinse water containing lead; 3,500 gallons of tank bottoms containing arsenic and lead; and 16,000 gallons of tank water and sludge bottoms containing arsenic and lead (*U.S. v. Paxton Landfill Corporation, et. al.* 1985).

In 1983, Roy F. Weston (Weston) submitted a closure/post-closure (C/P-C) plan for the Paxton II site; however, IEPA denied the permit application as incomplete. The reason given for rejecting the submitted plan was that a 10-year post-closure monitoring period was proposed, instead of the minimum required period of 30 years (IEPA 1986).

In 1985, the civil action, *U.S. v. Paxton Landfill Corporation, et. al.*, was filed by the United States Attorney General on behalf of U.S. EPA. The action was filed in the U.S. District Court for the Northern District of Illinois under Section 3008(a) of the Solid Waste Disposal Act, as amended by RCRA, 42 U.S.C. § 6928(a). The action was in response to continued operational violations at the Paxton II site, including receiving hazardous wastes without a permit (*U.S. v. Paxton Landfill Corporation, et. al.* 1985).

On March 16, 1987, IEPA received a permit application submitted by Weston on behalf of the Paxton II site to modify the site's groundwater monitoring program. The application was denied by IEPA on the basis that the Paxton II site had failed to submit the certification of compliance required for RCRA hazardous waste facilities. The certification was to demonstrate that the site had a suitable and compliant groundwater monitoring system in place, and that the site had financial assurance mechanisms in place to fund C/P-C site activities. Additionally, the C/P-C plan submitted with the

application included final contours reflecting an unpermitted 50 foot vertical expansion at the site (IEPA 1987).

In 1988, Paxton Corp. contracted Weston to prepare a Site Investigation Report as a component of a permit application. This report was submitted to IEPA in 1989 (BVWS 1995).

Landfilling activities at the Paxton II site ended on April 22, 1992, when police officers from the City of Chicago (Chicago) padlocked the gates to the site (Weston 1998).

The LHL facility is comprised of 2 separate landfills, LHL # 1 and LHL # 2. LHL # 1 is approximately 10 acres in size, and located at the northeast corner of the Paxton I site. The Paxton I site surrounds LHL # 2, which is a 7.5-acre facility. There is little documentation surrounding the wastes dumped at either landfill; however, LHL # 2 was permitted by IEPA to accept general refuse and construction debris, and is alleged to have accepted waste from 1976 through 1978. Landfilling activities began and ended at LHL # 1 during the 1970s. Currently, a retention pond exists within the boundaries of both LHL # 1 and LHL # 2. Both sites have 20 to 30 feet of cover above the buried waste, resulting in the final landfill elevations being at grade (Weston 1998).

3. Previous Site Assessment Activities

Several site inspections and site assessments have been performed at the Paxton site since landfilling activities began in 1970. These inspections and assessments have been conducted by IEPA and Chicago, as well as by environmental contractors on behalf of IEPA, Chicago, and U.S. EPA.

IEPA has conducted routine site inspections at the Paxton site beginning as early as in October 1973. These inspections led to several notifications of violation being issued to the site for various operational issues. IEPA inspections in 1974, 1975, and 1976 cited the facility for having inadequate daily and intermediate cover in the fill area. During the May 1975 IEPA site inspection, it was also noted that liquids from the active landfill trench were being discharged off site without treatment. Other violations noted during IEPA site inspections including ponded water on site, and waste being pushed into standing water within the active landfill trench. File information also documents instances of the Paxton II site accepting liquid wastes, sludges and wastes containing hazardous constituents between April 1976 and July 1978 prior to obtaining an IEPA operating permit for the Paxton II site. IEPA records also report inadequate daily and intermediate cover at the Paxton II site in inspection reports beginning in 1976.

The Paxton site was placed on the Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) database on April 1, 1979. The component landfills were grouped under the identification number, ILD069498186, which was previously used to identify the Paxton I site. The site was also placed on the RCRA notifiers' list for U.S. EPA Region 5 (BVWS 1995).

A Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Preliminary Assessment (PA) was initiated at the Paxton site by IEPA on March 28, 1984. The December 13, 1993, environmental sample event is considered to be an extension of this PA (BVWS 1995).

In 1988, Weston was contracted by Paxton Corp. to conduct a site investigation at Paxton II. The investigation was completed in four phases, with the final report being submitted to the IEPA in 1989. An electromagnetic survey and three ground penetrating radar surveys were completed during Phase I of the investigation. Four groundwater monitoring wells were installed during Phase II. During Phase III of the investigation, Weston excavated leachate pits, collected leachate and groundwater samples, and completed site surveys. An additional round of groundwater sampling was performed as Phase IV of the Weston site investigation (BVWS 1995).

On February 4, 1993, BVWS was authorized by U.S. EPA to conduct an Expanded Site Inspection (ESI) at the Paxton site. Harza Environmental Services, Inc. (Harza) was contracted by Chicago in 1993 to collect environmental samples at the Paxton site. On December 13, 1993, Harza collected eleven groundwater samples, four soil samples, four surface water samples, nine sediment samples, and three leachate samples at on and off site locations. The analytical results from these samples were reported in the ESI, and the sample event was considered to be the second phase of the March 28, 1984, CERCLA PA conducted by IEPA (BVWS 1995).

On July 1, 1997, IEPA contracted PEI to conduct a series of environmental studies at the Paxton II site. These studies included performing a slope stability analysis, conducting a leachate elevation and characterization study, and investigating landfill cover thickness and integrity. Among the conclusions determined by PEI was that the potential for landfill slope failure exists at the Paxton II site, with the most probable location being the northwest corner of the site. PEI cited elevated leachate levels within the waste mass as a significant contributing factor in the slope stability issue. PEI has collected and analyzed 2 rounds of leachate samples from the Paxton II site.

In January 1999, U.S. EPA tasked START to conduct a review of available site information for the Paxton site, and prepare a Site Assessment Report. This action was prompted by the December 17, 1998, letter from IEPA requesting the assistance of U.S. EPA to minimize an environmental release from the Paxton site. The specific activities discussed in the letter involve the removal and treatment of leachate from the Paxton II site.

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4. Historical Analytical Results

Analytical results or summary of results were located during the site file review for IEPA sample events conducted on August 21, 1985, and February 26, 1987; the two rounds of environmental sampling completed during the Weston 1988 site investigation; and the Harza December 13, 1993, sample event. These data were tabulated and are presented in Appendix A. The maximum groundwater concentrations reported for each sample event and the corresponding sample locations are presented in Appendix B. Groundwater is not used as a source of drinking water for residents in the vicinity of the Paxton site. The groundwater and leachate data were compared to contaminant limits established for the Safe Drinking Water Act (SDWA) in 40 CFR Part 141. Soil and sediment sample results were compared to the Risk Based Concentrations (RBCs) established by U.S. EPA Region 3 for Soil Ingestion at Industrial sites.

For the reviewed groundwater data, there were 14 instances of an inorganic contaminant being detected at a concentration that exceeded the SDWA limit. The applicable analytes include cadmium (maximum concentration of 19.5 micrograms per liter [μg/L] compared to 5 μg/L SDWA limit) and lead (maximum 158 μg/L to 15 μg/L). Similarly, there are 19 reported exceedences of the applicable limits for organic compounds. Benzene (maximum 340 μg/L to 5 μg/L), benzo(a)pyrene (maximum 10 μg/L to 0.2 μg/L), 1,2-dichloroethylene (maximum 2,500 μg/L to 100 μg/L) and toluene (maximum 1,300 μg/L to 1,000 μg/L) were among these compounds. These data are presented in Appendix A-1.

Analysis of the tabulated leachate data revealed eight instances of reported inorganic concentrations exceeding the SDWA limit. The affected compounds were cadmium (maximum 25.8 μg/L to 5 μg/L), chromium (maximum 168 μg/L to 100 μg/L) and lead (maximum 338 μg/L to 15 μg/L). There were also four instances where the concentration of organic leachate constituents exceeded the corresponding SDWA limit. The compounds involved were benzene (maximum 100

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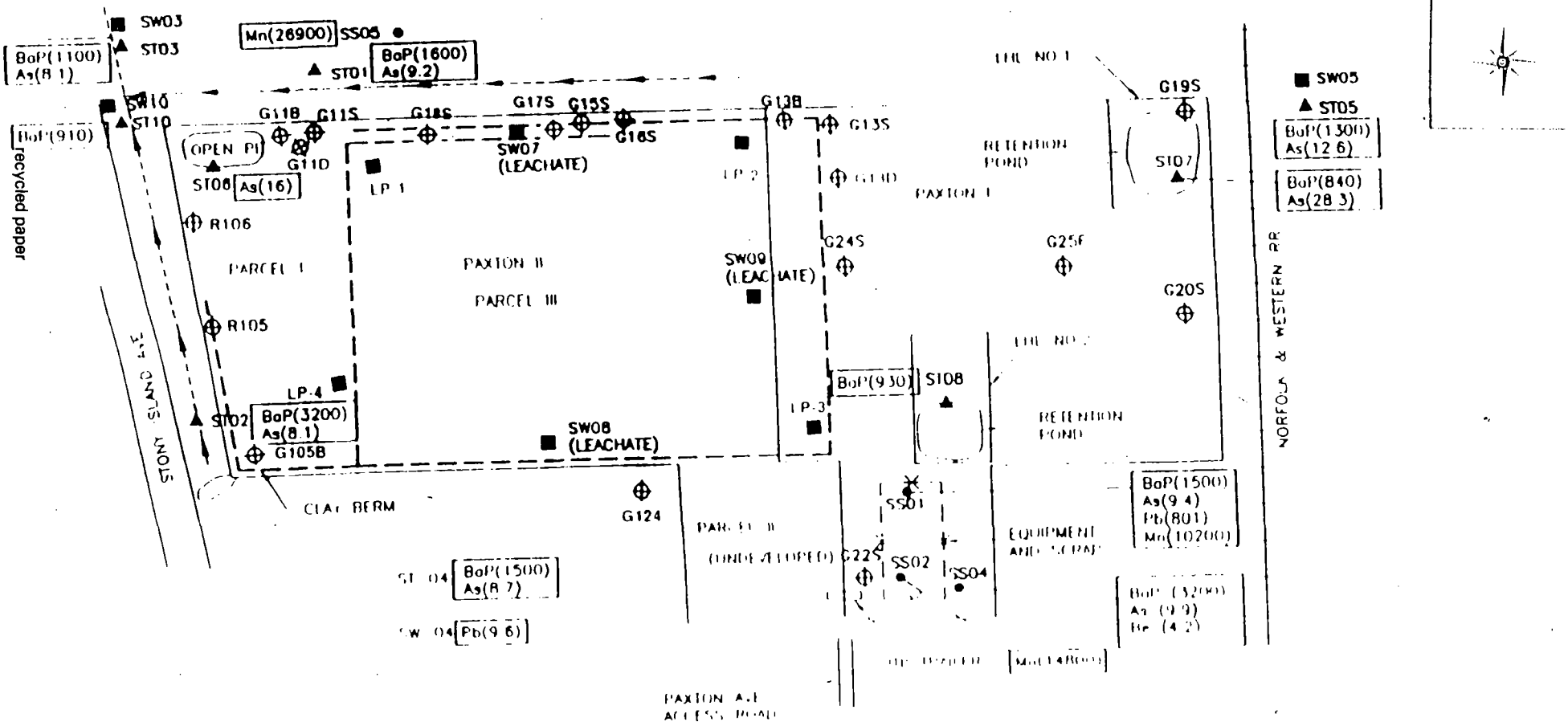
µg/L to 5 µg/L), tetrachloroethene (maximum 28 µg/L to 5 µg/L), and trichloroethene (maximum 10 µg/L to 5 µg/L). These data are presented in Appendix A-2.

There were four exceedances of inorganic contaminants revealed during the review of the analytical results from the collected soil samples. Lead was reported in sample SS01 at 801,000 micrograms per kilogram (µg/kg), which exceeds the RBC value of 400,000 µg/kg. Manganese concentrations for three of the four soil samples (maximum concentration 26,900,000 µg/kg) exceeded the RBC value (10,000,000 µg/kg). No sediment samples were reported as having inorganic concentrations that exceeded the RBCs. Benzo(a)pyrene was detected in seven of the eight sediment samples and one soil sample (maximum concentration 3,200 µg/kg) at concentrations that exceeded the RBC (780 µg/kg). Dibenzo(a,h)anthracene in soil sample SS01 was the only other organic substance that exceeded the corresponding RBC (1,300 µg/kg compared to 780 µg/kg). These data are presented as Appendix A-3.

A map showing the approximate sample locations for the groundwater, leachate, soil, and sediment samples collected during the Weston and Harza sample events is presented as Figure 4-1.

As part of the environmental studies being performed by PEI at the Paxton II site, two rounds of leachate samples were collected and analyzed. These data are presented as Appendix C, and were also compared to SDWA limits. This comparison revealed 36 instances where the reported concentration for an inorganic compound exceeded the corresponding SDWA limit. Among these compounds were arsenic (maximum 576 µg/L to 50 µg/L), chromium (maximum 1,770 µg/L to 100 µg/L), lead (maximum 4,460 µg/L to 15 µg/L) and mercury (maximum 20 µg/L to 2 µg/L). A review of the reported concentrations for organic constituents revealed 26 instances of the SDWA limit being exceeded. Benzene (maximum 460 µg/L to 5 µg/L), total polychlorinated biphenyls (maximum 0.54 µg/L to 0.5 µg/L), and vinyl chloride (maximum 42.1 µg/L to 2 µg/L) are among the compounds where exceedences were noted.



Legend

- ▲ SEDIMENT SAMPLE LOCATION
- ■ SURFACE WATER SAMPLE LOCATION
- MONITORING WELL LOCATION
- ● SURFACE SOIL SAMPLE LOCATION

INORGANICS IN MG/KG
ORGANICS IN UG/KG

BoP = BENZO(a)PYRENE
As = ARSENIC
Mn = MANGANESE
Be = BERYLLIUM
Pb = LEAD

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Superfund Technical Assessment and Response Team
Region 5
[illegible] South Dearborn Street, Chicago, Illinois, [illegible]

Title	Environmental Sample Location Map		Figure 4-1
Site	Paxton Landfill		Scale Not to scale
City	Chicago	State Illinois	TDD S05-9901-004
Source	Expanded Site Inspection, Black & Veatch Waste Science, Inc.		Date 1999

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5. Threats to Human Health and the Environment

Using the available historical file data, START has determined that the Paxton site demonstrates potential physical and chemical threats to human health and the environment. PEI determined that a physical threat existed at the Paxton II site following the completion of the slope stability analysis. The primary chemical threat was confirmed by comparing the available leachate analytical results to SDWA limits. In several instances, historical leachate data was shown to exceed applicable SDWA standards. A review of leachate data generated by PEI demonstrated similar tendencies. Groundwater is not used as a drinking water resource near the Paxton site. However, groundwater flow beneath the Paxton site is towards Lake Calumet, which eventually empties into the Little Calumet River and the Calumet Sag Channel. All three surface water bodies are fisheries. Surface water runoff from the site also drains into Lake Calumet.

Paragraph (b)(2) of Part 300.415 of the NCP lists factors to be considered when determining the appropriateness of a potential removal action at a site. The following discussion presents a summary of those factors for the Paxton site for wastes defined under CERCLA.

- **Actual or potential exposure to hazardous substances or pollutants or contaminants by nearby populations, animals, or food chains.** The primary threat at the Paxton II site is from potential slope failure at the northwest corner of the site. In the event of slope failure, leachate is expected to migrate off site, possibly across Stony Island Avenue and into Lake Calumet, a recreational use surface water body located less than 0.5 mile west of the site. Lake Calumet drains into the Little Calumet River, which empties into the Calumet Sag Channel. Lake Calumet, the Little Calumet River and the Calumet Sag Channel are all fisheries. Analytical results for soil, sediment, groundwater and leachate samples collected at the Paxton site revealed levels of organic and inorganic contaminants that exceed applicable U.S. EPA Region 3 RBCs and SDWA limits. The Paxton site is only partially fenced; therefore , site access is not completely restricted.

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- **Actual or potential contamination of drinking water or sensitive environments.** The occurrence of a slope failure at the northwest corner of the Paxton II site is likely to result in a significant leachate release which may result in chemical contaminants entering Lake Calumet, the Little Calumet River, and the Calumet Sag Channel. Lake Calumet, the Little Calumet River and the Calumet Sag Channel are all fisheries. As stated previously, leachate samples collected at the site have been shown to contain levels of contaminants that exceed applicable SDWA limits. Several instances of uncontrolled leachate discharges have been documented at the Paxton site during previous IEPA inspections. Runoff from the site may enter site perimeter ditches, which eventually empty into Lake Calumet. Additionally, habitats for 2 federally-listed and 17 state-listed bird species, as well as 3 state-listed plant species are located within 6 miles of the Paxton site. A nearby wetland area is the habitat for the Piping Plover, a federally-listed endangered/threatened bird specie.

- **Weather conditions that may cause pollutants or contaminants to migrate or be released.** The Paxton site is a poorly maintained landfill with documented instances of exposed refuse, off site discharge of contaminated surface water, and unpermitted acceptance of liquid and hazardous wastes. Soil and sediment samples collected at the site during the December 13, 1993, Harza sample event revealed levels of contaminants, including benzo(a)pyrene, and lead, that exceed U.S. EPA Region 3 RBCs. Data collected by PEI at the Paxton II site revealed leachate contaminants, including arsenic, benzene, cadmium and vinyl chloride, which exceed SDWA limits. Runoff from the site may be conveyed by the site's perimeter ditches into Lake Calumet, a recreational use surface water body.

6. Conclusions

The Paxton site, located at 12201 South Oglesby Street, Chicago, Cook County, Illinois, is a landfill facility comprised of four individual landfills. Permitted and unpermitted landfilling activities took place at the site from 1970 through April 22, 1992. Current activities at the site include an unpermitted leachate recirculation operation and maintenance activities for the intermediate cover.

Both U.S. EPA and IEPA are currently evaluating the Paxton site to determine if the site poses a threat to human health and the environment. IEPA has contracted PEI to perform several studies at the site, including a slope stability analysis, an evaluation of landfill cover thickness and integrity, and a leachate extraction study. The PEI slope stability analysis has concluded that the potential for slope failure exists at the northwest corner of the Paxton II site. In the event of a slope failure at this location, there would likely be a significant leachate release from the Paxton II site. This release could migrate across Stony Island Avenue and enter Lake Calumet. Lake Calumet discharges into the Little Calumet River, and, eventually, the Calumet Sag Channel. Lake Calumet, the Little Calumet River, and the Calumet Sag Channel are classified as fisheries by IDOC.

The possible remedial actions at the Paxton site include leachate removal from the Paxton II site, installation of a RCRA compliant landfill cover system, and installation of a methane collection system. However, only the leachate removal option would qualify as a time-critical response. PEI has determined that the removal of approximately 24,000,000 gallons of leachate from the Paxton II site would be sufficient to stabilize the slopes, thereby mitigating the likelihood of slope failure. A preliminary cost estimate of $6.5 million was developed by PEI. However, the results obtained from the leachate extraction study being completed by PEI may result in the modification of the proposed amount. PEI anticipates to have completed the leachate extraction study by May 1, 1999. START has not been requested to develop an alternate cost estimate for the site.

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7. References

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Appendix A

Historical Groundwater, Leachate and Soil/sediment Analytical Results

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Table A-1

HISTORICAL GROUNDWATER DATA
PAXTON LANDFILL SITE
CHICAGO, COOK COUNTY, ILLINOIS

Units - µg/L

Parameter	NPDWR MCL	Sample Designation (sample date)											
		G104 (8/21/85)	G104 (2/26/87)	G104 (1988)	G124 (8/21/85)	G124 (2/26/87)	G124 (1988)	G18S (8/21/85)	G18S (2/26/87)	G17S (8/21/85)	G17S (2/26/87)	G17S (1988)	G12D (8/21/85)
Inorganic Analytes													
Aluminum	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	2,000	NA	NA	817	NA	NA	643	NA	NA	NA	NA	739	NA
Beryllium	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Boron	-	NA	NA	3,350	NA	NA	8,800	NA	NA	NA	NA	4,900	NA
Cadmium	5	NA	NA	6.4	NA	NA	11.1	NA	NA	NA	NA	15.7	NA
Calcium	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	100	NA	NA	ND	NA	NA	2.6	NA	NA	NA	NA	78.1	NA
Cobolt	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	1,300	NA	NA	30	NA	NA	ND	NA	NA	NA	NA	85.5	NA
Cyanide, Total	200	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	15	NA	NA	NA	NA	NA	5	NA	NA	NA	NA	79	NA
Magnesium	-	NA	NA	138,000	NA	NA	219,000	NA	NA	NA	NA	225,000	NA
Manganese	-	NA	NA	84.4	NA	NA	79.2	NA	NA	NA	NA	2,160	NA
Mercury	2	NA	NA	0.26	NA	NA	ND	NA	NA	NA	NA	ND	NA
Nickel	-	NA	NA	ND	NA	NA	237	NA	NA	NA	NA	314	NA
Potassium	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	-	NA	NA	ND	NA	NA	ND	NA	NA	NA	NA	134	NA
Zinc	-	NA	NA	36	NA	NA	12.8	NA	NA	NA	NA	428	NA

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Table A-1

HISTORICAL GROUNDWATER DATA
PAXTON LANDFILL SITE
CHICAGO, COOK COUNTY, ILLINOIS

Units - µg/L

Parameter	NPDWR MCL	Sample Designation (sample date)											
		G104 (8/21/85)	G104 (2/26/87)	G104 (1988)	G124 (8/21/85)	G124 (2/26/87)	G124 (1988)	G18S (8/21/85)	G18S (2/26/87)	G17S (8/21/85)	G17S (2/26/87)	G17S (1988)	G12D (8/21/85)
Organic Compounds													
1,1,1-Trichloroethane	200	NA	NA	ND	NA	NA	ND	NA	NA	NA	NA	44	NA
1,1-Dichloroethane	-	ND	NA	NA	ND	NA	NA	ND	NA	ND	NA	NA	ND
1,2-Dichloroethylene	100	ND	NA	NA	ND	NA	NA	ND	NA	ND	NA	NA	ND
1,2-Dichloropropane	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Diethoxyethane	-	20	NA	NA	ND	NA	NA	ND	NA	ND	NA	NA	18
1,3,6-Trioxocane	-	ND	ND	NA	ND	20	NA	380	120	120	ND	NA	ND
1,3,9-Trioxocane	-	NA	ND	NA	NA	ND	NA	NA	ND	NA	50	NA	NA
1,3-Dioxolane	-	ND	ND	NA	95	20	NA	140	30	ND	ND	NA	ND
1,4-Dichlorobenzene	75	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	-	NA	NA	ND	NA	NA	ND	NA	NA	NA	NA	ND	NA
2-Butanone	-	NA	NA	ND	NA	NA	ND	NA	NA	NA	NA	ND	NA
2-Ethyl-4-methyl-1,3-dioxolone	-	ND	NA	NA	ND	NA	NA	420	NA	ND	NA	NA	ND
2-Hexanone	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methyl-2-propanol	-	NA	ND	NA	NA	ND	NA	NA	ND	NA	ND	NA	NA
2-Methylnaphthalene	-	NA	NA	ND	NA	NA	ND	NA	NA	NA	NA	ND	NA
2-Methylphenol	-	NA	NA	ND	NA	NA	ND	NA	NA	NA	NA	ND	NA
3-Methyl-2-butanone	-	ND	NA	NA	ND	NA	NA	630	NA	ND	NA	NA	ND
4,4'-DDE	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-1,3-dioxolane	-	ND	NA	NA	90	NA	NA	ND	NA	ND	NA	NA	ND
4-Methyl-2-Pentanone	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methylphenol	-	NA	NA	ND	NA	NA	ND	NA	NA	NA	NA	ND	NA
Acenaphthalene	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	-	NA	NA	ND	NA	NA	ND	NA	NA	NA	NA	ND	NA
Acetone	-	ND	ND	NA	ND	ND	NA	25	ND	ND	ND	NA	ND

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Table A-1

HISTORICAL GROUNDWATER DATA
PAXTON LANDFILL SITE
CHICAGO, COOK COUNTY, ILLINOIS

Units - µg/L

Parameter	NPDWR MCL	Sample Designation (sample date)											
		G104 (8/21/85)	G104 (2/26/87)	G104 (1988)	G124 (8/21/85)	G124 (2/26/87)	G124 (1988)	G18S (8/21/85)	G18S (2/26/87)	G17S (8/21/85)	G17S (2/26/87)	G17S (1988)	G12D (8/21/85)
Acetonitrile	-	NA	ND	NA	NA	ND	NA	NA	ND	NA	ND	NA	NA
Aliphatic acid esters	-	NA	ND	NA	NA	ND	NA	NA	ND	NA	ND	NA	NA
Aliphatic acids	-	ND	NA	NA	ND	NA	NA	ND	NA	ND	NA	NA	ND
Aliphatic alcohols	-	ND	ND	NA	ND	ND	NA	ND	30	ND	ND	NA	ND
Aliphatic hydrocarbons	-	100	50	NA	300	ND	NA	20	800	1,000	ND	NA	ND
Anthracene	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	5	ND	ND	ND	90	ND	ND	ND	60	ND	ND	ND	ND
Benzo(a)anthracene	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	0.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)flouranthene	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
C-3 substituted benzene	-	ND	NA	NA	ND	NA	NA	ND	NA	ND	NA	NA	ND
C-4 substituted benzene	-	ND	NA	NA	ND	NA	NA	ND	NA	ND	NA	NA	ND
Chlorobenzene	100	ND	NA	NA	ND	NA	NA	ND	NA	ND	NA	NA	ND
Chrysene	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyclohexanone	-	NA	ND	NA	NA	ND	NA	NA	ND	NA	ND	NA	NA
Dibenzofuran	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dieldrin	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diethylphthalate	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethoxymethane	-	ND	ND	NA	400	90	NA	500	100	ND	ND	NA	ND
Di-n-butylphthalate	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethyl ether	-	ND	NA	NA	70	NA	NA	ND	NA	ND	NA	NA	ND
Ethylbenzene	700	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Flouranthene	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Table A-1

HISTORICAL GROUNDWATER DATA
PAXTON LANDFILL SITE
CHICAGO, COOK COUNTY, ILLINOIS

Units - µg/L

Parameter	NPDWR MCL	Sample Designation (sample date)											
		G104 (8/21/85)	G104 (2/26/87)	G104 (1988)	G124 (8/21/85)	G124 (2/26/87)	G124 (1988)	G18S (8/21/85)	G18S (2/26/87)	G17S (8/21/85)	G17S (2/26/87)	G17S (1988)	G12D (8/21/85)
Flourene	-	NA	NA	ND	NA	NA	ND	NA	NA	NA	NA	ND	NA
Indeno(1,2,3-cd)pyrene	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone	-	ND	NA	NA	ND	NA	NA	ND	NA	ND	NA	NA	ND
Isopropyl ether	-	ND	NA	NA	960	NA	NA	ND	NA	ND	NA	NA	ND
Methoxy aliphatic acid esters	-	ND	NA	NA	ND	NA	NA	ND	NA	ND	NA	NA	ND
Methoxymethylethoxy methylethoxy propanol	-	NA	90	NA	NA	ND	NA	NA	33,000	NA	3,600	NA	NA
Methyl cyclopentanol	-	NA	ND	NA	NA	ND	NA	NA	ND	NA	ND	NA	NA
Methyl dioxolane	-	NA	ND	NA	NA	20	NA	NA	ND	NA	ND	NA	NA
Methyl pentanediol	-	NA	ND	NA	NA	ND	NA	NA	ND	NA	ND	NA	NA
Methyl phenols	-	ND	NA	NA	ND	NA	NA	ND	NA	ND	NA	NA	ND
Methylene chloride	-	ND	NA	NA	ND	NA	NA	ND	NA	ND	NA	NA	ND
Methylethoxy propanol	-	ND	NA	NA	250	NA	NA	7,500	NA	1,000	NA	NA	ND
Methylethoxymethoxy propanol	-	ND	20	NA	750	15	NA	ND	3,200	ND	90	NA	ND
Naphthalene	-	ND	ND	ND	ND	ND	ND	6	ND	7	ND	ND	ND
Other organic compounds	-	60	510	NA	380	750	NA	2,800	6,600	1,900	4,100	NA	ND
Oxepane	-	ND	NA	NA	ND	NA	NA	110	NA	ND	NA	NA	ND
Phenanthrene	-	NA	ND	ND	NA	ND	ND	NA	ND	NA	ND	ND	NA
Phenol	-	ND	NA	ND	ND	NA	ND	ND	NA	ND	NA	ND	ND
Propyl ester	-	NA	ND	NA	NA	240	NA	NA	ND	NA	ND	NA	NA
Pyrene	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	100	NA	NA	ND	NA	NA	ND	NA	NA	NA	NA	ND	NA
Tetrachloroethylene	5	ND	NA	NA	ND	NA	NA	ND	NA	ND	NA	NA	ND
Tetrahydofuran	-	ND	ND	NA	620	60	NA	8,400	6,600	4,600	1,900	NA	22
Tetrahydro-2-methyl-2-furanol	-	ND	NA	NA	ND	NA	NA	450	NA	ND	NA	NA	ND
Toluene	1,000	ND	ND	ND	ND	ND	ND	13	ND	ND	ND	ND	ND

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Table A-1

HISTORICAL GROUNDWATER DATA
PAXTON LANDFILL SITE
CHICAGO, COOK COUNTY, ILLINOIS

Units - µg/L

Parameter	NPDWR MCL	Sample Designation (sample date)											
		G104 (8/21/85)	G104 (2/26/87)	G104 (1988)	G124 (8/21/85)	G124 (2/26/87)	G124 (1988)	G18S (8/21/85)	G18S (2/26/87)	G17S (8/21/85)	G17S (2/26/87)	G17S (1988)	G12D (8/21/85)
Trichloroethylene	5	ND	NA	NA	ND	NA	NA	ND	NA	ND	NA	NA	ND
Vinyl acetate	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylene	10,000	ND	NA	ND	ND	NA	ND	ND	NA	ND	NA	25	ND

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Table A-1

HISTORICAL GROUNDWATER DATA
PAXTON LANDFILL SITE
CHICAGO, COOK COUNTY, ILLINOIS

Units - µg/L

Parameter	NPDWR MCL	Sample Designation (sample date)											
		G15S (8/21/85)	G15S (2/26/87)	G15S (12/13/93)	G12S (8/21/85)	G16S (8/21/85)	G16S (2/26/87)	G16S (12/13/93)	R11D (2/26/87)	R11D/G11D (1988)	R11S (2/26/87)	G11S (1988)	G11S (12/13/93)
Inorganic Analytes													
Aluminum	-	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA	NA	ND
Antimony	6	NA	NA	ND	NA	NA	NA	32	NA	NA	NA	NA	ND
Arsenic	50	NA	NA	ND	NA	NA	NA	4.2	NA	NA	NA	NA	ND
Barium	2,000	NA	NA	100	NA	NA	NA	560	NA	ND	NA	ND	1,200
Beryllium	4	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA	NA	ND
Boron	-	NA	NA	NA	NA	NA	NA	NA	NA	2,360	NA	1,590	NA
Cadmium	5	NA	NA	ND	NA	NA	NA	ND	NA	ND	NA	7.9	ND
Calcium	-	NA	NA	252,000	NA	NA	NA	32,000	NA	NA	NA	NA	122,000
Chromium	100	NA	NA	ND	NA	NA	NA	38	NA	ND	NA	19	ND
Cobolt	-	NA	NA	ND	NA	NA	NA	36	NA	NA	NA	NA	ND
Copper	1,300	NA	NA	ND	NA	NA	NA	5.4	NA	ND	NA	37	13
Cyanide, Total	200	NA	NA	61	NA	NA	NA	7.7	NA	NA	NA	NA	8.2
Iron	-	NA	NA	ND	NA	NA	NA	2,600	NA	NA	NA	NA	210
Lead	15	NA	NA	ND	NA	NA	NA	6.6	NA	ND	NA	158	3
Magnesium	-	NA	NA	170,000	NA	NA	NA	421,000	NA	7,240	NA	135,000	72,200
Manganese	-	NA	NA	97	NA	NA	NA	20	NA	95	NA	659	659
Mercury	2	NA	NA	ND	NA	NA	NA	ND	NA	ND	NA	ND	ND
Nickel	-	NA	NA	ND	NA	NA	NA	470	NA	ND	NA	ND	ND
Potassium	-	NA	NA	33,500	NA	NA	NA	456,000	NA	NA	NA	NA	17,700
Selenium	50	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA	NA	ND
Silver	-	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA	NA	ND
Sodium	-	NA	NA	80,700	NA	NA	NA	2,590,000	NA	NA	NA	NA	76,400
Thallium	2	NA	NA	ND	NA	NA	NA	10	NA	NA	NA	NA	ND
Vanadium	-	NA	NA	ND	NA	NA	NA	29	NA	ND	NA	ND	ND
Zinc	-	NA	NA	56	NA	NA	NA	41	NA	ND	NA	170	240

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Table A-1

HISTORICAL GROUNDWATER DATA
PAXTON LANDFILL SITE
CHICAGO, COOK COUNTY, ILLINOIS

Units - µg/L

Parameter	NPDWR MCL	Sample Designation (sample date)											
		G15S (8/21/85)	G15S (2/26/87)	G15S (12/13/93)	G12S (8/21/85)	G16S (8/21/85)	G16S (2/26/87)	G16S (12/13/93)	R11D (2/26/87)	R11D/G11D (1988)	R11S (2/26/87)	G11S (1988)	G11S (12/13/93)
Organic Compounds													
1,1,1-Trichloroethane	200	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA	ND	NA
1,1-Dichloroethane	-	ND	NA	ND	230	ND	NA	ND	NA	NA	NA	NA	ND
1,2-Dichloroethylene	100	2,500	NA	ND	1,050	ND	NA	ND	NA	NA	NA	NA	ND
1,2-Dichloropropane	5	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA	NA	ND
1,2-Diethoxyethane	-	ND	NA	NA	ND	120	NA	NA	NA	NA	NA	NA	NA
1,3,6-Trioxocane	-	ND	ND	NA	ND	ND	ND	NA	ND	NA	ND	NA	NA
1,3,9-Trioxocane	-	NA	ND	NA	NA	NA	ND	NA	ND	NA	ND	NA	NA
1,3-Dioxolane	-	ND	ND	NA	ND	40	ND	NA	ND	NA	ND	NA	NA
1,4-Dichlorobenzene	75	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA	NA	ND
2,4-Dimethylphenol	-	NA	NA	ND	NA	NA	NA	ND	NA	ND	NA	ND	ND
2-Butanone	-	NA	NA	ND	NA	NA	NA	ND	NA	ND	NA	ND	ND
2-Ethyl-4-methyl-1,3-dioxolone	-	ND	NA	NA	ND	ND	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	-	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA	NA	ND
2-Methyl-2-propanol	-	NA	ND	NA	NA	NA	ND	NA	ND	NA	ND	NA	NA
2-Methylnaphthalene	-	NA	NA	ND	NA	NA	NA	ND	NA	ND	NA	ND	ND
2-Methylphenol	-	NA	NA	ND	NA	NA	NA	ND	NA	ND	NA	ND	ND
3-Methyl-2-butanone	-	ND	NA	NA	ND	ND	NA	NA	NA	NA	NA	NA	NA
4,4'-DDE	-	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA	NA	ND
4-Methyl-1,3-dioxolane	-	ND	NA	NA	ND	ND	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-Pentanone	-	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA	NA	ND
4-Methylphenol	-	NA	NA	ND	NA	NA	NA	ND	NA	ND	NA	ND	ND
Acenaphthalene	-	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA	NA	ND
Acenaphthene	-	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA	NA	ND
Acenaphthylene	-	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA	ND	NA
Acetone	-	96,000	140	ND	16,000	40	ND	ND	ND	NA	ND	NA	ND

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Table A-1

HISTORICAL GROUNDWATER DATA
PAXTON LANDFILL SITE
CHICAGO, COOK COUNTY, ILLINOIS

Units - µg/L

Parameter	NPDWR MCL	Sample Designation (sample date)											
		G15S (8/21/85)	G15S (2/26/87)	G15S (12/13/93)	G12S (8/21/85)	G16S (8/21/85)	G16S (2/26/87)	G16S (12/13/93)	R11D (2/26/87)	R11D/G11D (1988)	R11S (2/26/87)	G11S (1988)	G11S (12/13/93)
Acetonitrile	-	NA	40	NA	NA	NA	ND	NA	ND	NA	ND	NA	NA
Aliphatic acid esters	-	NA	ND	NA	NA	NA	ND	NA	ND	NA	ND	NA	NA
Aliphatic acids	-	23,000	NA	NA	270	ND	NA	NA	NA	NA	NA	NA	NA
Aliphatic alcohols	-	330	ND	NA	16,000	ND	ND	NA	ND	NA	ND	NA	NA
Aliphatic hydrocarbons	-	59,000	ND	NA	80	60	ND	NA	ND	NA	560	NA	NA
Anthracene	-	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA	NA	ND
Benzene	5	40	300	ND	150	ND	ND	5	ND	ND	ND	ND	ND
Benzo(a)anthracene	-	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA	NA	ND
Benzo(a)pyrene	0.2	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA	NA	ND
Benzo(b)fluoranthene	-	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA	NA	ND
Benzo(k)flouranthene	-	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA	NA	ND
bis(2-Ethylhexyl)phthalate	-	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA	NA	ND
C-3 substituted benzene	-	ND	NA	NA	50	ND	NA	NA	NA	NA	NA	NA	NA
C-4 substituted benzene	-	ND	NA	NA	30	ND	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	100	ND	NA	ND	150	ND	NA	ND	NA	NA	NA	NA	ND
Chrysene	-	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA	NA	ND
Cyclohexanne	-	NA	530	NA	NA	NA	ND	NA	ND	NA	ND	NA	NA
Dibenzofuran	-	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA	NA	ND
Dieldrin	-	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA	NA	ND
Diethylphthalate	-	NA	NA	ND	NA	NA	NA	5	NA	NA	NA	NA	ND
Dimethoxymethane	-	ND	ND	NA	ND	ND	ND	NA	ND	NA	ND	NA	NA
Di-n-butylphthalate	-	NA	NA	4	NA	NA	NA	5	NA	NA	NA	NA	6
Ethyl ether	-	ND	NA	NA	ND	ND	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	700	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA	NA	ND
Flouranthene	-	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA	NA	ND

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Table A-1

HISTORICAL GROUNDWATER DATA
PAXTON LANDFILL SITE
- CHICAGO, COOK COUNTY, ILLINOIS

Units - µg/L

Parameter	NPDWR MCL	Sample Designation (sample date)											
		G15S (8/21/85)	G15S (2/26/87)	G15S (12/13/93)	G12S (8/21/85)	G16S (8/21/85)	G16S (2/26/87)	G16S (12/13/93)	R11D (2/26/87)	R11D/G11D (1988)	R11S (2/26/87)	G11S (1988)	G11S (12/13/93)
Flourene	-	NA	NA	ND	NA	NA	NA	ND	NA	ND	NA	ND	ND
Indeno(1,2,3-cd)pyrene	-	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA	NA	ND
Isophorone	-	360	NA	NA	ND	ND	NA	NA	NA	NA	NA	NA	NA
Isopropyl ether	-	ND	NA	NA	ND	ND	NA	NA	NA	NA	NA	NA	NA
Methoxy aliphatic acid esters	-	ND	NA	NA	67,000	ND	NA	NA	NA	NA	NA	NA	NA
Methoxymethylethoxy methylethoxy propanol	-	NA	26,000	NA	NA	NA	2,700	NA	ND	NA	ND	NA	NA
Methyl cyclopentanol	-	NA	350	NA	NA	NA	ND	NA	ND	NA	ND	NA	NA
Methyl dioxolane	-	NA	ND	NA	NA	NA	ND	NA	ND	NA	ND	NA	NA
Methyl pentanediol	-	NA	250	NA	NA	NA	ND	NA	ND	NA	ND	NA	NA
Methyl phenols	-	4,800	NA	NA	ND	ND	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	-	1,900	NA	NA	2,300	ND	NA	NA	NA	NA	NA	NA	NA
Methylethoxy propanol	-	ND	NA	NA	380	ND	NA	NA	NA	NA	NA	NA	NA
Methylethoxymethoxy propano	-	ND	1,400	NA	ND	580	50	NA	ND	NA	ND	NA	NA
Naphthalene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Other organic compounds	-	32,000	5,200	NA	7,900	1,600	330	NA	ND	NA	70	NA	NA
Oxepane	-	ND	NA	NA	ND	ND	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	-	NA	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND
Phenol	-	1,600	NA	ND	830	ND	NA	ND	NA	ND	NA	ND	ND
Propyl ester	-	NA	ND	NA	NA	NA	ND	NA	ND	NA	ND	NA	NA
Pyrene	-	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA	NA	ND
Styrene	100	NA	NA	ND	NA	NA	NA	ND	NA	ND	NA	ND	ND
Tetrachloroethylene	5	ND	NA	NA	30	ND	NA	NA	NA	NA	NA	NA	NA
Tetrahydofuran	-	9,600	700	NA	ND	720	170	NA	ND	NA	ND	NA	NA
Tetrahydro-2-methyl-2-furanol	-	ND	NA	NA	ND	ND	NA	NA	NA	NA	NA	NA	NA
Toluene	1,000	ND	300	ND	1,300	ND	ND	5	ND	ND	ND	ND	ND

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Table A-1

HISTORICAL GROUNDWATER DATA
PAXTON LANDFILL SITE
CHICAGO, COOK COUNTY, ILLINOIS

Units - µg/L

Parameter	NPDWR MCL	Sample Designation (sample date)											
		G15S (8/21/85)	G15S (2/26/87)	G15S (12/13/93)	G12S (8/21/85)	G16S (8/21/85)	G16S (2/26/87)	G16S (12/13/93)	R11D (2/26/87)	R11D/G11D (1988)	R11S (2/26/87)	G11S (1988)	G11S (12/13/93)
Trichloroethylene	5	ND	NA	NA	200	ND	NA	NA	NA	NA	NA	NA	NA
Vinyl acetate	-	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA	NA	ND
Xylene	10,000	ND	NA	ND	270	ND	NA	ND	NA	ND	NA	ND	ND

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Table A-1

HISTORICAL GROUNDWATER DATA
PAXTON LANDFILL SITE
CHICAGO, COOK COUNTY, ILLINOIS

Units - µg/L

Parameter	NPDWR MCL	Sample Designation (sample date)											
		R13D (2/26/87)	R13D/G13D (1988)	R13S (1988)	G13S (12/13/93)	R105 (2/26/87)	R105 (1988)	R105 (12/13/93)	R106 (2/26/87)	R106 (12/13/93)	G11B (1988)	G13B (1988)	G105B (1988)
Inorganic Analytes													
Aluminum	-	NA	NA	NA	ND	NA	NA	ND	NA	ND	NA	NA	NA
Antimony	6	NA	NA	NA	ND	NA	NA	29	NA	ND	NA	NA	NA
Arsenic	50	NA	NA	NA	5.4	NA	NA	5.8	NA	ND	NA	NA	NA
Barium	2,000	NA	999	511	460	NA	844	590	NA	1,100	1,060	246	383
Beryllium	4	NA	NA	NA	ND	NA	NA	ND	NA	ND	NA	NA	NA
Boron	-	NA	5,570	6,030	NA	NA	1,700	NA	NA	NA	950	1,140	550
Cadmium	5	NA	20	11	ND	NA	ND	ND	NA	ND	ND	ND	ND
Calcium	-	NA	NA	NA	59,400	NA	NA	53,400	NA	120,000	NA	NA	NA
Chromium	100	NA	ND	37	12	NA	ND	14	NA	ND	110	79.9	40
Cobolt	-	NA	NA	NA	19	NA	NA	13	NA	ND	NA	NA	NA
Copper	1,300	NA	ND	48.1	9.3	NA	ND	6.5	NA	ND	36	ND	29
Cyanide, Total	200	NA	NA	NA	100	NA	NA	51	NA	5.2	NA	NA	NA
Iron	-	NA	NA	NA	720	NA	NA	1,300	NA	220	NA	NA	NA
Lead	15	NA	ND	54	10	NA	19	6.6	NA	ND	13	9	ND
Magnesium	-	NA	277,000	147,000	168,000	NA	97,600	123,000	NA	71,300	20,100	ND	8,230
Manganese	-	NA	233	1,170	140	NA	230	66	NA	250	210	46.3	47
Mercury	2	NA	ND	1.6	ND	NA	ND	ND	NA	ND	0.26	0.62	ND
Nickel	-	NA	92.6	107	100	NA	ND	130	NA	ND	56.1	47.3	ND
Potassium	-	NA	NA	NA	296,000	NA	NA	260,000	NA	17,800	NA	NA	NA
Selenium	50	NA	NA	NA	ND	NA	NA	ND	NA	ND	NA	NA	NA
Silver	-	NA	NA	NA	ND	NA	NA	ND	NA	ND	NA	NA	NA
Sodium	-	NA	NA	NA	1,480,000	NA	NA	1,300,000	NA	77,000	NA	NA	NA
Thallium	2	NA	NA	NA	ND	NA	NA	ND	NA	ND	NA	NA	NA
Vanadium	-	NA	ND	ND	16	NA	ND	20	NA	ND	ND	ND	ND
Zinc	-	NA	40.4	103	130	NA	42.9	51	NA	42	62.6	30.1	20.3

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HISTORICAL GROUNDWATER DATA
PAXTON LANDFILL SITE
CHICAGO, COOK COUNTY, ILLINOIS

Units - µg/L

Parameter	NPDWR MCL	Sample Designation (sample date)											
		R13D (2/26/87)	R13D/G13D (1988)	R13S (1988)	G13S (12/13/93)	R105 (2/26/87)	R105 (1988)	R105 (12/13/93)	R106 (2/26/87)	R106 (12/13/93)	G11B (1988)	G13B (1988)	G105B (1988)
Organic Compounds													
1,1,1-Trichloroethane	200	NA	ND	ND	NA	NA	8	NA	NA	NA	ND	ND	ND
1,1-Dichloroethane	-	NA	NA	NA	ND	NA	NA	ND	NA	ND	NA	NA	NA
1,2-Dichloroethylene	100	NA	NA	NA	ND	NA	NA	ND	NA	ND	NA	NA	NA
1,2-Dichloropropane	5	NA	NA	NA	ND	NA	NA	ND	NA	ND	NA	NA	NA
1,2-Diethoxyethane	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3,6-Trioxocane	-	ND	NA	NA	NA	ND	NA	NA	ND	NA	NA	NA	NA
1,3,9-Trioxocane	-	ND	NA	NA	NA	ND	NA	NA	ND	NA	NA	NA	NA
1,3-Dioxolane	-	ND	NA	NA	NA	ND	NA	NA	ND	NA	NA	NA	NA
1,4-Dichlorobenzene	75	NA	NA	NA	ND	NA	NA	ND	NA	ND	NA	NA	NA
2,4-Dimethylphenol	-	NA	ND	970	640	NA	ND	ND	NA	ND	ND	ND	ND
2-Butanone	-	NA	ND	ND	ND	NA	ND	ND	NA	ND	ND	10	ND
2-Ethyl-4-methyl-1,3-dioxolone	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	-	NA	NA	NA	ND	NA	NA	ND	NA	ND	NA	NA	NA
2-Methyl-2-propanol	-	20	NA	NA	NA	ND	NA	NA	ND	NA	NA	NA	NA
2-Methylnaphthalene	-	NA	ND	260	590	NA	ND	ND	NA	ND	ND	ND	ND
2-Methylphenol	-	NA	ND	1,400	290	NA	ND	ND	NA	ND	ND	ND	ND
3-Methyl-2-butanone	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDE	-	NA	NA	NA	ND	NA	NA	ND	NA	ND	NA	NA	NA
4-Methyl-1,3-dioxolane	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-Pentanone	-	NA	NA	NA	ND	NA	NA	ND	NA	ND	NA	NA	NA
4-Methylphenol	-	NA	ND	980	340	NA	ND	ND	NA	ND	ND	ND	ND
Acenaphthalene	-	NA	NA	NA	130	NA	NA	ND	NA	ND	NA	NA	NA
Acenaphthene	-	NA	NA	NA	16	NA	NA	ND	NA	ND	NA	NA	NA
Acenaphthylene	-	NA	ND	250	NA	NA	ND	NA	NA	NA	ND	ND	ND
Acetone	-	ND	NA	NA	ND	ND	NA	ND	ND	ND	NA	NA	NA

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HISTORICAL GROUNDWATER DATA
PAXTON LANDFILL SITE
CHICAGO, COOK COUNTY, ILLINOIS

Units - µg/L

Parameter	NPDWR MCL	Sample Designation (sample date)											
		R13D (2/26/87)	R13D/G13D (1988)	R13S (1988)	G13S (12/13/93)	R105 (2/26/87)	R105 (1988)	R105 (12/13/93)	R106 (2/26/87)	R106 (12/13/93)	G11B (1988)	G13B (1988)	G105B (1988)
Acetonitrile	-	ND	NA	NA	NA	ND	NA	NA	ND	NA	NA	NA	NA
Aliphatic acid esters	-	ND	NA	NA	NA	15	NA	NA	ND	NA	NA	NA	NA
Aliphatic acids	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aliphatic alcohols	-	ND	NA	NA	NA	ND	NA	NA	ND	NA	NA	NA	NA
Aliphatic hydrocarbons	-	70	NA	NA	NA	30	NA	NA	90	NA	NA	NA	NA
Anthracene	-	NA	NA	NA	39	NA	NA	ND	NA	ND	NA	NA	NA
Benzene	5	ND	ND	340	240	ND	ND	5	ND	ND	ND	ND	ND
Benzo(a)anthracene	-	NA	NA	NA	16	NA	NA	ND	NA	ND	NA	NA	NA
Benzo(a)pyrene	0.2	NA	NA	NA	10	NA	NA	ND	NA	ND	NA	NA	NA
Benzo(b)fluoranthene	-	NA	NA	NA	9	NA	NA	ND	NA	ND	NA	NA	NA
Benzo(k)flouranthene	-	NA	NA	NA	10	NA	NA	ND	NA	ND	NA	NA	NA
bis(2-Ethylhexyl)phthalate	-	NA	NA	NA	ND	NA	NA	ND	NA	ND	NA	NA	NA
C-3 substituted benzene	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
C-4 substituted benzene	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	100	NA	NA	NA	ND	NA	NA	ND	NA	ND	NA	NA	NA
Chrysene	-	NA	NA	NA	17	NA	NA	ND	NA	ND	NA	NA	NA
Cyclohexanne	-	ND	NA	NA	NA	ND	NA	NA	ND	NA	NA	NA	NA
Dibenzofuran	-	NA	NA	NA	71	NA	NA	ND	NA	ND	NA	NA	NA
Dieldrin	-	NA	NA	NA	ND	NA	NA	ND	NA	ND	NA	NA	NA
Diethylphthalate	-	NA	NA	NA	ND	NA	NA	ND	NA	ND	NA	NA	NA
Dimethoxymethane	-	ND	NA	NA	NA	ND	NA	NA	ND	NA	NA	NA	NA
Di-n-butylphthalate	-	NA	NA	NA	3	NA	NA	5	NA	ND	NA	NA	NA
Ethyl ether	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	700	NA	NA	NA	19	NA	NA	ND	NA	ND	NA	NA	NA
Flouranthene	-	NA	NA	NA	61	NA	NA	ND	NA	ND	NA	NA	NA

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HISTORICAL GROUNDWATER DATA
PAXTON LANDFILL SITE
CHICAGO, COOK COUNTY, ILLINOIS

Units - µg/L

Parameter	NPDWR MCL	Sample Designation (sample date)											
		R13D (2/26/87)	R13D/G13D (1988)	R13S (1988)	G13S (12/13/93)	R105 (2/26/87)	R105 (1988)	R105 (12/13/93)	R106 (2/26/87)	R106 (12/13/93)	G11B (1988)	G13B (1988)	G105B (1988)
Flourene	-	NA	ND	130	61	NA	ND	ND	NA	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	-	NA	NA	NA	5	NA	NA	ND	NA	ND	NA	NA	NA
Isophorone	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isopropyl ether	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methoxy aliphatic acid esters	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methoxymethylethoxy methylethoxy propanol	-	40	NA	NA	NA	ND	NA	NA	ND	NA	NA	NA	NA
Methyl cyclopentanol	-	ND	NA	NA	NA	ND	NA	NA	ND	NA	NA	NA	NA
Methyl dioxolane	-	ND	NA	NA	NA	ND	NA	NA	ND	NA	NA	NA	NA
Methyl pentanediol	-	ND	NA	NA	NA	ND	NA	NA	ND	NA	NA	NA	NA
Methyl phenols	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylethoxy propanol	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylethoxymethoxy propano	-	ND	NA	NA	NA	ND	NA	NA	ND	NA	NA	NA	NA
Naphthalene	-	30	ND	6,000	7,000	ND	ND	ND	ND	ND	ND	ND	ND
Other organic compounds	-	60	NA	NA	NA	20	NA	NA	20	NA	NA	NA	NA
Oxepane	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	-	30	ND	170	150	ND	ND	ND	ND	ND	ND	ND	ND
Phenol	-	NA	ND	740	180	NA	ND	ND	NA	ND	ND	ND	ND
Propyl ester	-	ND	NA	NA	NA	ND	NA	NA	ND	NA	NA	NA	NA
Pyrene	-	NA	NA	NA	43	NA	NA	ND	NA	ND	NA	NA	NA
Styrene	100	NA	ND	92	66	NA	ND	ND	NA	ND	ND	ND	ND
Tetrachloroethylene	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrahydofuran	-	ND	NA	NA	NA	ND	NA	NA	ND	NA	NA	NA	NA
Tetrahydro-2-methyl-2-furanol	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	1,000	ND	ND	310	220	ND	ND	ND	ND	ND	ND	ND	ND

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Table A-1

HISTORICAL GROUNDWATER DATA
PAXTON LANDFILL SITE
CHICAGO, COOK COUNTY, ILLINOIS

Units - µg/L

Parameter	NPDWR MCL	Sample Designation (sample date)											
		R13D (2/26/87)	R13D/G13D (1988)	R13S (1988)	G13S (12/13/93)	R105 (2/26/87)	R105 (1988)	R105 (12/13/93)	R106 (2/26/87)	R106 (12/13/93)	G11B (1988)	G13B (1988)	G105B (1988)
Trichloroethylene	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl acetate	-	NA	NA	NA	ND	NA	NA	ND	NA	ND	NA	NA	NA
Xylene	10,000	NA	ND	340	280	NA	ND	ND	NA	ND	ND	ND	ND

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Table A-1

HISTORICAL GROUNDWATER DATA
PAXTON LANDFILL SITE
CHICAGO, COOK COUNTY, ILLINOIS

Units - µg/L

Parameter	NPDWR MCL	Sample Designation (sample date)						
		G130B (1988)	G19S (12/13/93)	G20S (12/13/93)	G22S (12/13/93)	G24S (12/13/93)	G25F (12/13/93)	G25FDL (12/13/93)
Inorganic Analytes								
Aluminum	-	NA	ND	ND	ND	ND	NS	NS
Antimony	6	NA	ND	ND	ND	ND	NS	NS
Arsenic	50	NA	ND	4.9	ND	ND	NS	NS
Barium	2,000	230	1,300	330	740	620	NS	NS
Beryllium	4	NA	ND	ND	ND	ND	NS	NS
Boron	-	1,640	NA	NA	NA	NA	NS	NS
Cadmium	5	ND	ND	ND	ND	ND	NS	NS
Calcium	-	NA	278,000	98,900	101,000	46,300	NS	NS
Chromium	100	13.7	ND	9.8	18	12	NS	NS
Cobolt	-	NA	13	7.2	13	18	NS	NS
Copper	1,300	ND	8.6	75	ND	16	NS	NS
Cyanide, Total	200	NA	160	8	6.1	NA	NS	NS
Iron	-	NA	540	1,100	1,000	980	NS	NS
Lead	15	5	ND	ND	2.4	9.1	NS	NS
Magnesium	-	1,030	130,000	222,000	305,000	151,000	NS	NS
Manganese	-	26.8	190	150	47	56	NS	NS
Mercury	2	ND	ND	ND	ND	ND	NS	NS
Nickel	-	ND	46	790	ND	110	NS	NS
Potassium	-	NA	88,800	141,000	320,000	374,000	NS	NS
Selenium	50	NA	ND	ND	ND	ND	NS	NS
Silver	-	NA	ND	ND	ND	ND	NS	NS
Sodium	-	NA	721,000	1,230,000	1,380,000	1,960,000	NS	NS
Thallium	2	NA	ND	ND	ND	ND	NS	NS
Vanadium	-	ND	5	7	20	ND	NS	NS
Zinc	-	19.9	100	80	100	170	NS	NS

Table A-1

HISTORICAL GROUNDWATER DATA
PAXTON LANDFILL SITE
CHICAGO, COOK COUNTY, ILLINOIS

Units - µg/L

Parameter	NPDWR MCL	Sample Designation (sample date)						
		G130B (1988)	G19S (12/13/93)	G20S (12/13/93)	G22S (12/13/93)	G24S (12/13/93)	G25F (12/13/93)	G25FDL (12/13/93)
Organic Compounds								
1,1,1-Trichloroethane	200	ND	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	-	NA	ND	ND	ND	ND	37	ND
1,2-Dichloroethylene	100	NA	ND	ND	ND	ND	18	ND
1,2-Dichloropropane	5	NA	ND	ND	ND	ND	10	ND
1,2-Diethoxyethane	-	NA	NA	NA	NA	NA	NA	NA
1,3,6-Trioxocane	-	NA	NA	NA	NA	NA	NA	NA
1,3,9-Trioxocane	-	NA	NA	NA	NA	NA	NA	NA
1,3-Dioxolane	-	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	75	NA	ND	ND	ND	8	NA	NA
2,4-Dimethylphenol	-	ND	ND	ND	ND	ND	NA	NA
2-Butanone	-	ND	ND	ND	ND	ND	14,000	15,000
2-Ethyl-4-methyl-1,3-dioxolone	-	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	-	NA	ND	ND	ND	ND	20	ND
2-Methyl-2-propanol	-	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	-	ND	ND	ND	ND	ND	NA	NA
2-Methylphenol	-	ND	ND	ND	ND	ND	NA	NA
3-Methyl-2-butanone	-	NA	NA	NA	NA	NA	NA	NA
4,4'-DDE	-	NA	ND	ND	ND	0.07	NA	NA
4-Methyl-1,3-dioxolane	-	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-Pentanone	-	NA	ND	ND	ND	ND	1,200	1,200
4-Methylphenol	-	120	ND	ND	ND	ND	NA	NA
Acenaphthalene	-	NA	ND	ND	ND	26	NA	NA
Acenaphthene	-	NA	ND	ND	ND	3	NA	NA
Acenaphthylene	-	ND	NA	NA	NA	NA	NA	NA
Acetone	-	NA	ND	ND	ND	ND	13,000	22,000

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Table A-1

HISTORICAL GROUNDWATER DATA
PAXTON LANDFILL SITE
CHICAGO, COOK COUNTY, ILLINOIS

Units - µg/L

Parameter	NPDWR MCL	Sample Designation (sample date)						
		G130B (1988)	G19S (12/13/93)	G20S (12/13/93)	G22S (12/13/93)	G24S (12/13/93)	G25F (12/13/93)	G25FDL (12/13/93)
Acetonitrile	-	NA	NA	NA	NA	NA	NA	NA
Aliphatic acid esters	-	NA	NA	NA	NA	NA	NA	NA
Aliphatic acids	-	NA	NA	NA	NA	NA	NA	NA
Aliphatic alcohols	-	NA	NA	NA	NA	NA	NA	NA
Aliphatic hydrocarbons	-	NA	NA	NA	NA	NA	NA	NA
Anthracene	-	NA	ND	ND	ND	2	NA	NA
Benzene	5	ND	ND	ND	ND	21	70	ND
Benzo(a)anthracene	-	NA	ND	ND	ND	ND	NA	NA
Benzo(a)pyrene	0.2	NA	ND	ND	ND	ND	NA	NA
Benzo(b)fluoranthene	-	NA	ND	ND	ND	ND	NA	NA
Benzo(k)flouranthene	-	NA	ND	ND	ND	ND	NA	NA
bis(2-Ethylhexyl)phthalate	-	NA	ND	ND	ND	37	NA	NA
C-3 substituted benzene	-	NA	NA	NA	NA	NA	NA	NA
C-4 substituted benzene	-	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	100	NA	ND	ND	ND	100	ND	ND
Chrysene	-	NA	ND	ND	ND	ND	NA	NA
Cyclohexanne	-	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	-	NA	ND	ND	ND	ND	NA	NA
Dieldrin	-	NA	ND	ND	ND	0.07	NA	NA
Diethylphthalate	-	NA	ND	ND	ND	ND	NA	NA
Dimethoxymethane	-	NA	NA	NA	NA	NA	NA	NA
Di-n-butylphthalate	-	NA	ND	ND	ND	ND	NA	NA
Ethyl ether	-	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	700	NA	ND	ND	ND	68	170	ND
Flouranthene	-	NA	ND	ND	ND	ND	NA	NA

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Table A-1

HISTORICAL GROUNDWATER DATA
PAXTON LANDFILL SITE
CHICAGO, COOK COUNTY, ILLINOIS

Units - µg/L

Parameter	NPDWR MCL	Sample Designation (sample date)						
		G130B (1988)	G19S (12/13/93)	G20S (12/13/93)	G22S (12/13/93)	G24S (12/13/93)	G25F (12/13/93)	G25FDL (12/13/93)
Flourene	-	ND	ND	ND	ND	4	NA	NA
Indeno(1,2,3-cd)pyrene	-	NA	ND	ND	ND	ND	NA	NA
Isophorone	-	NA	NA	NA	NA	NA	NA	NA
Isopropyl ether	-	NA	NA	NA	NA	NA	NA	NA
Methoxy aliphatic acid esters	-	NA	NA	NA	NA	NA	NA	NA
Methoxymethylethoxy methylethoxy propanol	-	NA	NA	NA	NA	NA	NA	NA
Methyl cyclopentanol	-	NA	NA	NA	NA	NA	NA	NA
Methyl dioxolane	-	NA	NA	NA	NA	NA	NA	NA
Methyl pentanediol	-	NA	NA	NA	NA	NA	NA	NA
Methyl phenols	-	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	-	NA	NA	NA	NA	NA	NA	NA
Methylethoxy propanol	-	NA	NA	NA	NA	NA	NA	NA
Methylethoxymethoxy propanol	-	NA	NA	NA	NA	NA	NA	NA
Naphthalene	-	ND	ND	ND	ND	75	NA	NA
Other organic compounds	-	NA	NA	NA	NA	NA	NA	NA
Oxepane	-	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	-	ND	ND	ND	ND	4	NA	NA
Phenol	-	35	ND	ND	ND	ND	NA	NA
Propyl ester	-	NA	NA	NA	NA	NA	NA	NA
Pyrene	-	NA	ND	ND	ND	ND	NA	NA
Styrene	100	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethylene	5	NA	NA	NA	NA	NA	NA	NA
Tetrahydofuran	-	NA	NA	NA	NA	NA	NA	NA
Tetrahydro-2-methyl-2-furanol	-	NA	NA	NA	NA	NA	NA	NA
Toluene	1,000	ND	ND	ND	ND	7	1,100	1,300

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Table A-1

HISTORICAL GROUNDWATER DATA
PAXTON LANDFILL SITE
CHICAGO, COOK COUNTY, ILLINOIS

Units - µg/L

Parameter	NPDWR MCL	Sample Designation (sample date)						
		G130B (1988)	G19S (12/13/93)	G20S (12/13/93)	G22S (12/13/93)	G24S (12/13/93)	G25F (12/13/93)	G25FDL (12/13/93)
Trichloroethylene	5	NA	NA	NA	NA	NA	NA	NA
Vinyl acetate	-	NA	ND	ND	ND	ND	56	ND
Xylene	10,000	ND	ND	ND	ND	240	660	760

Key:

µg/L	=	Micrograms per liter.
NPDWR	=	National Primary Drinking Water Regulations.
MCL	=	Maximum contaminant level.
1988	=	Data from 1988 Weston site investigation.
12/13/93	=	Data from Harza sample event.
-	=	Value not established.
NA	=	Not analyzed.
ND	=	Not detected.
NS	=	Not sampled.

Note:

G19S is background sample for Harza sample event.

Sources:

Illinois Environmental Protection Agency, May 11, 1986, Memorandum to Division File, 0316000033.
Illinois Environmental Protection Agency, May 5, 1987, Memorandum to Division File, 0316000033.
Black & Veatch Waste Science, Inc., July 14, 1995, Expanded Site Inspection.

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Table A-2

HISTORICAL LEACHATE DATA
PAXTON LANDFILL SITE
CHICAGO, COOK COUNTY, ILLINOIS

Units - µg/L

Parameter	NPDWR MCL	Sample Designation (sample date)						
		LP-1 (1988)	LP-2 (1988)	LP-3 (1988)	LP-4 (1988)	SW07 (12/13/93)	SW08 (12/13/93)	SW09 (12/13/93)
Inorganic Analytes								
Barium	2,000	457	457	800	558	NA	NA	NA
Beryllium	4	2.5	ND	ND	ND	NA	NA	NA
Boron	-	4,140	3,420	17,200	3,100	NA	NA	NA
Cadmium	5	ND	ND	27.8	25.8	NA	NA	NA
Chromium	100	ND	20	98.4	28.7	NA	316	168
Cobolt	-	NA	NA	NA	NA	28.3	37.3	14.4
Copper	1,300	ND	48.2	220	51.6	NA	NA	NA
Lead	15	28	138	338	90	NA	NA	NA
Magnesium	-	98,500	15,000	368,000	402,000	405,000	156,000	350,000
Manganese	-	267	492	1,250	937	289	195	180
Mercury	2	ND	ND	0.48	ND	NA	NA	NA
Nickel	-	104	217	283	100	164	236	108
Potassium	-	NA	NA	NA	NA	1,790,000	1,430,000	8,580,000
Sodium	-	NA	NA	NA	NA	4,330,000	5,090,000	17,400,000
Vanadium	-	ND	ND	53.5	ND	19.6	75.3	61.2
Zinc	-	43	571	1,780	171	NA	NA	NA
Volatile Organic Compounds (VOCs)								
1,1,1-Trichloroethane	200	5	6	ND	10	NA	NA	NA
1,2-Dichloroethene	100	ND	84	7	ND	NA	NA	NA
2-Butanone	-	24	21	160	130	NA	290	NA
2-Hexanone	-	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-Pentanone	-	ND	ND	26	29	NA	NA	NA
4-Methylphenol	-	ND	70	60	ND	NA	NA	NA
Acetone	-	NA	NA	NA	NA	NA	190	1,100
Benzene	5	ND	15	100	ND	NA	NA	NA
Chlorobenzene	100	ND	7	ND	ND	NA	NA	NA
Chloroethane	-	ND	ND	29	ND	110	NA	NA
Ethylbenzene	700	5	91	44	8	NA	380	NA
Phenol	-	ND	1,200	ND	87	NA	NA	NA
Tetrachloroethene	5	ND	28	ND	5	NA	NA	NA
Toluene	1,000	ND	380	190	19	NA	310	170
Trichloroethene	5	ND	10	ND	ND	NA	NA	NA
Xylene	10,000	NA	460	150	29	NA	1,400	NA

Key:

µg/L	=	Micrograms per liter.
NPDWR	=	National Primary Drinking Water Regulations.
MCL	=	Maximum contaminant level.
1988	=	Data from 1988 Roy F. Weston site investigation.
12/13/93	=	Data from Harza sample event.
NA	=	Not analyzed.
ND	=	Not detected.
-	=	Value not established.

Source: Black & Veatch Waste Science, Inc., July 14, 1995, Expanded Site Inspection.

Table A-3

ANALYTICAL RESULTS FOR SOIL AND SEDIMENT SAMPLES
PAXTON LANDFILL SITE
CHICAGO, COOK COUNTY, ILLINOIS
DECEMBER 13, 1993

Units - µg/kg

Parameter	U.S. EPA Region 3 RBC, Ingestion	Sample Designation								
		ST01	ST02	ST03	ST04	ST05	ST06	ST07	ST08	ST10
Inorganic Analytes										
Aluminum	1,000,000,000	10,200,000	7,730,000	10,100,000	10,300,000	5,340,000	12,300,000	7,820,000	7,310,000	10,200,000
Antimony	820,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	610,000	9,200	8,100	8,100	6,700	12,600	16,000	28,300	5,300	8,400
Barium	140,000,000	81,500	66,800	61,200	65,100	124,000	51,400	74,500	4,600	64,700
Berylium	1,300	740	600	600	550	960	730	1,000	390	460
Cadmium	1,000,000	1,200	970	1,600	ND	ND	ND	ND	ND	ND
Calcium	-	62,800,000	60,000,000	62,900,000	61,200,000	13,000,000	58,000,000	60,900,000	55,900,000	61,400,000
Chromium	10,000,000	23,100	22,200	23,400	23,500	28,300	21,000	33,100	15,000	22,300
Cobolt	120,000,000	12,000	11,900	9,600	11,800	7,500	11,600	7,200	8,300	11,300
Copper	82,000,000	48,700	39,400	37,500	38,400	130,000	26,200	31,600	24,300	37,600
Cyanide, Total	41,000,000	NA	4,700	7,400	6,600	9,900	1,400	3,200	1,100	4,800
Iron	610,000,000	21,600,000	18,700,000	22,200,000	21,800,000	33,200,000	12,600,000	18,200,000	15,300,000	22,100,000
Lead	400,000	105,000	88,500	92,300	75,500	206,000	31,600	68,400	63,900	73,100
Magnesium	-	31,900,000	29,400,000	31,500,000	29,800,000	4,170,000	28,600,000	26,300,000	30,100,000	31,000,000
Manganese	10,000,000	634,000	714,000	600,000	575,000	238,000	400,000	888,000	371,000	531,000
Mercury	610,000	NA	ND	ND	ND	ND	ND	ND	210	ND
Nickel	41,000,000	31,800	27,600	24,000	29,300	31,100	27,600	19,900	22,000	27,900
Potassium	-	2,870,000	1,990,000	3,100,000	3,170,000	716,000	3,680,000	1,690,000	2,060,000	2,910,000
Selenium	10,000,000	ND	ND	530	1,200	3,200	ND	ND	ND	ND
Silver	10,000,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	-	202,000	171,000	279,000	267,000	291,000	215,000	248,000	257,000	218,000
Thallium	-	560	560	480	650	650	580	630	330	710
Vanadium	14,000,000	24,100	20,200	24,800	27,500	25,700	25,600	20,400	17,700	24,300
Zinc	610,000,000	108,000	102,000	97,300	101,000	484,000	57,500	153,000	69,100	97,900
Volatile Organic Compounds (VOCs)										
Acetone	200,000,000	ND	ND	ND	61	200	ND	31	ND	ND
1,2-Dichloroethene (Total)	20,000,000	ND	ND	ND	ND	ND	ND	ND	ND	11
Tetrachloroethene	110,000	ND	7	ND	12	ND	ND	ND	ND	ND

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Table A-3

ANALYTICAL RESULTS FOR SOIL AND SEDIMENT SAMPLES
PAXTON LANDFILL SITE
CHICAGO, COOK COUNTY, ILLINOIS
DECEMBER 13, 1993

Units - µg/kg

Parameter	U.S. EPA Region 3 RBC, Ingestion	Sample Designation								
		ST01	ST02	ST03	ST04	ST05	ST06	ST07	ST08	ST10
Semivolatile Organic Compounds (SVOCs)										
2-Methylnaphthalene	82,000,000	ND	ND	ND	ND	370	ND	ND	ND	ND
Acenaphthene	120,000,000	190	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthylene	-	ND	ND	ND	ND	390	ND	ND	ND	ND
Anthracene	610,000,000	530	1,100	360	440	400	ND	230	270	280
Benzo(g,h,i)perylene	-	ND	1,500	760	1,000	1,200	ND	700	620	630
Benzo(a)anthracene	7,800	1,700	3,600	1,200	1,500	1,100	ND	780	920	970
Benzo(a)pyrene	780	1,600	3,200	1,100	1,500	1,300	ND	640	930	910
Benzo(b)fluoranthene	7,800	2,200	4,500	1,400	2,000	2,100	ND	980	1,200	1,300
Benzo(k)fluoranthene	78,000	830	2,000	560	620	730	ND	370	320	510
bis(2-ethylhexyl)phthalate	410,000	710	ND	280	480	ND	ND	ND	ND	510
Butylbenyl phthalate	410,000,000	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbozole	290,000	210	ND	ND	ND	ND	ND	ND	ND	ND
Crysene	780,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo(a,h)anthracene	780	1,300	ND	190	270	ND	ND	210	190	ND
Dibenzofuran	8,200,000	ND	ND	ND	ND	370	ND	ND	ND	ND
Fluoranthene	82,000,000	2,200	6,900	2,000	2,300	1,800	260	1,100	1,100	1,400
Fluorene	82,000,000	250	ND	ND	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	7,800	1,600	1,700	840	1,200	1,300	ND	920	830	740
Naphthalene	82,000,000	ND	ND	ND	ND	1,000	ND	230	ND	ND
Phenanthrene	-	2,000	4,400	1,500	1,700	1,300	270	960	960	1,100
Pyrene	61,000,000	4,500	8,500	2,800	3,600	2,500	310	1,800	2,100	2,900
Pesticides/Polychlorinated biphenyls										
4,4'-DDD	24,000	14	11	21	18	31	ND	10	ND	7.6
4,4'-DDE	17,000	8.6	12	10	11	42	ND	6.6	3.7	6.7
4,4'-DDT	17,000	12	39	20	14	62	ND	6.9	5.6	6.9
alpha-Chlordane	4,400	2.3	7.5	2.9	2.8	8	ND	2.1	1.9	2.2
Aroclor-1242	-	47	65	47	64	ND	ND	ND	ND	ND
Aroclor-1254	1,000	50	70	91	61	94	ND	49	ND	73
Aroclor-1260	-	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Table A-3

ANALYTICAL RESULTS FOR SOIL AND SEDIMENT SAMPLES
PAXTON LANDFILL SITE
CHICAGO, COOK COUNTY, ILLINOIS
DECEMBER 13, 1993

Units - µg/kg

Parameter	U.S. EPA Region 3 RBC, Ingestion	Sample Designation								
		ST01	ST02	ST03	ST04	ST05	ST06	ST07	ST08	ST10
delta-BHC	4,400	ND	ND	ND	ND	6.5	ND	ND	ND	ND
Dieldrin	360	ND	ND	3.2	ND	ND	ND	ND	ND	3.1
Endrin ketone	-	16	ND	10	8	20	ND	ND	11	7
gamma-Chlordane	4,400	ND	5.5	4.3	1.9	3.3	ND	ND	2.4	4
Methoxychlor	10,000,000	53	40	20	27	54	ND	6.9	29	15

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Table A-3

ANALYTICAL RESULTS FOR SOIL AND SEDIMENT SAMPLES
PAXTON LANDFILL SITE
CHICAGO, COOK COUNTY, ILLINOIS
DECEMBER 13, 1993

Units - µg/kg

Parameter	U.S. EPA Region 3 RBC, Ingestion	Sample Designation			
		SS01	SS02	SS04	SS05
Inorganic Analytes					
Aluminum	1,000,000,000	9,170,000	8,360,000	10,200,000	10,300,000
Antimony	820,000	ND	ND	ND	ND
Arsenic	610,000	9,400	5,500	6,800	6,700
Barium	140,000,000	69,500	71,400	66,000	125,000
Berylium	1,300	340	390	880	530
Cadmium	1,000,000	ND	ND	ND	910
Calcium	-	88,800,000	116,000,000	48,900,000	158,000,000
Chromium	10,000,000	1,140,000	786,000	26,520	696,000
Cobolt	120,000,000	14,900	9,800	12,400	7,800
Copper	82,000,000	191,000	84,500	40,500	50,200
Cyanide, Total	41,000,000	1,900	830	ND	15,800
Iron	610,000,000	128,000,000	90,900,000	22,800,000	57,300,000
Lead	400,000	801,000	162,000	81,000	268,000
Magnesium	-	42,800,000	25,500,000	23,300,000	15,300,000
Manganese	10,000,000	10,200,000	14,800,000	715,000	26,900,000
Mercury	610,000	ND	150	ND	ND
Nickel	41,000,000	138,000	36,000	27,500	19,600
Potassium	-	392,000	826,000	2,520,000	1,310,000
Selenium	10,000,000	ND	ND	440	ND
Silver	10,000,000	390	ND	ND	ND
Sodium	-	261,000	652,000	613,000	739,000
Thallium	-	ND	2,000	ND	5,800
Vanadium	14,000,000	156,000	222,000	21,600	187,000
Zinc	610,000,000	123,000	114,000	107,000	473,000
Volatile Organic Compounds (VOCs)					
Acetone	200,000,000	NA	NA	NA	NA
1,2-Dichloroethene (Total)	20,000,000	NA	NA	NA	NA
Tetrachloroethene	110,000	NA	NA	NA	NA

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Table A-3

ANALYTICAL RESULTS FOR SOIL AND SEDIMENT SAMPLES
PAXTON LANDFILL SITE
CHICAGO, COOK COUNTY, ILLINOIS
DECEMBER 13, 1993

Units - µg/kg

Parameter	U.S. EPA Region 3 RBC, Ingestion	Sample Designation			
		SS01	SS02	SS04	SS05
Semivolatile Organic Compounds (SVOCs)					
2-Methylnaphthalene	82,000,000	160	97	68	83
Acenaphthene	120,000,000	200	49	35	74
Acenaphthylene	-	68	28	ND	57
Anthracene	610,000,000	410	120	37	130
Benzo(g,h,i)perylene	-	850	480	180	1,200
Benzo(a)anthracene	7,800	2,200	720	390	780
Benzo(a)pyrene	780	1,500	490	220	590
Benzo(b)fluoranthene	7,800	3,800	1,500	750	1,500
Benzo(k)fluoranthene	78,000	NA	NA	NA	NA
bis(2-ethylhexyl)phthalate	410,000	NA	NA	NA	NA
Butylbenyl phthalate	410,000,000	ND	120	ND	ND
Carbozole	290,000	200	ND	ND	98
Crysene	780,000	1,700	600	290	740
Dibenzo(a,h)anthracene	780	250	220	ND	320
Dibenzofuran	8,200,000	240	91	50	63
Fluoranthene	82,000,000	3,100	940	550	1,200
Fluorene	82,000,000	170	52	ND	71
Indeno(1,2,3-cd)pyrene	7,800	890	180	61	970
Naphthalene	82,000,000	ND	110	45	130
Phenanthrene	-	1,900	690	380	770
Pyrene	61,000,000	3,400	1,000	550	2,100
Pesticides/Polychlorinated biphenyls					
4,4'-DDD	24,000	ND	ND	ND	ND
4,4'-DDE	17,000	ND	ND	ND	ND
4,4'-DDT	17,000	ND	ND	ND	ND
alpha-Chlordane	4,400	ND	ND	ND	ND
Aroclor-1242	-	ND	ND	ND	ND
Aroclor-1254	1,000	ND	ND	ND	ND
Aroclor-1260	-	ND	65	ND	ND

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Table A-3

ANALYTICAL RESULTS FOR SOIL AND SEDIMENT SAMPLES
PAXTON LANDFILL SITE
CHICAGO, COOK COUNTY, ILLINOIS
DECEMBER 13, 1993

Units - µg/kg

Parameter	U.S. EPA Region 3 RBC, Ingestion	Sample Designation			
		SS01	SS02	SS04	SS05
delta-BHC	4,400	ND	ND	ND	ND
Dieldrin	360	ND	ND	ND	ND
Endrin ketone	-	ND	ND	ND	ND
gamma-Chlordane	4,400	ND	ND	ND	ND
Methoxychlor	10,000,000	ND	ND	ND	ND

Key:

µg/kg	=	Micrograms per kilogram.
U.S. EPA	=	United States Environmental Protection Agency.
RBC, Ingestion	=	Risk-based concentration for soil ingestion, industrial limit.
-	=	Value not established.
NA	=	Not analyzed.
ND	=	Not detected.

Notes:

1. ST05 is background sediment sample.
2. SS05 is background soil sample.

Source: Black & Veatch Waste Science, Inc., July 14, 1995, Expanded Site Inspection.

Appendix B

Maximum Historical Groundwater Analytical Results

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Table B-1

MAXIMUM HISTORICAL GROUNDWATER DATA
PAXTON LANDFILL SITE
CHICAGO, COOK COUNTY, ILLINOIS

Units - µg/L

Parameter	NPDWR MCL	August 21, 1985		February 26, 1987		1988		December 13, 1993	
		Sample Point	Concentration	Sample Point	Concentration	Sample Point	Concentration	Sample Point	Concentration
Inorganic Analytes									
Antimony	6	NA	NA	NA	NA	NA	NA	G16S	32
Arsenic	50	NA	NA	NA	NA	NA	NA	R105	5.8
Barium	2,000	NA	NA	NA	NA	G11B	1,060	NA	NA
Boron	-	NA	NA	NA	NA	G124	8,800	NA	NA
Cadmium	5	NA	NA	NA	NA	G13D	19.5	NA	NA
Chromium	100	NA	NA	NA	NA	G11B	110	G16S	38
Copper	1,300	NA	NA	NA	NA	G17S	85.5	G20S	75
Iron	-	NA	NA	NA	NA	NA	NA	G16S	2,600
Lead	15	NA	NA	NA	NA	G11S	158	G13S	9.6
Magnesium	-	NA	NA	NA	NA	G13D	277,000	G16S	421,000
Manganese	-	NA	NA	NA	NA	G17S	2,160	NA	NA
Mercury	2	NA	NA	NA	NA	G13S	1.6	NA	NA
Nickel	-	NA	NA	NA	NA	G17S	314	G20S	790
Potassium	-	NA	NA	NA	NA	NA	NA	G16S	456,000
Sodium	-	NA	NA	NA	NA	NA	NA	G16S	2,590,000
Thallium	2	NA	NA	NA	NA	NA	NA	G16S	9.8
Vanadium	-	NA	NA	NA	NA	G17S	134	G16S	29
Zinc	-	NA	NA	NA	NA	G17S	428	NA	NA
Organic Compounds									
1,1,1-Trichloroethane	200	NA	NA	NA	NA	G17S	44	NA	NA
1,1-Dichloroethane		G12S	230	NA	NA	NA	NA	NA	NA
1,2-Dichloroethylene	100	G15S	2,500	NA	NA	NA	NA	NA	NA
1,2-Diethoxyethane	-	G16S	120	NA	NA	NA	NA	NA	NA
1,3,6-Trioxocane	-	G18S	380	G18S	120	NA	NA	NA	NA
1,3,9-Trioxocane	-	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dioxolane	-	G18S	140	G18S	30	NA	NA	NA	NA
2,4-Dimethylphenol	-	NA	NA	NA	NA	G13S	970	G13S	640

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Table B-1

MAXIMUM HISTORICAL GROUNDWATER DATA
PAXTON LANDFILL SITE
CHICAGO, COOK COUNTY, ILLINOIS

Units - µg/L

Parameter	NPDWR MCL	August 21, 1985		February 26, 1987		1988		December 13, 1993	
		Sample Point	Concentration	Sample Point	Concentration	Sample Point	Concentration	Sample Point	Concentration
2-Butanone	-	NA	NA	NA	NA	G13B	10	NA	NA
2-Ethyl-4-methyl-1,3-dioxolone	-	G18S	420	NA	NA	NA	NA	NA	NA
2-Methyl-2-propanol	-	NA	NA	G13D	20	NA	NA	NA	NA
2-Methylnaphthalene	-	NA	NA	NA	NA	G13S	260	G13S	590
2-Methylphenol	-	NA	NA	NA	NA	G13S	1,400	G13S	290
3-Methyl-2-butanone	-	G18S	630	NA	NA	NA	NA	NA	NA
4,4'-DDE	-	NA	NA	NA	NA	NA	NA	G24S	0.07
4-Methyl-1,3-dioxolane	-	G124	90	NA	NA	NA	NA	NA	NA
4-Methylphenol	-	NA	NA	NA	NA	G13S	980	G13S	340
Acenaphthalene	-	NA	NA	NA	NA	NA	NA	G13S	130
Acenaphthene	-	NA	NA	NA	NA	NA	NA	G13S	16
Acenaphthylene	-	NA	NA	NA	NA	G13S	250	NA	NA
Acetone	-	G15S	96,000	G15S	140	NA	NA	NA	NA
Acetonitrile	-	NA	NA	G15S	40	NA	NA	NA	NA
Aliphatic acid esters	-	NA	NA	R105	15	NA	NA	NA	NA
Aliphatic acids	-	G15S	23,000	NA	NA	NA	NA	NA	NA
Aliphatic alcohols	-	G12S	16,000	G18S	30	NA	NA	NA	NA
Aliphatic hydrocarbons	-	G12S	59,000	G18S	800	NA	NA	NA	NA
Anthracene	-	NA	NA	NA	NA	NA	NA	G13S	39
Benzene	5	G12S	150	R11D	60	G13S	340	G13S	240
Benzo(a)anthracene	-	NA	NA	NA	NA	NA	NA	G13S	16
Benzo(a)pyrene	0.2	NA	NA	NA	NA	NA	NA	G13S	10
Benzo(k)flouranthene	-	NA	NA	NA	NA	NA	NA	G13S	10
bis(2-Ethylhexyl)phthalate	-	NA	NA	NA	NA	NA	NA	G24S	37
C-3 substituted benzene	-	G12S	50	NA	NA	NA	NA	NA	NA
C-4 substituted benzene	-	G12S	30	NA	NA	NA	NA	NA	NA
Chlorobenzene	100	G12S	150	NA	NA	NA	NA	G24S	100
Chrysene	-	NA	NA	NA	NA	NA	NA	G13S	17

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Table B-1

MAXIMUM HISTORICAL GROUNDWATER DATA
PAXTON LANDFILL SITE
CHICAGO, COOK COUNTY, ILLINOIS

Units - µg/L

Parameter	NPDWR MCL	August 21, 1985		February 26, 1987		1988		December 13, 1993	
		Sample Point	Concentration	Sample Point	Concentration	Sample Point	Concentration	Sample Point	Concentration
Cyclohexanne	-	NA	NA	G15S	530	NA	NA	NA	NA
Dibenzofuran	-	NA	NA	NA	NA	NA	NA	G13S	71
Dieldrin	-	NA	NA	NA	NA	NA	NA	G24S	0.07
Dimethoxymethane	-	G18S	500	G18S	100	NA	NA	NA	NA
Ethyl ether	-	G124	70	NA	NA	NA	NA	NA	NA
Ethylbenzene	700	NA	NA	NA	NA	NA	NA	G24S	68
Flouranthene	-	NA	NA	NA	NA	NA	NA	G13S	61
Flourene	-	NA	NA	NA	NA	G13S	130	G13S	61
Isophorone	-	G15S	360	NA	NA	NA	NA	NA	NA
Isopropyl ether	-	G124	960	NA	NA	NA	NA	NA	NA
Methoxy aliphatic acid esters	-	G12S	67,000	NA	NA	NA	NA	NA	NA
Methoxymethylethoxy methylethoxy propanol	-	NA	NA	G15S	26,000	NA	NA	NA	NA
Methyl cyclopentanol	-	NA	NA	G15S	350	NA	NA	NA	NA
Methyl dioxolane	-	NA	NA	G124	20	NA	NA	NA	NA
Methyl pentanediol	-	NA	NA	G15S	250	NA	NA	NA	NA
Methyl phenols	-	G15S	4,800	NA	NA	NA	NA	NA	NA
Methylene chloride	-	G12S	2,300	NA	NA	NA	NA	NA	NA
Methylethoxy propanol	-	G18S	7,500	NA	NA	NA	NA	NA	NA
Methylethoxymethoxy propanol	-	G18S	750	G15S	1,400	NA	NA	NA	NA
Naphthalene	-	G17S	7	G13D	30	G13S	6,000	G13S	7,000
Other organic compounds	-	G15S	59,000	G18S	6,600	NA	NA	NA	NA
Oxepane	-	G18S	110	NA	NA	NA	NA	NA	NA
Phenanthrene	-	NA	NA	G13D	30	G13S	170	G13S	150
Phenol	-	G15S	1,600	NA	NA	G13S	740	G13S	180
Propyl ester	-	NA	NA	G124	240	NA	NA	NA	NA
Pyrene	-	NA	NA	NA	NA	NA	NA	G13S	43

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Table B-1

MAXIMUM HISTORICAL GROUNDWATER DATA
PAXTON LANDFILL SITE
CHICAGO, COOK COUNTY, ILLINOIS

Units - µg/L

Parameter	NPDWR MCL	August 21, 1985		February 26, 1987		1988		December 13, 1993	
		Sample Point	Concentration	Sample Point	Concentration	Sample Point	Concentration	Sample Point	Concentration
Styrene	100	NA	NA	NA	NA	G13S	92	G13S	66
Tetrachloroethylene	5	G12S	30	NA	NA	NA	NA	NA	NA
Tetrahydofuran	-	G15S	9,600	G18S	6,600	NA	NA	NA	NA
Tetrahydro-2-methyl-2-furanol	-	G18S	450	NA	NA	NA	NA	NA	NA
Toluene	1,000	G12S	4,300	G15S	300	G13S	310	G13S	220
Trichloroethylene	5	G12S	200	NA	NA	NA	NA	NA	NA
Xylene	10,000	G12S	270	NA	NA	G13S	340	G13S	280

Key:

µg/L	=	Micrograms per liter.
NPDWR	=	National Primary Drinking Water Regulations.
MCL	=	Maximum contaminant level.
1988	=	Data from 1988 Weston site investigation.
-	=	Value not established.
NA	=	Not analyzed.

Sources:

Illinois Environmental Protection Agency, May 11, 1986, Memorandum to Division File, 0316000033.
Illinois Environmental Protection Agency, May 5, 1987, Memorandum to Division File, 031600003.
Black & Veatch Waste Science, Inc., July 14, 1995, Expanded Site Inspection.

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Appendix C

Leachate Analytical Results From Patrick Engineering, Inc.

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Table C-1

LEACHATE DATA
PAXTON LANDFILL SITE
CHICAGO, COOK, COUNTY, ILLINOIS

Units - µg/L

Parameter	NPDWR MCL	Sample Designation (sample date)									
		MH-1 (4/98)	MH-2 (4/98)	MH-3 (4/98)	MH-4 (4/98)	MH-5 (4/98)	MH-6 (4/98)	MH-7 (4/98)	MH-8 (4/98)	MH-9 (4/98)	MH-10 (4/98)
Inorganic Analytes											
Antimony	6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	2,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Biological oxygen demand (BOD), 5-day	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Boron	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloride	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cobolt	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chemical oxygen demand (COD)	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	1,300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyanide	200	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Magnesium	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Oil and Grease	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Potassium	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sodium	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total suspended solids	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Table C-1

LEACHATE DATA
PAXTON LANDFILL SITE
CHICAGO, COOK, COUNTY, ILLINOIS

Units - µg/L

Parameter	NPDWR MCL	Sample Designation (sample date)									
		MH-1 (4/98)	MH-2 (4/98)	MH-3 (4/98)	MH-4 (4/98)	MH-5 (4/98)	MH-6 (4/98)	MH-7 (4/98)	MH-8 (4/98)	MH-9 (4/98)	MH-10 (4/98)
Volatile Organic Compounds (VOCs)											
1,1-Dichloroethane	-	ND	ND	22	ND	ND	4.8	4.4	35	ND	ND
1,2-Dichloropropane	5	ND	ND	ND	ND	ND	ND	ND	8.1	ND	ND
1,4-Dichlorobenzene	75	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dioxane	-	NA	NA	NA	NA	NA	NA	14	NA	NA	NA
2-Butanone	-	ND	7.9	ND	ND	ND	ND	ND	ND	ND	ND
2-Hexanone	-	13	ND	ND	ND	ND	ND	ND	ND	11	ND
4-Methyl-2-Pentanone	-	18	ND	39	ND	6.1	6.6	ND	7.6	ND	ND
4-Nitrophenol	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	-	61	40	100	ND	52	54	110	ND	53	40
Acrolein	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acrylonitrile	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aliphatic ketone	-	NA	NA	76	24	56	24	NA	32	38	32
Benzene	5	4.1	4.4	100	ND	75	7.7	ND	ND	ND	ND
bis(2-ethylhexyl)phthalate	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	-	ND	ND	ND	100	29	24	ND	84	26	ND
cis-1,2-Dichloroethylene	70	ND	ND	ND	ND	ND	ND	ND	18	ND	ND
Diethyl sulfide	-	NA	NA	NA	NA	NA	NA	NA	19	NA	NA
Diisopropyl ether	-	NA	NA	NA	NA	NA	NA	NA	13	48	27
Dimethylphthalate	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethyl ether	-	NA	5.5	NA	8.4	NA	65	120	360	16	19
Ethylbenzene	700	21	7.4	ND	ND	64	ND	ND	ND	ND	ND
Isophorone	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	-	ND	ND	ND	ND	ND	ND	ND	21	ND	ND
Naphthalene	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Other VOCs	-	59	70	NA	130	NA	24	180	110	50	87
Oxepene	-	NA	NA	NA	7.6	NA	NA	NA	NA	NA	NA
Phenol	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrahydro-2h-pyran	-	NA	160	250	230	100	15	NA	NA	88	78

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Table C-1

LEACHATE DATA
PAXTON LANDFILL SITE
CHICAGO, COOK, COUNTY, ILLINOIS

Units - µg/L

Parameter	NPDWR MCL	Sample Designation (sample date)									
		MH-1 (4/98)	MH-2 (4/98)	MH-3 (4/98)	MH-4 (4/98)	MH-5 (4/98)	MH-6 (4/98)	MH-7 (4/98)	MH-8 (4/98)	MH-9 (4/98)	MH-10 (4/98)
Tetrahydro-2-methyl-2h-pyran	-	NA	NA	65	NA	NA	NA	NA	NA	18	NA
Tetrahydro-2-methylfuran	-	NA	210	170	140	52	NA	14	25	33	30
Tetrahydrofuran	-	140	210	270	220	320	140	190	140	82	77
Tetramethylfuran	-	NA	NA	NA	NA	23	NA	NA	NA	NA	NA
Thiophene	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	1,000	26	ND	620	ND	39	ND	ND	ND	ND	ND
Trichloroethene	-	ND	ND	ND	ND	ND	ND	ND	5.9	ND	ND
Trichlorofluoromethane	-	ND	ND	ND	ND	ND	ND	8.7	ND	ND	ND
Vinyl chloride	2	ND	ND	ND	ND	ND	ND	ND	11	ND	ND
Xylene	10,000	55	4.8	1,100	ND	300	40	440	30	590	97
Semivolatile Organic Compounds (SVOCs) and Pesticides/PCBs											
2(3h)-benzothaimine	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methylphenol	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Alachlor	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aliphatic acids	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Alpha-BHC	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Atrazine	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bisphenol A	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Captan	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor	0.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Matrabuzin	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methoxychlor	40	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
P,P'-DDD	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
P,P'-DDE	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total PCBs	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toxicity Characteristic Leaching Procedure (TCLP) Compounds											
Metals											
Arsenic	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Table C-1

LEACHATE DATA
PAXTON LANDFILL SITE
CHICAGO, COOK, COUNTY, ILLINOIS

Units - µg/L

Parameter	NPDWR MCL	Sample Designation (sample date)									
		MH-1 (4/98)	MH-2 (4/98)	MH-3 (4/98)	MH-4 (4/98)	MH-5 (4/98)	MH-6 (4/98)	MH-7 (4/98)	MH-8 (4/98)	MH-9 (4/98)	MH-10 (4/98)
Barium	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
VOCs											
2-Butanone	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3- and 4-Methylphenol	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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Table C-1

LEACHATE DATA
PAXTON LANDFILL SITE
CHICAGO, COOK, COUNTY, ILLINOIS

Units - µg/L

Parameter	NPDWR MCL	Sample Designation (sample date)									
		MH-11 (4/98)	MH-12 (4/98)	MH-12 (1/99)	MH-13 (4/98)	MH-14 (4/98)	MH-15 (4/98)	MH-15 (1/99)	MH-16 (4/98)	MH-17 (4/98)	MH-18 (4/98)
Inorganic Analytes											
Antimony	6	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA
Arsenic	50	NA	NA	31	NA	NA	NA	32	NA	NA	NA
Barium	2,000	NA	NA	2,290	NA	NA	NA	680	NA	NA	NA
Beryllium	4	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA
Biological oxygen demand (BOD), 5-day	-	NA	NA	1,700,000	NA	NA	NA	190,000	NA	NA	NA
Boron	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	5	NA	NA	ND	NA	NA	NA	15	NA	NA	NA
Chloride	-	NA	NA	50,000,000	NA	NA	NA	16,000,000	NA	NA	NA
Chromium	100	NA	NA	295	NA	NA	NA	1,040	NA	NA	NA
Cobolt	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chemical oxygen demand (COD)	-	NA	NA	10,900,000	NA	NA	NA	8,710,000	NA	NA	NA
Copper	1,300	NA	NA	57	NA	NA	NA	1,120	NA	NA	NA
Cyanide	200	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA
Lead	15	NA	NA	21	NA	NA	NA	72	NA	NA	NA
Magnesium	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	2	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA
Nickel	-	NA	NA	246	NA	NA	NA	254	NA	NA	NA
Oil and Grease	-	NA	NA	ND	NA	NA	NA	681,000	NA	NA	NA
Potassium	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	50	NA	NA	17	NA	NA	NA	ND	NA	NA	NA
Silver	-	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA
Sodium	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	-	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA
Total suspended solids	-	NA	NA	21,000	NA	NA	NA	128,000	NA	NA	NA
Vanadium	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	-	NA	NA	190	NA	NA	NA	246	NA	NA	NA

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Table C-1

LEACHATE DATA
PAXTON LANDFILL SITE
CHICAGO, COOK, COUNTY, ILLINOIS

Units - µg/L

Parameter	NPDWR MCL	Sample Designation (sample date)									
		MH-11 (4/98)	MH-12 (4/98)	MH-12 (1/99)	MH-13 (4/98)	MH-14 (4/98)	MH-15 (4/98)	MH-15 (1/99)	MH-16 (4/98)	MH-17 (4/98)	MH-18 (4/98)
Volatile Organic Compounds (VOCs)											
1,1-Dichloroethane	-	ND	ND	ND	ND	ND	4.6	ND	4	ND	19
1,2-Dichloropropane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	75	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA
1,4-Dioxane	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone	-	460	1,300	NA	ND	ND	ND	NA	ND	ND	ND
2-Hexanone	-	ND	ND	NA	15	12	13	NA	8.7	ND	8.6
4-Methyl-2-Pentanone	-	160	86	NA	ND	7.3	ND	NA	9.3	ND	23
4-Nitrophenol	-	NA	NA	125	NA	NA	NA	ND	NA	NA	NA
Acetone	-	1,200	2,000	NA	ND	120	43	NA	48	ND	ND
Acrolein	-	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA
Acrylonitrile	-	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA
Aliphatic ketone	-	48	32	NA	11	31	78	NA	39	51	54
Benzene	5	ND	12	76	460	18	6.3	13.7	32	140	150
bis(2-ethylhexyl)phthalate	-	NA	NA	ND	NA	NA	NA	147,000	NA	NA	NA
Chlorobenzene	100	ND	ND	ND	11	5.6	ND	ND	ND	ND	ND
Chloroethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	44
cis-1,2-Dichloroethylene	70	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Diethyl sulfide	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diisopropyl ether	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethylphthalate	-	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA
Ethyl ether	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	700	ND	40	34	190	190	ND	14.2	ND	ND	ND
Isophorone	-	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA
Methylene chloride	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Naphthalene	-	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA
Other VOCs	-	99	71	NA	30	39	33	NA	NA	NA	NA
Oxepene	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	-	NA	NA	1,650	NA	NA	NA	790	NA	NA	NA
Tetrahydro-2h-pyran	-	NA	NA	NA	NA	37	41	NA	21	140	110

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Table C-1

LEACHATE DATA
PAXTON LANDFILL SITE
CHICAGO, COOK, COUNTY, ILLINOIS

Units - µg/L

Parameter	NPDWR MCL	Sample Designation (sample date)									
		MH-11 (4/98)	MH-12 (4/98)	MH-12 (1/99)	MH-13 (4/98)	MH-14 (4/98)	MH-15 (4/98)	MH-15 (1/99)	MH-16 (4/98)	MH-17 (4/98)	MH-18 (4/98)
Tetrahydro-2-methyl-2h-pyran	-	NA	NA	NA	NA	NA	NA	NA	NA	22	NA
Tetrahydro-2-methylfuran	-	NA	NA	NA	NA	17	18	NA	NA	75	53
Tetrahydrofuran	-	20	NA	ND	22	27	NA	ND	78	170	140
Tetramethylfuran	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thiophene	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	1,000	ND	8.5	43.6	27	4	180	7.7	ND	80	210
Trichloroethene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	-	ND	ND	NA	NA	NA	NA	NA	ND	ND	ND
Vinyl chloride	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Xylene	10,000	ND	ND	NA	NA	NA	NA	NA	500	1,200	ND
Semivolatile Organic Compounds (SVOCs) and Pesticides/PCBs											
2(3h)-benzothaimine	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	-	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA
4-Methylphenol	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Alachlor	2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aliphatic acids	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Alpha-BHC	-	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA
Atrazine	3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bisphenol A	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Captan	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor	0.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Matrabuzin	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methoxychlor	40	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
P,P'-DDD	-	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA
P,P'-DDE	-	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA
Phenol	-	NA	NA	865	NA	NA	NA	ND	NA	NA	NA
Total PCBs	0.5	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA
Toxicity Characteristic Leaching Procedure (TCLP) Compounds											
Metals											
Arsenic	-	NA	NA	29	NA	NA	NA	21	NA	NA	NA

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Table C-1

LEACHATE DATA
PAXTON LANDFILL SITE
CHICAGO, COOK, COUNTY, ILLINOIS

Units - µg/L

Parameter	NPDWR MCL	Sample Designation (sample date)									
		MH-11 (4/98)	MH-12 (4/98)	MH-12 (1/99)	MH-13 (4/98)	MH-14 (4/98)	MH-15 (4/98)	MH-15 (1/99)	MH-16 (4/98)	MH-17 (4/98)	MH-18 (4/98)
Barium	-	NA	NA	2,100	NA	NA	NA	ND	NA	NA	NA
Cadmium	-	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA
Chromium	-	NA	NA	289	NA	NA	NA	449	NA	NA	NA
Lead	-	NA	NA	12	NA	NA	NA	ND	NA	NA	NA
Selenium	-	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA
VOCs											
2-Butanone	-	NA	NA	1750	NA	NA	NA	ND	NA	NA	NA
2-Methylphenol	-	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA
3- and 4-Methylphenol	-	NA	NA	ND	NA	NA	NA	ND	NA	NA	NA

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Table C-1

LEACHATE DATA
PAXTON LANDFILL SITE
CHICAGO, COOK, COUNTY, ILLINOIS

Units - µg/L

Parameter	NPDWR MCL	Sample Designation (sample date)									
		TC-1 (4/98)	MC-1 (4/98)	LC-1 (1/99)	LC-2 (1/99)	LC-3 (1/99)	LC-4 (1/99)	P-1 (1/99)	P-4 (1/99)	P-7 (1/99)	MH-15FP (1/99)
Inorganic Analytes											
Antimony	6	NA	NA	56	ND	ND	ND	ND	95	126	NA
Arsenic	50	NA	NA	153	26	34	22	61	576	186	NA
Barium	2,000	NA	NA	1,570	1,020	674	1,070	1,090	2,370	5,440	NA
Beryllium	4	NA	NA	7	ND	ND	ND	ND	ND	18	NA
Biological oxygen demand (BOD), 5-day	-	NA	NA	10,900,000	309,000	180,000	309,000	778,000	10,300,000	568,000	189,000
Boron	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	5	NA	NA	35	ND	ND	ND	6	16	87	NA
Chloride	-	NA	NA	7,500,000	12,500,000	11,000,000	12,500,000	7,500,000	11,000,000	8,500,000	NA
Chromium	100	NA	NA	768	307	588	249	1,550	1,280	1,770	NA
Cobolt	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chemical oxygen demand (COD)	-	NA	NA	20,400,000	3,140,000	3,530,000	3,110,000	7,630,000	19,100,000	7,460,000	13,500,000
Copper	1,300	NA	NA	222	55	47	66	169	360	1,810	NA
Cyanide	200	NA	NA	ND	ND	ND	ND	ND	ND	140	NA
Lead	15	NA	NA	700	28	ND	23	578	661	4,460	NA
Magnesium	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	2	NA	NA	ND	ND	ND	ND	ND	20	ND	NA
Nickel	-	NA	NA	343	246	311	226	469	370	2,280	NA
Oil and Grease	-	NA	NA	5,000	ND	ND	2,000	2,000	2,000	3,000	0.18
Potassium	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	50	NA	NA	ND	ND	18	ND	19	ND	ND	NA
Silver	-	NA	NA	ND	ND	ND	ND	ND	ND	32	NA
Sodium	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	-	NA	NA	86,000	ND	ND	ND	ND	1,230,000	ND	NA
Total suspended solids	-	NA	NA	3,540,000	209,000	27,000	100,000	346,000	2,400,000	9,300,000	4,360,000
Vanadium	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	-	NA	NA	4,930	124	176	114	861	2,100	4,800	NA

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Table C-1

LEACHATE DATA
PAXTON LANDFILL SITE
CHICAGO, COOK, COUNTY, ILLINOIS

Units - µg/L

Parameter	NPDWR MCL	Sample Designation (sample date)									
		TC-1 (4/98)	MC-1 (4/98)	LC-1 (1/99)	LC-2 (1/99)	LC-3 (1/99)	LC-4 (1/99)	P-1 (1/99)	P-4 (1/99)	P-7 (1/99)	MH-15FP (1/99)
Volatile Organic Compounds (VOCs)											
1,1-Dichloroethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
1,2-Dichloropropane	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
1,4-Dichlorobenzene	75	NA	NA	ND	ND	ND	ND	73	ND	ND	NA
1,4-Dioxane	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone	-	360	150	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	-	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-Pentanone	-	27	14	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	-	NA	NA	ND	ND	ND	ND	ND	ND	ND	NA
Acetone	-	530	380	NA	NA	NA	NA	NA	NA	NA	NA
Acrolein	-	NA	NA	ND	ND	ND	ND	ND	ND	ND	NA
Acrylonitrile	-	NA	NA	ND	ND	ND	ND	ND	ND	ND	NA
Aliphatic ketone	-	42	39	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	5	22	9.2	ND	20.3	105	5.8	ND	ND	36.3	NA
bis(2-ethylhexyl)phthalate	-	NA	NA	ND	ND	ND	ND	617	ND	ND	NA
Chlorobenzene	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
Chloroethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
cis-1,2-Dichloroethylene	70	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
Diethyl sulfide	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Diisopropyl ether	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethylphthalate	-	NA	NA	ND	ND	ND	ND	ND	ND	614	NA
Ethyl ether	-	NA	85	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	700	ND	ND	15.3	9.4	185	ND	27.4	9.5	285	NA
Isophorone	-	NA	NA	ND	ND	ND	ND	ND	ND	66	NA
Methylene chloride	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
Naphthalene	-	NA	NA	ND	ND	ND	ND	76	ND	301	NA
Other VOCs	-	55	62	NA	NA	NA	NA	NA	NA	NA	NA
Oxepene	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	-	46	ND	17,000	450	560	260	380	67,000	1,350	NA
Tetrahydro-2h-pyran	-	84	89	NA	NA	NA	NA	NA	NA	NA	NA

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Table C-1

LEACHATE DATA
PAXTON LANDFILL SITE
CHICAGO, COOK, COUNTY, ILLINOIS

Units - µg/L

Parameter	NPDWR MCL	Sample Designation (sample date)									
		TC-1 (4/98)	MC-1 (4/98)	LC-1 (1/99)	LC-2 (1/99)	LC-3 (1/99)	LC-4 (1/99)	P-1 (1/99)	P-4 (1/99)	P-7 (1/99)	MH-15FP (1/99)
Tetrahydro-2-methyl-2h-pyran	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrahydro-2-methylfuran	-	49	51	NA	NA	NA	NA	NA	NA	NA	NA
Tetrahydrofuran	-	150	160	ND	ND	ND	ND	ND	ND	ND	NA
Tetramethylfuran	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thiophene	-	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	1,000	140	16	87.4	52.4	374	ND	75.6	116	2,140	NA
Trichloroethene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
Trichlorofluoromethane	-	ND	ND	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	2	ND	ND	ND	ND	ND	ND	ND	ND	42	NA
Xylene	10,000	160	210	NA	NA	NA	NA	NA	NA	NA	NA
Semivolatile Organic Compounds (SVOCs) and Pesticides/PCBs											
2(3h)-benzothaimine	-	87	82	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	-	41	66	ND	ND	ND	ND	140	ND	ND	NA
4-Methylphenol	-	54	ND	NA	NA	NA	NA	NA	NA	NA	NA
Alachlor	2	0.07	0.05	NA	NA	NA	NA	NA	NA	NA	NA
Aliphatic acids	-	620	250	NA	NA	NA	NA	NA	NA	NA	NA
Alpha-BHC	-	0.02	0.03	ND	ND	ND	ND	ND	ND	ND	NA
Atrazine	3	4.3	6.2	NA	NA	NA	NA	NA	NA	NA	NA
Bisphenol A	-	600	670	NA	NA	NA	NA	NA	NA	NA	NA
Captan	-	0.24	0.18	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor	0.4	0.13	0.16	ND	ND	ND	ND	ND	ND	ND	ND
Matrabuzin	-	0.17	0.16	NA	NA	NA	NA	NA	NA	NA	NA
Methoxychlor	40	ND	0.15	NA	NA	NA	NA	NA	NA	NA	NA
P,P'-DDD	-	0.02	0.02	ND	ND	ND	ND	ND	ND	ND	NA
P,P'-DDE	-	0.04	ND	ND	ND	ND	ND	ND	ND	ND	NA
Phenol	-	46	ND	8,780	ND	ND	ND	ND	21,600	148	NA
Total PCBs	0.5	0.54	0.51	ND	ND	ND	ND	ND	ND	ND	NA
Toxicity Characteristic Leaching Procedure (TCLP) Compounds											
Metals											
Arsenic	-	NA	NA	97	16	20	16	50	492	40	13

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Table C-1

LEACHATE DATA
PAXTON LANDFILL SITE
CHICAGO, COOK, COUNTY, ILLINOIS

Units - µg/L

Parameter	NPDWR MCL	Sample Designation (sample date)									
		TC-1 (4/98)	MC-1 (4/98)	LC-1 (1/99)	LC-2 (1/99)	LC-3 (1/99)	LC-4 (1/99)	P-1 (1/99)	P-4 (1/99)	P-7 (1/99)	MH-15FP (1/99)
Barium'	-	NA	NA	ND	ND	ND	ND	ND	1,200	1,500	ND
Cadmium	-	NA	NA	7	ND	ND	ND	8	ND	ND	ND
Chromium	-	NA	NA	441	253	512	207	1,040	747	454	295
Lead	-	NA	NA	32	ND	ND	12	125	ND	26	ND
Selenium	-	NA	NA	ND	ND	ND	ND	16	25	13	ND
VOCs											
2-Butanone	-	NA	NA	1,080	ND	ND	ND	ND	7,230	ND	ND
2-Methylphenol	-	NA	NA	ND	ND	ND	ND	ND	ND	330	ND
3- and 4-Methylphenol	-	NA	NA	3,700	ND	ND	ND	150	17,700	490	ND

Key:

µg/L = Micrograms per liter.
NPDWR = National Primary Drinking Water Regulations.
MCL = Maximum contaminant level.
NA = Not analyzed.
ND = Not detected.
- = Value not established.
P,P' = 4,4'.
PCBs = Polychlorinated biphenyls.

Notes:

1. Sample designations MH are leachate manholes.
2. Sample designations P are leachate piezometers.
3. Sample designations LC, TC and MC are composite samples.
4. Sample designation MH-15-FP is a sample of the free product floating on leachate from the manhole.

Source: Patrick Engineering, Inc., data from Paxton Landfill Leachate Characterization/Extraction Study.

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Appendix G

Telephone Logs - Ecology and Environment, Inc.

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ecology and environment, inc., telephone log

Contact	Company or Agency	
Damon Sinacs	START / Ecology & Environment	
Position	**Contact Phone Number**	
Project Manager	312-578-9243	
E & E Employee	**Date**	**Time**
Paul Atkociunas	4/21/99	1500
Site Name and Location		**Job No./Pan**
Lake Calumet Cluster Site		6B135CS1XX

START Sinacs informed me that they witnessed fishing activities in Lake Calumet along the northeastern bank during sampling activities at the site

Signature/Date Paul Atkociunas 4/21/99

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ecology and environment, inc., telephone log

Contact	Company or Agency	
Damon Sinars	START / Ecology & Environment	
Position	**Contact Phone Number**	
Project Manager	312-578-9243	
E & E Employee	**Date**	**Time**
Paul Atkocinas	4/21/99	15:00
Site Name and Location		**Job No./Pan**
Lake Calumet Cluster Site		6055 CS1XX

START Sinars informed me that PID readings taken directly above soil samples indicated concentrations of organic vapors from 0 parts per million (ppm) to 3 ppm. Subsurface samples showed readings as high as 150 ppm.

Signature/Date Paul Atkocinas 4/21/99

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