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E.C.JORDAN CO. ENGINEERS & SCIENTISTS

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SUPERFUND STANDBY CONTRACT

NORTH LAWRENCE
OIL DUMP SITE
St. Lawrence County, New York
WORK ASSIGNMENT NO. D002472-10

FINAL
REMEDIAL INVESTIGATION REPORT
VOLUME I

E.C. JORDAN CO.
MARCH 1993

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NORTH LAWRENCE OIL DUMP SITE
ST. LAWRENCE COUNTY, NEW YORK

Submitted to:

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Albany, New York

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EXECUTIVE SUMMARY

The Remedial Investigation (RI) of the North Lawrence Oil Dump Site (NLODS) was completed by E.C. Jordan Co., of Portland, Maine, under contract to the New York State Department of Environmental Conservation (NYSDEC). The RI field activities were completed in three phases conducted from 1989 through 1992. Results of these investigations are presented in this report. The Risk Assessment and Feasibility Study (FS) will be presented in separate documents.

This report presents the findings and conclusions of all phases of investigation conducted at the NLODS. The purpose of the field investigation was to characterize subsurface geologic and hydrogeologic conditions, and provide analytical data to delineate potential contamination in the air, soil, sediment, surface water, and groundwater on-site and in the vicinity of the site. The field investigation data will be used in the Risk Assessment to identify potential public health and environmental risks posed by the contaminants detected on-site. The NLODS FS will identify and evaluate potential remedial technologies and alternatives that may mitigate the impact of the contaminants detected at the site. The FS will include a detailed description and evaluation of each remedial alternative.

The NLODS is an inactive hazardous waste site in the Township of Lawrence in St. Lawrence County, New York. The site is situated south of McAuslen Road and east of Cemetery Road. The site includes a lagoon that is approximately 600 feet long and 75 feet wide and a regulated wetland next to the lagoon. The lagoon area

- identify potential threats to public health and the environment posed by the release of contaminants from the site

- evaluate potential remedial alternatives based on engineering factors, implementability, environmental and public health concerns, and costs

- select an appropriate approach for site remediation and prepare a conceptual implementation plan

Field activities conducted during various phases of the RI included:

- completion of a soil boring program to develop data to characterize the nature and distribution of contamination in the lagoon

- completion of a groundwater investigation including installation of piezometers and monitoring wells to determine the potential impact to groundwater from both the lagoon and closed North Lawrence Town Landfill

- completion of a surface water and sediment sampling program to characterize the nature and distribution of contamination present in the wetlands

- completion of air sampling and analysis the full Target Compound List of analytes, landfill wastes are not a contributing source of groundwater contamination.

- Contamination was detected in sediment and surface water samples collected from the southwestern end of the lagoon and the wetland southeast of the lagoon. Sediment contamination is the primary source of surface water contamination with surface water flow acting as the primary transport mechanism for the distribution of contamination in the wetlands.

- Sediments in the wetland area, within approximately 300 feet of the southwestern end of the lagoon, are contaminated with inorganics, particularly lead, VOAs, and PCBs. Sediment samples from greater than approximately 300 feet from the lagoon are primarily contaminated with lead. Contaminant concentrations generally decrease with distance from the lagoon.

- Ecological samples collected in the lagoon and wetlands exhibit PCB and inorganic contamination, indicating probable contamination in the food chain.

The results of the RI field activities and laboratory analysis will be used in evaluating the potential risks to public health and the environment. RI and Risk Assessment results will be used during the FS in support of the development and evaluation of remedial alternatives.

1.0 INTRODUCTION

A Remedial Investigation/Feasibility Study (RI/FS) for the North Lawrence Oil Dump Site (NLODS) was initiated by E.C. Jordan Co. (Jordan) for the New York State Department of Environmental Conservation (NYSDEC) under Contract Number D002098. The RI/FS is being completed under the New York State Superfund Standby Contract Number D002472, as Work Assignment D002472-10. The NLODS, shown in Figure 1-1, is located in the Township of Lawrence in St. Lawrence County, New York.

The NLODS RI has been conducted in accordance with NYSDEC requirements, as identified in the Request for Proposal dated October 1987, at the site meeting on October 29, 1987, and the Work Assignment letter dated May 23, 1991. This report presents results of the First, Second, and Third Phase field investigations, interpretation and discussion of analytical data and test results, and conclusions regarding the nature and distribution of site contamination. The results of the Risk Assessment and First, Second, and Third Phase FS will be submitted as separate documents.

1.1 REPORT ORGANIZATION

The purpose and scope of the RI are presented, with a brief site history, in Section 1.0. The general physical setting and characteristics of the area surrounding the site, such as population, land-use characteristics, natural resources, climate, and geology are described in Section 2.0. In Section 3.0, the technical approach and structure of the field program are discussed, as well as Applicable, or Relevant and Appropriate, Requirements (ARARs) and State Criteria and Guidelines (SCGs), site (E.C. Jordan Co., 1990b). The Risk Assessment will be used to develop target clean-up levels for use in the FS. The FS will identify remedial alternatives that include remedies to reduce the toxicity, mobility, and volume of the contaminants on site. The FS will evaluate potential remedial alternatives against nine criteria, which serve as a basis for conducting a comparative analysis and subsequently for selecting an appropriate remedy.

1.3 SCOPE OF WORK

The scope of work required to fulfill the objectives of the RI, as presented in the site work plans (E.C. Jordan Co., 1989a, 1991c, and 1992), consists of the following tasks:

1. Project planning - preparation of the First and Second Phase RI Work Plans, Quality Assurance Project Plans (QAPPs), and site-specific Health and Safety Plans (HASPs)

2. Community relations support for NYSDEC

3. A three-phase field investigation program consisting of the following tasks:

   <u>First Phase</u>:

   - perform a geophysical investigation consisting of a seismic survey to delineate geologic stratigraphy at the site
   - drill 31 soil borings in the lagoon and collect subsurface soil samples

5. Development of a Risk Assessment that includes public health and ecological assessments

6. Preparation of the RI report

1.4 SITE HISTORY

The NLODS is an inactive hazardous waste site located next to a regulated wetland and the closed North Lawrence Town Landfill (see Figure 1-1). The site occupies portions of two private properties.

The NLODS was identified during an October 1980 investigation of the abandoned York Oil Company waste oil site in Moira in Franklin County, New York. The York Oil site is located approximately 2 miles from the NLODS. Information obtained during interviews with Moira residents by U.S. Environmental Protection Agency (USEPA) personnel indicated the existence of a similar waste oil dump (i.e., NLODS) in North Lawrence, New York. Based on these interviews, the NLODS is potentially associated with activities at the York Oil Company site in Moira.

The NLODS reportedly was operated as a gravel pit before the disposal of waste oil. The excavation operation apparently shaped the site into a depression with a mounded perimeter. During the middle to late 1960s, the NLODS apparently was used for the disposal of waste oil and oil sludge. Evidence of oil deposits over the topographically low of the perimeter berm at the southwestern end and on vegetation in adjacent wetland areas suggests the dump was operated as a lagoon. During periods of high water, free-floating oil escaped from the topographically low

The risks involved with direct contact (Sdc) and the potential for fire and explosion (Sfe) are evaluated according to site-specific information, including toxicity of waste, quantity, site demographics, and location with respect to sensitive wildlife habitats. Migration potential (Sm) is evaluated through the rating of factors associated with three routing modes: groundwater (Sgw), surface water (Ssw), and air (Sa). The scored value for each route is composited to determine the risk to public health and/or the environment from the migration of hazardous substances from the site (Sm). The NLODS was scored according to the Mitre Corporation HRS, receiving the following scores:

Sm = 31.6 (Sgw = 51.3; Ssw = 18.9; Sa = 0)
Sfe = 0
Sdc = 12.5

The HRS scores indicate that the greatest risk at the NLODS is from the migration of contaminants by groundwater and, to a lesser degree, by surface water. Airborne contamination was determined not to be a risk at this site. Human and animal contact with the contaminants found on site is a potential risk reflected by the direct contact score of 12.5. These scores reflected conditions at the site that warranted further investigation.

2.0 PHYSICAL SETTING

This section describes the physical setting of the NLODS location. Population and land use of the surrounding area are discussed, as well as the natural resources and climate.

2.1 SITE DESCRIPTION

The NLODS is an inactive hazardous waste site in the Township of Lawrence, St. Lawrence County, New York. The site is located south of McAuslen Road and east of Cemetery Road. The lagoon, which is reached by an access road off of McAuslen Road, is 600 feet long and 75 feet wide. Immediately south and east of the lagoon is a New York State-regulated wetland. Surface water from this wetland drains to Redwater Brook (see Figure 1-1).

The NLODS is approximately 390 feet above sea level, with higher terrain south of the site. Topography in the immediate vicinity is generally flat, sloping downward to the north and northwest with an approximate 1 percent grade. Reportedly, the site area initially was operated as a gravel pit; currently, it appears as a depression surrounded by a soil berm.

Regional surface drainage is north and northwest via tributaries of Deer River and Redwater Brook. Wetlands occupy much of the surrounding landscape. Drainage from the site area is directed southwest by surface topography and enters a regulated wetland south of the site. Drainage is then directed northward via tributaries of Redwater Brook.

The only known human uses of the site are hunting or infrequent trespassing. Access to the site is limited by a dirt berm built across the lagoon access road. The closed North Lawrence Town Landfill is located along the lagoon access road. The landfill, closed by NYSDEC before 1979, has no current permissible use (NYSDEC, 1990).

Currently, major industries employing residents from the area include Kraft General Foods Frozen Division in North Lawrence, that employs 100 people; Wolverine Shoe Company, in Malone, that employs approximately 400 people; a dress factory in Malone, that employs 100 people; a correctional facility that employs 400 people; and a hospital and two nursing homes. In addition, area dairy farms still comprise an important sector of the economy.

2.3 SURROUNDING LAND USE

The NLODS is located within a sparsely populated rural section of the Township of Lawrence. The nearest residential properties are about 1 mile from the site along Cemetery Road. The surrounding area is undeveloped and characterized by stands of spruce, white pine, and mixed hardwoods. Historically, dairy farmers used the area near the site for pasture. Currently, much of the surrounding area has been converted from pasture to cornfields.

2.4 NATURAL RESOURCES

This subsection briefly summarizes the natural resources found in the study area; a more detailed analysis of natural resources at the NLODS site is discussed in year, with the average monthly maximum temperature ranging between 27 and 33 degrees F. During these months the average monthly minimum can drop to 8 to 12 degrees F. During the warmer months, May to October, the average monthly temperature ranges from 59 to 72 degrees F. July is the warmest month of the year. Total monthly rainfall ranges from 1.23 to 4.46 inches. The area receives snow between October and April. Total annual precipitation is 35 inches as equivalent rainfall.

3.0 REMEDIAL INVESTIGATION PROGRAM

This section outlines the approaches used to conduct the NLODS RI. Subsection 3.1 discusses the technical approach and summarizes the field activities at the site during the three phases of investigation. Subsection 3.2 presents the analytical program for soil, sediment, surface water, air, and groundwater samples collected during the three phases of the RI. Subsection 3.3 is an initial identification of potential federal and state ARARs and SCGs that apply to the NLODS. Subsection 3.4 outlines criteria used in evaluating the analytical data and determining site contaminants. Subsection 3.5 concludes with a discussion of the field parameters measured during surface water and groundwater sampling.

3.1 FIELD INVESTIGATION TECHNICAL APPROACH

The RI field investigation programs were conducted to identify and assess the distribution of contaminants at the site and evaluate if the contaminants pose any risk to public health or the environment. Assessing the distribution of contamination in the lagoon and wetlands is necessary to support the FS for estimating the nature and volume of material requiring remediation and developing potential remediation and treatment alternatives.

The purpose and objectives of the First Phase field investigation were developed and presented in the RI/FS Work Plan (E.C. Jordan Co., 1989a). To support the objectives for the First Phase investigation, two additional documents, the QAPP (E.C. Jordan Co., 1989b) and the HASP (E.C. Jordan Co., 1989c), were developed by Jordan and approved by the NYSDEC. The First Phase RI field program was conducted by Jordan personnel from March through May of 1989. Results of the by RECRA were conducted in accordance with New York State Contract Laboratory Protocols (CLP) (NYSDEC, 1987). Analytical services for the Second Phase sampling program were provided by NYTEST Environmental, Inc. (NYTEST) of Port Washington, New York. At the time of the Second Phase program, NYSDEC requirements specified that laboratory analyses be conducted in accordance with New York State Analytical Services Protocols (ASP) (NYSDEC, 1989a). Third Phase samples were analyzed by NYSDEC. Survey services at the conclusion of the First Phase program were provided by Modi Associates (Modi) of Clay, New York. Second Phase exploration and sample locations were surveyed by Om P. Popli Associates (Popli) of Rochester, New York.

Sample collection, shipment, and tracking, decontamination, Quality Assurance/Quality Control (QA/QC) sampling, and chain-of-custody procedures were all conducted in accordance with First and Second Phase site-specific QAPPs (E.C. Jordan Co., 1989b and 1991a).

A summary of field investigation activities during the three phases of investigation is as follows:

- a geophysical investigation consisting of a seismic refraction and magnetometer survey
- installation of eight piezometers (five shallow and three deep)
- installation of 16 overburden monitoring wells (five paired wells and six single shallow wells)

stratigraphy at the site, including the thickness and character of the glacial till and the depth to the bedrock surface.

The seismic refraction survey was completed along three traverses identified as Lines 01, 02, and 03, consisting of a total of 2,000 linear feet of seismic profiling. The profile locations and orientations are shown in Figure 3-1. Lines 01 and 02, located between the closed North Lawrence Town Landfill and the lagoon, were oriented north-south and east-west, respectively. Line 03, located on the closed North Lawrence Town Landfill, was oriented north-south. The survey was conducted using a Geometrics ES2414F Signal Enhancement Seismograph, which uses small explosive charges to produce the energy required for the survey. The seismograph produced analog seismographs, which were plotted and interpreted to yield seismic profiles along the traverses. Results of the seismic survey are presented in Subsection 4.5.2.

Jordan conducted a magnetometer survey at the closed North Lawrence Town Landfill in April 1990. The purpose of this survey was to delineate the limits of the landfill and to facilitate the siting of monitoring wells up- and downgradient of the landfill for the Second Phase field investigation. A secondary objective was to delineate any potential trenches reportedly used to dispose of refuse. The survey results were used during the Second Phase drilling program to locate and install three monitoring wells to assess whether the historic use of the closed landfill has adversely impacted groundwater quality.

The survey was conducted using an EDA Instruments Omni Plus Vertical gradiometer. All data were acquired temporarily in the buffer memory of the instrument and downloaded to a computer at the conclusion of each field day for sampling programs is presented in Table 3-1. The locations of the soil borings are in Figure 3-4.

The scope of work for the First Phase soil boring program, set forth in the Work Plan, proposed 34 borings within the lagoon. However, during the field investigation, site geology presented difficult drilling conditions, so borings TB-19, TB-20, TB-21 and TB-28 were eliminated from the boring program. With the addition of boring TB-1A, a total of 31 borings were drilled from March through April of 1989. The results of the First Phase RI identified the need for additional subsurface soil samples for analysis of Target Compound List (TCL) volatile organic analytes (VOAs), semivolatile organic analytes (SVOAs), and inorganics to provide data for final evaluation of the distribution of contamination in the lagoon.

During the Second Phase field investigation, three hand auger borings (i.e., SB-208, SB-209, and SB-210) were advanced on the edge of the ponded area at the southwestern end of the lagoon (see Figure 3-4). Seven soil borings (i.e., SB-201 through SB-207) were drilled in the lagoon to obtain analytical subsurface soil samples.

Borings were completed by AA&D using hollow-stem augers (HSAs) and wireline coring techniques. In the First Phase investigation, split-spoon samples were screened in the field for total petroleum hydrocarbons (TPH) using a GC with a flame ionization detector (FID), and for PCBs using a GC with an electron capture detector (ECD). The first sample showing a non-detect for PCBs or TPH was submitted to the laboratory for confirmatory analysis. For borings with detectable concentrations in all samples, the sample exhibiting the lowest concentration was submitted to the laboratory for analysis. In addition, 10 soil samples were selected because adequate data were developed during the First Phase RI. Results of the soil boring sampling and analysis program are presented in Subsection 5.3. Laboratory analytical results, including final validated data, are in Appendix D-1.

3.1.4 Piezometers

The piezometer installation program was conducted from March 8 through 15, 1989, and consisted of the installation of eight piezometers (i.e., PZ-1 through PZ-8). PZ-1, PZ-3, and PZ-7 were drilled to and installed at 30 feet bgs. PZ-2, PZ-4, PZ-5, PZ-6, and PZ-8 were drilled to and installed at 15 feet bgs. The depth of the piezometers are listed in Table 3-1.

Piezometer locations are shown in Figure 3-5. The borings were advanced using a 3.875-inch outside diameter (OD) wireline coring technique, except for PZ-8, which was installed using 2-inch ID wireline. Soil samples were obtained at 5-foot intervals using a 2-foot split-spoon sampler. Reference soil samples were obtained from each split-spoon, placed in pint-size jars, and described on a boring log by a Jordan field geologist, using the USCS. Boring logs are presented in Appendix A-2. Grain-size distribution analyses were performed on six split-spoon samples from PZ-1, PZ-2, and PZ-3. The grain-size distribution analyses are in Appendix A-7. Drill cuttings and fluids from the borings were left at each boring location.

One soil sample from each piezometer boring, except PZ-2, was analyzed for inorganics to develop data on background concentrations of inorganics in soil. The sample from PZ-2 was analyzed for TCL VOAs, SVOAs, and pesticides and PCBs, to provide background organic data. The depths at which the analytical samples were collected are summarized in Table 3-1. Results of the piezometer sampling

April 14, 1989. Jordan and the drilling subcontractor, AA&D, installed 12 groundwater monitoring wells. Five well pairs and two single wells were installed. For the monitoring well pairs, MW-101A, MW-102A, MW-104A, MW-105A, and MW-107A are the deep monitoring wells and MW-101B, MW-102B, MW-104B, MW-105B, and MW-107B are the shallow wells. The single monitoring wells, MW-103 and MW-106, are shallow wells. Monitoring well locations were chosen based on information generated from the piezometers to (1) confirm groundwater table data and flow direction and (2) collect groundwater samples for analysis from areas most likely to contain contamination. Locations of the monitoring wells are shown in Figure 3-5.

The monitoring well borings were drilled using two techniques. The shallow wells were drilled using 4.25-inch ID HSAs. The borings for the installation of these wells were drilled to 10 feet bgs. The shallow monitoring wells were installed at 10 feet bgs. The deep monitoring well borings were advanced using 3.875-inch OD wireline coring technique to a depth of 40 feet bgs. The borings were then enlarged by spinning 4-inch casing to the bottom of the boring for well installation purposes. The deep monitoring wells were installed at 40 feet bgs except monitoring well MW-104A, which was installed at 38.5 feet bgs.

Split-spoon samples were obtained at 5-foot intervals in the deep borings. The sampling started at the depth of the deepest sample collected from the piezometer located near the monitoring well. Reference soil samples were collected from each split-spoon and classified using the USCS. No soil samples for chemical analyses were obtained from the monitoring well borings. However, a reference sample was obtained from the screened interval in both the deep and shallow

As in the First Phase program, the monitoring wells were installed using two drilling techniques: HSAs and wireline coring. All the monitoring wells were installed using the wireline coring technique except for MW-201, which was installed using 6.25-inch HSAs. The depths of the four monitoring wells ranged from 8 feet bgs at MW-204 to 28 feet bgs at MW-201.

Split-spoon samples were obtained at 5-foot intervals in all the borings. Reference soil samples were collected from each split-spoon sample and classified using the USCS. No analytical samples were obtained from the monitoring well borings. The monitoring well boring logs are in Appendix B-2.

In accordance with NYSDEC requirements, the monitoring wells were constructed of 2-inch ID, flush-jointed stainless steel with 0.010-inch spun-wire well screens as in the First Phase program. All the monitoring wells had 10-foot screens except MW-204, which had a 5-foot screen. A silica sandpack was placed around each well screen and the boring annulus filled to 2 feet above the screen. A 2-foot bentonite seal was placed on top of the sandpack and the remainder of the boring was filled to the ground surface with a silica sand/cement/bentonite grout slurry. A protective casing with locking cover, 4-inch ID and 6 feet long, was installed over the top of each well and concreted into place with a minimum of 1 foot of concrete and a concrete collar at the ground surface.

The exception to this installation method was MW-204, which was installed at a depth of 8 feet bgs. Because of the shallow placement of the well, sand was placed to a depth of 1 foot bgs, followed by a 6-inch bentonite seal. The well was finished with installation of a 4-inch ID 3-foot long protective casing concreted in place with

TCL VOAs, SVOAs, inorganics, pesticides and PCBs. The full list of parameters was selected for these wells because the nature of wastes disposed of in the closed North Lawrence Town Landfill is unknown. Results of the groundwater sampling and analysis program are presented in Subsection 5.4. Laboratory analytical results, including final validated data, are in Appendix D-2.

3.1.7 Hydraulic Conductivity Testing

In April 1989, hydraulic conductivity tests were performed in all 12 of the First Phase monitoring wells. The Hvorslev empirical method was used to calculate hydraulic conductivities from the rising-head data. The field data, graphs and hydraulic conductivity calculations are in Appendix A-6. The results and interpretation of the hydraulic conductivity testing are discussed in Subsection 4.7.

In situ rising-head hydraulic conductivity tests were performed in all four Second Phase monitoring wells in January 1992. Consistent with the First Phase, the Hvorslev empirical method was used to calculate hydraulic conductivities from the rising-head test data. Results of the calculations using the Hvorslev empirical method were compared to values calculated using the Bouwer-Rice method. The field data, graphs, and hydraulic conductivity calculations are presented in Appendix B-4. The results and interpretation are discussed in Subsection 4.7.

3.1.8 Surface Water and Sediment

The purpose of the First Phase surface water and sediment sampling program was to evaluate whether site contaminants were present in surface water and sediments on or off site. Sixteen surface water and sediment sample pairs were collected on

The results and conclusions of the First Phase RI did not identify any further data requirements for surface water. However, the elevated concentration of contaminants detected in sediments, especially lead, required additional sampling to define the distribution of contamination in wetland sediments. Therefore, the Second Phase field investigation included an extensive sediment sampling program to delineate the extent of lead contamination in the wetland southwest of the lagoon. Fifty-nine sediment samples were collected in November 1991. A summary of the Second Phase sediment samples and associated analyses is presented in Table 3-2. Results of the sediment sampling and analysis program are presented in Subsection 5.6. Laboratory analytical results, including final validated data, are in Appendix D-3.

Three samples, SD-201, SD-202, and SD-203, were collected to define background levels of inorganics, especially lead, in the sediments. The samples were collected approximately 750 feet east of the lagoon, and approximately 500 to 700 feet south of McAuslen Road, to minimize effects that the proximity of the road might have on background levels of inorganics (see Figure 3-8). The remaining 56 samples were collected from the wetland southwest of the lagoon (i.e., Area A) to assess the extent of contamination in the wetland (see Figure 3-7).

Sediment samples collected during the First Phase field investigation from the western portion of the wetland southwest of the lagoon (i.e., SD-4 and SD-5) contained elevated levels of inorganics. To further define the western edge of the contamination in this area, eight sediment samples (i.e., SD-217 through SD-224) were collected from locations west of First Phase sampling locations SD-4 and SD-5 (see Figure 3-7). Two samples (i.e., SD-215 and SD-216) were collected from locations east of the First Phase sample location SD-9. These 10 samples were the vertical distribution of contamination, grab samples were collected from two depths, 6 inches bgs and 12 inches bgs, at First Phase sample locations, SD-4, SD-10, and SD-13, for a total of six sediment samples (see Table 3-2). The six grab samples were submitted to NYTEST for analysis of TCL PCBs and inorganics. The samples were also analyzed for TOC for use in the Ecological Risk Assessment. Results of this sediment sampling and analysis are presented in Subsection 5.6.4. Analytical results, including final validated tables, are included in Appendix D-3.

The lateral extent of lead contamination to the west, south, and east of the First Phase sediment sample locations also needed to be defined. Because elevated concentrations of lead were detected in the outer-most First Phase sediment sample locations SD-13 (2,040 mg/kg), SD-12 (571 mg/kg), and SD-9 (97.9 mg/kg), a wide area of the wetland was targeted for sampling during the Second Phase.

Sediment samples were collected along five 300-foot long transects leading away from the lagoon (see Figure 3-7). The transects were set into the wetland toward the west, southwest, south, and southeast. Seven samples were collected at 50-foot intervals along each of the five transects. A total of 35 sediment samples (i.e., SD-225 through SD-259) were submitted for laboratory analysis of lead only to define the distribution of lead contamination in wetland sediments.

The Third Phase field investigation, conducted in June 1992, consisted of the collection of 12 sediment samples from the wetland south and east of the Second Phase sediment sample locations. Locations of the samples followed the direction of surface water flow. This program was conducted to further define the area of wetland impacted by inorganic (i.e., lead) contamination. Laboratory analysis of

SD-244. The transect then proceeded S 23° E for a distance of 1,100 feet. Sediment samples SD-311 and SD-312 were located in this direction from SD-310 at intervals of approximately 300 and 900 feet, respectively.

The 12 sediment samples were collected from approximately ground surface to 6 inches bgs and were analyzed for lead only. The purpose of this data is to provide a basis for determining the portion of the wetland adversely impacted by the elevated concentrations of lead.

3.1.9 Air Monitoring

Air sampling was performed at the NLODS during the week of April 12, 1989. The program was proposed to be conducted in two phases during the field investigation: background air monitoring and air monitoring. The background air monitoring program consisted of two monitoring locations on site, collected in duplicate, at least 100 feet from any suspected PCB source. Because of equipment failures and extremely cold ambient air temperatures, the background air monitoring program could not be conducted until the end of the drilling program. The samples were collected approximately 15 hours after the last soil boring was drilled in the lagoon. Table 3-3 lists the sample locations and sampling durations, and Figure 3-10 shows the sample locations.

The air monitoring program was conducted on three consecutive days, April 12 through 14, 1989, while drilling activities took place in the lagoon. Four samples were collected during each sampling event. One sampling site was an upwind "background" site. The other three sampling sites were located near the RI drilling activities. A summary of the samples is as follows:

exposure routes to receptors was also conducted with an evaluation of the magnitude of the exposure.

Numerous species of birds, mammals, amphibians, reptiles, and invertebrates exist in the NLODS vicinity. Various species of aquatic and terrestrial organisms were observed at the site during the field investigation. However, because the fauna of a particular locality cannot be thoroughly characterized without extensive field studies, the list of species observed was supplemented with species identified by fisheries and wildlife officials as being expected at the site based on range and habitat. Results of the field observations and ecological characterization of the NLODS are discussed in Subsection 5.7.

Biological Tissue Sampling and Analysis. Biological tissue sampling and analysis was conducted at the NLODS because of the high bioconcentration potential and toxicity of PCBs, one of the primary site-related contaminants. This subsection describes the methods used in the biological sampling program. Results of the tissue sampling and analysis are presented in Subsection 5.9. Laboratory results, including final validated data, are in Appendix C-7.

The goal of the tissue sampling and analysis was to provide information on the potential for food chain contamination. Consequently, organisms at various trophic levels were collected. The samples collected at the site, the general location of the sample, and the sampling techniques used for each sample are presented in Table 3-4. The biological sampling stations are located throughout an extensive sampling area encompassing the site and adjacent wetland. An overview map illustrating the two different sampling areas is presented in Figure 3-6. A detailed set in holes, level with the ground surface. Low plastic garden fencing was set up to guide small mammals into the traps. No organisms were collected with these traps, possibly because the lack of suitable habitat in the areas where the pit traps were placed.

Minnow traps were baited with dog food or chicken liver and set overnight. No fish were collected in the minnow traps set in the lagoon, although they were collected in traps set in the wetland outlet. Also, no organisms were collected in minnow traps placed overnight in the wetland adjacent to the lagoon. This may be due to a seasonal lack of standing water in the wetland, as indicated by the National Wetlands Inventory (NWI) modifier of "seasonally saturated," which would prevent organisms dependent on permanent standing water from becoming established.

Tadpoles, probably the leopard frog, were the most abundant organism collected in the minnow traps in the lagoon, although some aquatic insects and a salamander were also collected. The minnow traps set at the wetland outlet collected tadpoles and eight species of small fish: chub sucker, three-spine stickleback, five-spine stickleback, mud minnow, red-bellied dace, golden shiner, killifish, and an unidentified cyprinid.

Dip nets were used to collect the eastern painted turtle and the two leopard frogs. Several attempts were made to collect frogs or other organisms in the wetland using a dip net; however, these efforts were unsuccessful.

viability of the treatment technologies identified during the First Phase FS (E.C. Jordan Co., 1990c). The technologies evaluated included solvent extraction, thermal desorption, and solidification/stabilization (S/S). Treatability study sampling locations are illustrated on Figure 3-13. Two areas of the lagoon were selected to collect sludge that historically contained high concentrations of leachate lead and PCBs. For purposes of the S/S treatability study, sludge with high levels of leachable lead was necessary. Sludge with high concentrations of PCBs was required for the solvent extraction and thermal desorption treatability studies. Samples were collected with a shovel and placed in 5-gallon containers for purposes of moving to a location for compositing. Sludge for the S/S treatability study was shipped in 2-gallon containers. Sludge for the thermal desorption treatability study was shipped in 5-gallon containers. Sludge for the solvent extraction study was shipped in 1-liter glass containers. Unused sludge was returned to the lagoon.

Four sampling locations in the northeast portion of the lagoon, JTS-110A through JTS-110D, were selected to collect sludge for the S/S treatability study. Approximately 3 gallons of sludge were collected from each location and composited. Approximately 8 gallons of the composited sludge sample were shipped to OBG Laboratories, Inc. in Plymouth Meeting, Pennsylvania, for bench-scale S/S testing.

Two composited samples (i.e., C1 and C2) for the solvent extraction and thermal desorption treatability studies were collected from locations in the southwest portion of the lagoon. Approximately 5 gallons of sludge were collected from sample locations JTS-C1A through JTS-C1C and composited, for a total of 15 gallons. The second composited sample was composed of 5 gallons of sludge collected from sample locations JTS-C2A through JTS-C2C, for a total of 15

The scope of work for the Second Phase RI required surveying horizontal positions to the nearest 1 foot and vertical positions, at the natural ground surface, to the nearest 0.1 foot for soil borings, sediment samples, and monitoring wells. Two additional vertical positions, at the top of the uncapped well risers and the rims of the protective casings, were established to the nearest 0.01 foot for the monitoring wells. Additional topographic survey information of the berm around the lagoon was developed to better define the lagoon boundaries on the base map.

The horizontal positions of the NLODS were tied into the New York State Plane Coordinate System. Vertical positions are tied to mean sea level as determined by the 1929 General Adjustment. Horizontal and vertical control lines are at third-order accuracy.

3.2 ANALYTICAL PROGRAM

The analytical parameters and methods described in this subsection were selected to evaluate the nature of chemicals in soil, sediment, surface water, air, and groundwater. Subsection 3.2.1 discusses the Data Quality Objectives (DQOs) for the NLODS RI. Subsections 3.2.2 and 3.2.3 present the specific chemical analytical parameters and methods selected to meet these objectives. Subsection 3.2.4 presents laboratory data evaluation procedures, including data reduction, validation, and reporting formats.

The QA requirements and DQOs developed for this RI were established and are presented in further detail in both the First Phase QAPP (E.C. Jordan Co., 1989b) and the Second Phase QAPP (E.C. Jordan Co., 1991a). The analytical procedures

3.2.1.2 Representativeness. Measurements are made so that results are representative of the sampling population, the medium (e.g., soil, sediment, and groundwater), and the site conditions. Sampling protocols were developed to ensure that samples were representative of the media, that sampling locations were properly selected, and that a sufficient number of samples were collected. Sample handling protocols (e.g., chain-of-custody, storage, and transportation) were designed to preserve sample integrity. Proper documentation established that the correct protocols were followed during all three phases of the NLODS RI.

3.2.1.3 Completeness. The characteristic of completeness is defined as the percentage of valid data obtained compared to what would be expected under normal conditions. USEPA has found that Contract Laboratory Program protocols typically generate data that is 80 percent complete. Because sampling activities are often influenced by field conditions, the NLODS First and Second Phase Work Plans provided estimates of the number of samples to be collected during the field program. There were no significant deviations from the proposed field programs.

3.2.1.4 Comparability. The characteristic of comparability reflects both the internal consistency of measurements and the expression of results in units consistent with other organizations reporting similar data. Each value reported for a given measurement should be similar to other values within the same data set and with other related data sets. Comparability was assured through the use of standardized sampling procedures and CLP and ASP analytical methods.

First Phase analytical parameters included:

- TCL VOAs
- TCL SVOAs
- TCL inorganics
- TCL Pesticides/PCBs

NYTEST, under subcontract to Jordan, provided analytical services for the Second Phase field program. The laboratory procedures that NYTEST followed to complete the analytical program are specified in the NYSDEC ASP (NYSDEC, 1989a). These analytical protocols and the required laboratory deliverables were developed to provide legally defensible data.

Second Phase analytical parameters included:

- TCL VOAs
- TCL SVOAs
- TCL inorganics
- TCL Pesticides/PCBs
- lead

NYSDEC provided analytical services for the Third Phase sediment samples. Third Phase samples were analyzed for lead only. The single groundwater sample from MW-107 was analyzed by NYTEST for pesticides and PCBs only.

Third Phase sediment sample analytical data was submitted in hard copy format directly from NYSDEC to Jordan. No further conversion of data occurred.

3.2.4.2 Data Validation. Analytical data received from RECRA was validated following the *Laboratory Data Validation, Functional Guidelines for Evaluating Organic Analyses* (USEPA, 1988) and *Laboratory Data Validation, Functional Guidelines for Evaluating Inorganic Analyses* (USEPA, 1988).

For the Second Phase field investigation validation of laboratory data was performed in accordance with USEPA protocols, as well as, appropriate USEPA Region II revisions. In addition, the validation protocols were modified to include laboratory requirements in the NYSDEC ASP. Data validation activities are presented in detail in the QAPP (E.C. Jordan Co., 1989b and 1990a).

Sediment samples collected during the Third Phase were analyzed by the NYSDEC. NYSDEC did not require validation of the data. The laboratory data of the single groundwater sample collected during the Third Phase, and analyzed by NYTEST, was validated by Jordan in accordance with USEPA protocols.

3.2.4.3 Data Reporting. Three presentations of the analytical data were prepared by Jordan personnel for both the First and Second Phase field investigation data packages. Three sets of data tables were prepared for all laboratory data.

1. Table 1 - presents raw data as received from the laboratory, tabulated by medium and analytical fraction.

Relevant and appropriate requirements are those federal and state requirements that, while not legally "applicable," can be applied to a site if it is determined that site circumstances are sufficiently similar to those situations that are covered and use of the requirement makes good sense. There is discretion in this determination, in that it is possible for only a part of a requirement to be considered relevant and appropriate, and the rest of the regulation dismissed if judged not to pertain to the given situation. Relevant and appropriate requirements are intended to have the same weight and consideration as applicable requirements.

The term "relevant" was included so that a requirement initially screened as nonapplicable because of jurisdictional restrictions would be reconsidered and, if appropriate, be included as an ARAR for the site. For example, MCLs would be relevant and appropriate requirements at a site where groundwater contamination could affect a potential, rather than actual, drinking water source.

Other requirements to be considered are federal and state nonpromulgated advisories or guidelines that are not legally binding and do not have the status of potential ARARs and SCGs. However, if there are no specific ARARs and SCGs for a chemical or site condition, or if existing ARARs and SCGs are not deemed sufficiently protective, then guidance or advisory criteria should be identified and used to ensure protection of human health and the environment.

Identification of ARARs and SCGs. Under the description of ARARs set forth in the NCP, state and federal environmental requirements must be considered. These requirements include ARARs that are:

Parts 700-705) (NYSDEC, 1991), will be used during the RI/FS to compare to the concentration of contaminants detected in the groundwater. Groundwater is used as a drinking water source by area residents in the general vicinity of the site; therefore, these standards are ARARs for the NLODS.

Location-Specific ARARs and SCGs. Location-specific ARARs and SCGs natural site features (e.g., wetlands, floodplains, and sensitive ecosystems) and man-made features (e.g., places of historical or archeological significance). These ARARs and SCGs generally restrict the concentration of hazardous substances or the conduct of activities solely based on a site's particular characteristics or location. Table 3-7 provides a list and synopses of location-specific ARARs for the NLODS.

Because there is a New York State-regulated wetland on site, and contamination extends into that wetland, a number of federal and state regulations apply to the site. At the federal level, the Clean Water Act, U.S. Army Corps of Engineers Permit Program, and Wetlands Executive Order outline requirements for actions conducted in wetland. The New York Freshwater Regulations also set forth permit design and performance requirements for any work conducted in the wetland.

Many location-specific ARARs also fall under the definition of action-specific because the regulations do not apply unless some activity is conducted in the regulated area. This situation exists at NLODS because the contamination extends into a New York State-regulated wetland. Federal and state regulations protecting wetlands will apply to those remedial alternatives that propose work or some action in the wetland area. Because remedial activities at the NLODS will be conducted under the New York State Superfund program, permits are not required for any work conducted on site (6 NYCRR Part 375-1.7). While permits do not need to be

For groundwater, concentrations of both organic and inorganic compounds will be compared to both New York State and federal standards, as well as background concentrations detected in upgradient wells. The primary standards for comparison are New York State Drinking Water Standards (5 NYCRR Part 10). If a compound has no drinking water standard, concentrations will be compared to federal MCLs promulgated under the SDWA (40 CFR Part 141) or New York State Class GA Groundwater Standards (6 NYCRR Parts 701-705). If the concentration of a compound exceeds any of these standards, it will be compared to background concentrations to evaluate whether the contaminant is site-related. If the concentration of a compound is less than the appropriate standard, but greater than background concentrations, it will still be considered a potential site contaminant. If no standards exist for a compound, its concentration will be compared to background concentrations to evaluate whether it is a potential site contaminant.

3.5 FIELD PARAMETERS

During surface water and groundwater sampling, selected water quality parameters were measured to ensure that representative samples were collected, and toprovide data to assess the quality of surface water and groundwater. The following field parameters were measured by Jordan personnel during the sampling episodes:

- pH
- specific conductance
- temperature

4.0 SITE HYDROLOGY, GEOLOGY, AND HYDROGEOLOGY

4.1 REGIONAL WATERSHEDS

Surface water runoff from the site drains from the northern portion of the site into the wetland on and adjacent to the site. Surface water in the wetland forms an unnamed stream just south of McAuslen Road and flows north. This unnamed stream flows through another wetland area before joining Redwater Brook. Redwater Brook flows northwesterly, crossing the boundary of the Walter F. Pratt Memorial Forest, where it flows into a small unnamed pond within the forest boundaries. Redwater Brook joins Deer River approximately 1 mile from the outlet of the pond (see Figure 1-1).

The Deer River flows north approximately 5 miles before joining the St. Regis River. The St. Regis River is a tributary of the St. Lawrence River, which flows along the New York State/Canadian boundary into Canada, and ultimately drains to the Atlantic Ocean in the Gulf of St. Lawrence.

4.2 LOCAL WATERSHEDS

Surface water flows through the wetland at a low velocity; however, seasonal variations exist, with the highest velocities occurring during the spring. Surface water flows through the wetland in a southeasterly, then northeasterly direction, circling around the southern end of the site. Water draining from the wetland develops into a stream that crosses under McAuslen Road and exits the site.

- Class D - Secondary-contact recreation uses only. Because of natural conditions such as intermittent stream flow, water or streambed conditions may not support the propagation of fish.

Redwater Brook, located in the eastern portion of the NLODS, flows northwest and is part of the St. Regis watershed. Redwater Brook is classified as a Class B water.

4.4 SOILS

Based on U.S. Soil Conservation Service maps for St. Lawrence County, soils at NLODS consist of Trout River loamy fine sand, Coveytown and Cook soils, and Hogansburg and Greenville soils. The Trout River soils are deep, gently sloping, somewhat excessively drained, low lime, sandy and gravelly soils, derived from wave-washed material. The Coveytown and Cook soils are nearly level and are somewhat poorly to very poorly drained. The Hogansburg and Grenville soils are nearly level to gently sloping, well or moderately well drained, and derived from glacial till. Site geology is described in detail in the following subsection.

4.5 GEOLOGY

4.5.1 Regional Geology

The NLODS is mapped in the Moira Quadrangle, which is part of the St. Lawrence Lowland. The St. Lawrence Lowland consists of that part of New York State northward from the Adirondack Upland and the Tug Plateau to the St. Lawrence

At the 450-to-460-foot elevation, a row of beach deposits with marine fossils extends from Brushton through Moira and Lawrenceville (including the Township of Lawrence) toward Stockholm, indicating that this area was once a marine shoreline.

4.5.2 Site Geology

To develop site-specific information about the geology at NLODS, a seismic survey was conducted before initiating the First Phase drilling program. The location and relative position of the seismic traverses is illustrated in Figure 3-1. Interpretative figures of results of each line of the seismic survey are presented in Figures 4-1 through 4-3. These results, combined with additional geologic information from the soil borings were used to develop an interpretation of the geology of the site. The stratigraphy of the site is interpreted in four geologic profiles. The profile locations and orientations are shown in Figure 4-4. The profiles shown in Figures 4-5 through 4-8 are constructed with a 10-to-1 vertical scale exaggeration.

The site surface soils consist of approximately 5 to 17 feet of loose, unconsolidated, and unsaturated Coveytown and Cook soils with a seismic velocity of approximately 1,500 feet per second (fps). These soils were encountered in all the piezometer and monitoring well borings on site. This stratigraphic unit is absent from the borings located within the lagoon area. It is believed to have been excavated during the use of this area as a sand and gravel pit in the early 1960s.

Underlying the surficial unit is a denser stratigraphic unit consisting of dense overburden; it has a seismic velocity ranging from 6,500 to 7,500 fps. Velocities of these magnitudes in the Northeast are typical of dense glacial tills that contain around the perimeter of the landfill, probably with heavy equipment, to make room near the access road for vehicles to unload trash. The central portion of the property does not appear to be underlain by trash, although surface refuse is evident in various areas.

4.6 GROUNDWATER CLASSIFICATION

New York State classifies groundwater supplies based on whether the source is fresh or saline groundwater. Groundwater in the North Lawrence area is classified as GA, which is fresh groundwater found in the saturated zone of unconsolidated deposits and consolidated bedrock. New York State defines the best use of Class GA waters as a source of potable water.

Local residents on McAuslen and Cemetery Roads use groundwater for their domestic water supply. New York State has also classified the groundwater aquifer in this area as Class GA; water that is suitable for potable water supply.

4.7 SITE HYDROGEOLOGY

Groundwater was encountered in all soil strata on the site. Water level measurements were taken periodically between 1989 and 1992 during the First, Second, and Third Phase field investigations. Water level elevations have varied with the seasons and precipitation trends. A summary of water level measurements is presented in Table 4-1. Based on the similarity of water level data in sands and till, it appears that groundwater within the glacial till is in good hydraulic communication with groundwater in the shallow sands and silts. Based on these data, the overburden deposits at the site function as a single water table aquifer.

glacial till was determined from field tests to range from 2.0×10^{-5} to 7.0×10^{-5} cm/sec, or from 0.056 to 0.2 ft/day. The geometric mean hydraulic conductivity is calculated to be 3.7×10^{-5} cm/sec or 0.1 ft/day.

Flow rates for groundwater through the overburden can be calculated from the hydraulic gradient (i), hydraulic conductivity (K), and porosity (n). The porosity of the sand was assumed to be 0.3 and the porosity of the glacial till was assumed to be 0.4 based on values published by Morris and Johnson (1967). The average groundwater flow rate is estimated using the following equation:

$$\textit{flow rate} = Ki/n$$

For the NLODS, using gradients in the silty sands ranging from 0.01 to 0.02 feet per foot (ft/ft), the corresponding horizontal groundwater flow rate in the sand is estimated to range from 3.7 to 7.5 feet per year (ft/yr). Using the gradients of 0.015 to 0.042 calculated for the glacial till, the corresponding horizontal groundwater flow rate is estimated to range from 1.4 to 4.0 ft/yr.

Multilevel water level data for the well pairs indicate vertical seepage gradients at the site. Water level data collected in June 1992 was used to calculate the vertical hydraulic gradients from the well pairs are shown below.

5.0 NATURE AND DISTRIBUTION OF CONTAMINATION

This section describes results from field GC screening from the First Phase field investigation and laboratory analysis of samples collected during the First, Second, and Third Phase field investigations. Site contaminants have been identified by comparing the concentrations of compounds detected above the CRQL, or method detection limit in each medium to:

- analytical results of associated QA/QC samples (i.e., field, trip, and laboratory blanks).
- actual background concentrations, where available,
- published background concentrations, and
- New York State and federal regulatory standards.

The analytical results of the QA/QC blanks are evaluated to screen out matrix interferences, detect contamination introduced to samples during and after collection, and detect contamination of laboratory equipment.

The analytical results for each sample medium are presented in the following subsections. Air monitoring is discussed in Subsection 5.1. Surface soils are discussed in Subsection 5.2, followed by subsurface soils in Subsection 5.3. Groundwater is discussed in Subsection 5.4. Surface water is discussed in Subsection 5.5 and sediments in Subsection 5.6. Subsection 5.7 discusses potential

5.2 Surface Soil

During the First Phase field investigation, surface soil samples were collected from shallow soils at five locations along the access road from the closed North Lawrence Town Landfill to the lagoon (see Figure 3-3). The samples were collected to assess whether PCB contamination had been carried from the lagoon during clean-up activities or from unauthorized vehicular traffic. The surface soil samples were analyzed for PCBs only. PCBs were detected only in one sample location, SS-5, at 4.6 mg/kg and 6 mg/kg in SS-5 DUP. Surface soil results are summarized in Table 5-2.

5.3 Subsurface Soil

Thirty-one soil borings were drilled in the lagoon during the First Phase field investigation at the NLODS. Two hundred and fifteen subsurface soil samples from these borings were screened in the field with a GC for TPH and PCBs. In addition, 10 confirmatory samples were submitted for laboratory analysis of TCL VOAs, SVOAs, inorganics, pesticides, and PCBs. (see Table 3-1). The results of this investigation were presented in the First Phase RI Report (E.C. Jordan Co., 1990a), which concluded that additional sampling and analysis was required to support the interpretation of the distribution of contamination in the lagoon and to provide additional CLP confirmatory data to further verify the field screening PCB data. To provide this additional data, the Second Phase RI subsurface sampling program was developed.

The Second Phase field investigation, conducted in November 1991, included drilling and sampling seven additional borings in the lagoon. Soil samples were

5.3.1 Volatile Organic Analytes

Ten VOAs were detected in the lagoon samples from the First Phase investigation and nine VOAs were detected during the Second Phase (see Tables 5-3 and 5-4). The seven compounds common to both field investigations are:

- trichloroethylene (TCE)
- benzene
- 4-methyl-2-pentanone
- tetrachloroethylene (PCE)
- toluene
- ethylbenzene
- total xylenes

The most frequently occurring VOAs were total xylenes and PCE. Total xylenes were detected in 36 of 52 samples at concentrations ranging from 11 micrograms per kilogram (μg/kg) to 130,000 μg/kg. PCE was also detected in 36 of 52 samples at concentrations ranging from 8 to 99,000 μg/kg. TCE, toluene, and ethylbenzene were detected in 28, 29, and 28 samples, respectively, ranging from 7 to 21,000 μg/kg (TCE), from 7 to 42,000 μg/kg (toluene), and from 6 to 23,000 μg/kg (ethylbenzene). Benzene was detected in seven samples in concentrations ranging from 10 to 1,200 μg/kg. 4-Methyl-2-pentanone was detected in six samples ranging from 18 to 250 μg/kg. 1,1,2,2-Tetrachloroethane was detected in five samples from the First Phase investigation ranging from 8 to 720 μg/kg, but was not detected in any samples from the Second Phase investigation. Chlorobenzene was detected in three samples from the First Phase investigation ranging from 6 to 25 μg/kg, but was not detected in any samples from the Second Phase investigation. Methylene

Eight samples were noncompliant with over 50 percent of the data for the SVOA TCL being rejected. Noncompliant samples included:

Boring	Depth (feet bgs)	Boring	Depth (feet bgs)
TB-101	0-2	TB-122	0-2
TB-102	0-2	TB-123	0-2
TB-106	2-4	TB-129	0-2
TB-116	4-6	TB-129 (DUP)	0-2

Eleven SVOAs were detected in subsurface soil samples collected from the lagoon. A summary of the compounds detected in the First Phase investigation is presented in Table 5-5. Six noncarcinogenic polynuclear aromatic hydrocarbons (PAHs) were the most frequently detected group of SVOAs, found in 13 of 44 samples and 12 of 31 borings; no carcinogenic PAHs were detected.

Diethylphthalate and di-n-octylphthalate were detected in one boring (TB-118) at an estimated concentration of 2,300 μg/kg (2 feet bgs) and at 28,000 μg/kg (4 feet bgs). Isophorone and 1,2-dichlorobenzene were detected in one sample (TB-106, 2 feet bgs) at concentrations of 3,200 and 4,500 μg/kg, respectively. Dichlorobenzene was also detected in one sample (TB-123, surface) at an estimated concentration of 1,300 μg/kg. Dibenzofuran was detected in one sample (TB-106, 2 feet bgs) at an estimated concentration of 4,900 μg/kg. In some cases dibenzofuran may be an indicator of the potential formation of polychlorinated dibenzofurans (PCDFs). PCDFs may be formed from the incomplete combustion of PCBs. However, since there is no historical information that combustion of PCB-contaminated oil occurred at the site, the potential for formation of PCDFs is not considered to be significant.

extraction method with a GC. GC results are presented in Table 5-8. Thirty-nine samples were collected for laboratory analysis to confirm the field screening data. The 39 confirmatory analytical samples selected represented samples where field GC screening results ranged from non-detect to high concentrations of PCBs and TPH. First Phase analytical results are presented in Table 5-9. During the Second Phase program, seven samples and one duplicate were collected from the lagoon and sent for laboratory analysis for pesticides and PCBs. Second Phase analytical results are presented in Table 5-10.

PCB laboratory results of the test boring samples were inconsistent with the field screening data, with the laboratory reporting much lower concentrations than field results. This discrepancy is most likely due to the low recovery from the oily soil matrix samples extracted by steam distillation. Analysis using the Soxhlet and sonication extraction procedures showed improved recovery and results consistent with field findings. Therefore, laboratory results generated using the Soxhlet or sonication procedure were used as presented. For samples where the steam distillation was performed, the field screening data were used. The Second Phase RI field program included additional confirmatory sampling for the field screening results.

PCBs were detected in 64 of the 215 soil samples analyzed during the GC screening. The concentrations ranged from 0.5 to 60 ppm. Results of the screening data indicated that the extent of PCB contamination was from samples collected between the surface and 6 feet bgs. The one exception to this was at TB-124, where PCBs were detected at 2 ppm at 14 feet bgs.

concentrations ranged from 2.5 to 19.9 mg/kg. Barium concentrations in the piezometer locations are much less varied, ranging from 65.8 to 507 mg/kg. Cobalt was detected in one sample at 14.3 mg/kg.

Lagoon Samples. Barium, cobalt, lead, and zinc were detected in the lagoon samples. A summary of the inorganic analyses for the lagoon boring samples is presented in Table 5-12. Barium and lead were detected in the widest range of concentrations and in the greatest number of samples. Barium was detected in 40 of 44 samples in the lagoon borings with estimated concentrations ranging from 24 to 12,100 mg/kg. Lead was detected in 37 of 44 lagoon boring samples with estimated concentrations ranging from 16 to 75,900 mg/kg.

Cobalt and zinc were detected with much less frequency than barium and lead. Cobalt was detected in seven soil boring samples with estimated concentrations ranging from 5.3 to 25 mg/kg. Zinc was detected in 11 boring samples with estimated concentrations ranging from 199 to 72,900 mg/kg.

5.3.6 Total Organic Carbon

Lagoon samples were analyzed for TOC to develop data for use in the Ecological Risk Assessment. A summary of TOC data for the boring samples is presented in Table 5-13. TOC estimated concentrations in lagoon samples ranged from 19,450 to 835,000 mg/kg. The significance of these results will be discussed in the Risk Assessment.

<u>TPH</u>. Based on TPH field screening results, the interpretation of the distribution of TPH suggests there are two discrete areas of contamination, the southwestern and northeastern ends of the lagoon, with a much greater extent of contamination located in the northeastern end. Figure 5-3 illustrates the TPH concentration distribution horizontally and vertically. Sample locations not shaded in Figure 5-3 represent locations where samples were not analyzed for TPH. TPH in concentrations greater that 1,000 ppm have migrated vertically to a depth of greater than 10 feet. However, concentrations greater than 10,000 ppm are typically found within 4 feet of the ground surface in the oil sludge layer.

<u>PCBs</u>. The PCB field screening data from the First Phase investigation has been combined with the analytical data from both the First and Second Phase investigations in the following discussion. PCBs were detected in 63 of 215 field screening samples collected from 31 borings located within the lagoon area in the First Phase investigation. The concentrations ranged from less than 500 μg/kg, the detection limit, to 60,000 μg/kg, and were found to be distributed in depth from ground surface to approximately 10 feet bgs.

Concentrations greater than 10,000 μg/kg tend to be within 2 feet of the ground surface. PCB concentrations greater than 1,000 μg/kg are located within 4 feet of the ground surface, within the oil sludge layer. The exception is TB-6, which exhibits the highest PCB concentration of 60,000 μg/kg at a depth of 4 to 6 feet, within the transition zone between the oil sludge and natural soil. PCBs were not detected in samples collected from 8 to 10 feet bgs with the exception of two samples, TB-106 and TB-107, where PCBs were detected at concentrations greater than 1,000 μg/kg.

Lagoon samples RH-101 through RH-107 were analyzed using the TCLP. Several of the samples failed the TCLP for lead. Also, PCBs at a concentration of 60 ppm were detected in lagoon boring sample, TB-106 collected from 4 to 6 feet bgs. Under both RCRA and New York State regulations, samples failing TCLP analyses are defined as a characteristic hazardous waste. Under New York State regulations, materials containing PCBs at concentrations greater than 50 ppm are defined as a hazardous waste. Based on these data, the lagoon sludge will be subject to federal and state hazardous waste regulations.

5.4 GROUNDWATER

The First Phase groundwater sampling program occurred from May 8 to 12, 1989. Samples were analyzed for TCL VOAs, SVOAs, and inorganics. Because MW-104B was the only monitoring well where VOA contamination was detected in the groundwater in the First Phase investigation, it was determined that an additional exploration was required downgradient of MW-104B to provide more data to further quantify downgradient contamination of the groundwater. During the Second Phase field investigation, MW-204 was installed downgradient of MW-104B for this purpose (see Figure 3-5).

The Second Phase groundwater sampling program occurred during the week of January 13, 1992. The First Phase monitoring wells and four Second Phase wells were sampled. The groundwater samples obtained from the First Phase wells and Second Phase well MW-204 were analyzed for TCL VOAs, inorganics, pesticides, and PCBs. The groundwater samples from the three remaining Second Phase wells, MW-201 through MW-203, were analyzed for TCL VOAs, SVOAs, inorganics, pesticides, and PCBs. The full parameter list was selected for these bis(2-ethylhexyl)-phthalate was also detected in background well, MW-201, at a concentration of 10 μg/L, the method detection limit for that compound. Because this compound was only detected in the background well, it is not considered to be a site contaminant. Analytical results from the Second Phase groundwater sampling are presented in Table 5-16.

5.4.3 Inorganics

During the First Phase investigation, 12 inorganic constituents were detected in groundwater samples. Results of the inorganic analyses of groundwater are presented in Table 5-17. Calcium and magnesium were detected in all the samples. Calcium was detected in concentrations ranging from 17,500 to 54,900 μg/L. Magnesium was detected in concentrations ranging from 5,570 to 27,400 μg/L. Manganese was detected in all samples except MW-102A at concentrations ranging between 33 and 1,210 μg/L. Sodium was detected in all monitoring wells except MW-102B and the duplicate collected at this location. The concentrations ranged from 5,000 to 73,000 μg/L. Iron was detected in four of the 14 samples at estimated concentrations ranging from 720 to 2,120 μg/L.

Other inorganics detected in groundwater include potassium, beryllium, aluminum, barium, chromium, cobalt, and zinc. Potassium was detected in only three samples with estimated concentrations ranging from 5,980 to 34,000 μg/L. Beryllium and zinc were detected in two samples, with beryllium at the detection limit of 5 μg/L and zinc at estimated concentrations of 65 and 7,390 μg/L. Cobalt was detected in two samples at 50 and 70 μg/L. Inorganics detected at a frequency of only one sample included aluminum at 1,100 μg/L, barium at 520 μg/L, and chromium at 10 μg/L. Several inorganics detected in groundwater are constituents that occur was qualified during data validation as a tentative identification. This well was resampled during the Third Phase field event and analyzed for TCL pesticides and PCBs, and delta-BHC was not detected in the sample or duplicate.

5.4.5 Distribution of Contamination

The following paragraphs present an interpretation of the extent of groundwater contamination. The discussion reflects groundwater analytical data from all phases of investigation.

Standards for the protection of groundwater and drinking water supplies have been promulgated under three regulations including: the SDWA (40 CFR Part 141), New York State drinking water standards (10 NYCRR Part 5) and New York State Groundwater Quality Standards (6 NYCRR Part 701-705). Federal regulations usually take precedence over state regulations except when state standards are more stringent. Concentrations of contaminants detected in groundwater were compared to the three sets of standards applicable to groundwater. In all instances, contaminant concentrations were compared to the most stringent standard. MCLs have been promulgated for a number of contaminants detected in groundwater at NLODS.

VOAs. The federal and New York State MCL for PCE, TCE, and benzene is 5 μg/L for each compound. New York State also has a separate groundwater quality standard of 0.7 μg/L for benzene. These standards were exceeded in MW-104B where the highest concentration of PCE was 42 μg/L, TCE was 93 μg/L, and benzene was 12 μg/L.

detected in groundwater during the Second Phase investigation. Of the eight detections of lead, three samples had concentrations above the federal MCL including: MW-101B (17.8 μg/L), MW-105B (41.6 S μg/L), and MW-107A (47.1 μg/L).

The pattern of detection, including both First and Second Phase sampling results, indicates that groundwater quality has been impacted downgradient of the lagoon in the area of MW-104A. It appears that contaminants in the northern portion of the lagoon are entering the groundwater and moving downgradient in a southeasterly direction.

Based on the groundwater data, there is a localized area of TCE and PCE contamination potentially originating from the northeastern end of the lagoon, where the widest distribution of TCE and PCE concentrations were detected in the soil samples. The area of groundwater contamination extends to the south, past MW-104, toward the wetlands and is bounded laterally between MW-103 and MW-105, which did not have TCE or PCE present above detection limits. Contaminated groundwater is potentially discharging to the wetland at concentrations below detection levels, due to dilution and volatilization.

Wells downgradient from the southwestern portion of the lagoon do not show the presence of similar types of contamination. Because VOAs were not detected in these samples, it appears that contamination in the southwestern portion of the lagoon is not adversely impacting downgradient groundwater quality.

5.5.3 Inorganics

Thirteen inorganic constituents were detected in surface water samples at varying concentrations. A total of 16 surface water samples were collected. A summary of inorganic analytical results is presented in Table 5-22.

Lead and manganese were detected in all 12 of the surface water sample collected in the wetland south of the lagoon. The concentration of lead ranged from 8.1 to 15,600 μg/L. Manganese values were estimated and ranged from 20 to 6,200 μg/L. Zinc was another frequently occurring inorganic constituent, detected in eight of the 12 samples in concentrations ranging from 72 to 769 μg/L. Barium was detected in seven of the 12 samples at estimated concentrations ranging from 630 to 9,510 μg/L. Aluminum was found in three samples at 3,340, 7,100, and 4,810 μg/L. Copper was estimated only in one sample at an estimated concentration of 253 μg/L. Cobalt was detected in two samples at a concentration of 60 μg/L. Six other inorganics were detected in the wetland surface water samples including: beryllium, calcium, iron, magnesium, silver, and sodium. Beryllium was found at concentrations of 5 and 6 μg/L, at or slightly above the CRQL of 5 μg/L, in 9 of the 12 samples. The range of concentrations of the other parameters is as follows: calcium at 16,100 to 102,000 μg/L in all 12 samples; iron at 1,650 to 13,660 μg/L in six of 12 samples; magnesium at 5,210 to 16,200 μg/L in all 12 samples; silver at 13 μg/L in one sample only; and sodium at 5,000 to 18,000 μg/L in 10 of the 12 samples.

Analysis of the four background surface water samples (i.e., SW-1, SW-14, SW-15, and SW-16) collected south of McAuslen Road detected six inorganic constituents. Manganese was detected in all samples at estimated concentrations ranging from

The NYSDEC Class B surface water quality standard for lead is dependant upon the hardness of the water. The hardness for each surface water sample was calculated based on the concentration of calcium and magnesium. The hardness value for each sample was then used to calculate the surface water quality standard for lead at each sample point. The calculated standard ranged from 0.71 to 14.21 μg/L, with an average of 3.23 μg/L. Because this average standard is below the CRQL of 5 μg/L for lead, it is difficult to evaluate surface water quality relative to lead. Those samples where lead was detected, exceed the New York State standard; samples where lead was not detected above the CRQL could not be evaluated against the average standard.

NYSDEC surface water quality standards for aluminum (100 μg/L) and zinc (30 μg/L) were exceeded in all samples where these metals were detected. Aluminum was detected in SW-5 (3,340 μg/L); SW-6 (7,100 μg/L), and SW-12 (4,810 μg/L). Zinc was detected in eight samples (SW-2, SW-3, SW-4, SW-5, SW-6, SW-7, SW-11, and SW-12), with concentrations ranging from 72 to 769 μg/L. The concentrations were highest in the ponded section at the southwestern end of the lagoon and decreased with distance from the lagoon into the wetland.

Because sediments are the likely source of inorganic contamination of the surface water, definition of the surface water contamination is not as critical as defining the sediment contamination. Also, the distribution of surface water contamination is likely to change throughout the year as the direction and velocity of water flowing through the wetland varies. Depending on flow velocities, contaminated sediments may be eroded or scoured and redeposited.

immediately southwest of the lagoon. Field sampling observations noted for SD-204 indicate the sample consisted of organic sediment with an oil sheen and apparent oil stain. This sample was collected from the ground surface to 6 inches bgs. The same observations were made regarding SD-206, collected from 6 to 8 inches bgs. Upon further investigation, this oily layer could be found by digging several inches below the ground surface in an area with a radius of approximately 40 feet from surface soil sample location SS-5.

The Third Phase sediment sampling program was conducted in June 1992 to further delineate the area of the wetland that has been impacted by lead contamination. A total of 12 sediment samples were collected from the area south and east of the Second Phase sediment sampling program area, in the direction of surface water flow (see Figure 3-9). The samples were analyzed by NYSDEC for lead only.

5.6.1 Volatile Organic Analytes

VOAs were detected in the two lagoon samples (i.e., SD-2 and SD-3) and four of the 10 sediment samples obtained from the wetland south of the lagoon during the First Phase. A summary of VOA data is presented in Table 5-23. Acetone was detected in four samples with estimated concentrations ranging from 310 to 2,900 μg/kg. TCE was detected in one sample of 16,000 μg/kg. PCE was detected in four samples at estimated concentrations of 33 to 18,000 μg/kg. Sample SD-3 also contained ethylbenzene and total xylenes at estimated concentrations of 11,000 and 28,000 μg/kg, respectively.

5.6.4 Inorganics

Inorganic constituents were detected at varying concentrations in the sediment samples during the First Phase investigation. A summary of sediment inorganic data is presented in Table 5-27. In the wetland samples, barium, lead, and manganese were detected in every sediment sample except SD-11 and SD-6, where barium was not detected. Concentrations of barium detected ranged from 188 to 10,900 mg/kg. Lead concentrations were estimated and ranged from 98 to 76,200 mg/kg.

Manganese was detected at estimated concentrations ranging from 32 to 317 mg/kg. Copper was detected in six samples ranging between 70 and 587 mg/kg. Chromium was detected ranging from 15.8 to 52.7 mg/kg. Arsenic was detected in one sample at 3.6 mg/kg. Other inorganics detected in the sediments included aluminum, which was detected in 10 of the 12 samples. The concentrations ranged from 403 to 4,520 mg/kg. Calcium was detected in all 12 samples, ranging from 3,500 to 28,700 mg/kg. Iron was detected in all 12 samples, ranging from 984 to 4,340 mg/kg. Sodium was detected in only one sample at a concentration of 2,790 mg/kg. Zinc was detected in all 12 samples, ranging from 28 to 6,990 mg/kg.

Analysis of the samples collected near McAuslen Road (SD-1, SD-14, SD-15, SD-16) detected a number of inorganic constituents (see Table 5-27). Lead and manganese were present in every sample. Lead was detected at estimated concentrations of 15 to 102 mg/kg. Manganese was detected in concentrations of 67.1 to 868 mg/kg. Arsenic was detected in two samples, at concentrations of 7.4 mg/kg and 3.2 to 8.5 mg/kg in duplicate samples. Barium was detected in two samples at 74.3 and 200 mg/kg. Cyanide was present in only one sample at 14.3

Because of the elevated concentrations of lead detected in First Phase sediment samples, during the Second Phase 35 samples (i.e., SD-225 through SD-259) were collected along five transects and analyzed for lead only, to try to determine the extent of lead contamination in wetland sediment. The lead concentrations ranged from 7.5 to 2,280 mg/kg. Second Phase lead data for wetland sediments is summarized in Table 5-29.

Additional sampling of wetland sediments was conducted during the Third Phase investigation to further define the area of the wetland impacted by inorganic (i.e., lead) contamination. Twelve samples, and one duplicate, were collected from areas deep in the wetland. Sample locations were selected to follow the direction of the surface water flow through the wetland. Sediment samples were analyzed for lead only. Lead was detected in all 12 samples at concentrations ranging from 14 to 170 mg/kg. Results are summarized in Table 5-30.

5.6.5 Toxicity Characteristic Leaching Procedure

During the Second Phase investigation, three samples, including one duplicate (i.e., SD-204, SD-205, and SD-205 DUP), were analyzed for TCLP inorganics only. Second Phase TCLP results are summarized in Table 5-31. Barium and lead were the two inorganic analytes detected. Barium was detected in leachate of SD-204 at 903 μg/L, leachate of SD-205 and SD-205 DUP at 752 μg/L and 828 μg/L, respectively. Lead was detected at a concentration of 756 μg/L in leachate of SD-204, 293 μg/L and 188 μg/L in leachate of SD-205 and SD-205 DUP, respectively.

from south of McAuslen Road (i.e., Area B) detected elevated levels of inorganics. The purpose of these samples were to provide data on background levels of inorganics in sediments; however, the samples were collected less than 300 feet from McAuslen Road and the data were considered suspect. The elevated levels of inorganics were potentially attributable to proximity to the road.

Because the First Phase background sediment sample data was questionable, Second Phase sediment samples SD-201, SD-202, and SD-203 were collected in the area south of McAuslen road from locations over 700 feet from the road. Concentrations of inorganics detected in these samples were lower than the concentrations detected in the First Phase background samples. Second Phase background sediment data is also within the range of background for soils of both the Eastern United States and New York State (see Table 3-8). It is unlikely that the concentrations detected in the samples can be attributed to the site. Therefore, it is likely that the constituents and related concentrations detected represent background levels, and not the influence of the site.

The primary purpose of the Second Phase background sediment samples was to establish a background concentration for lead. The lead concentrations of samples SD-201, SD-202, and SD-203 are 18.3, 30.2, and 16.5 mg/kg, respectively. The distribution of lead within the wetland area adjacent to the lagoon appears to follow the direction of surface water flow to the east. The highest concentration of lead in lagoon sediments occurs at the southwest end of the berm and the highest concentrations of lead in the wetland sediments in an area within approximately 300 feet of the lagoon berm. It appears that surface water overflow from the lagoon or direct dumping in the wetland adjacent to the lagoon berm is the source of the lead contamination. Surface water movement then transports and distributes in samples SD-206 (0.85 mg/kg), SD-208 (0.76 mg/kg), SD-210 (1.9 mg/kg), SD-218 (1.3 mg/kg), SD-220 and SD-220 DUP (24.1 and 24.2 mg/kg, respectively), SD-221 (22 mg/kg), and SD-222 (23.3 mg/kg). All of these samples are within approximately 300 feet of the southwest end of the lagoon. This localized area of mercury contamination is consistent with the distribution of elevated concentrations of lead and barium detected in wetland sediments.

Seven VOAs were detected in the sediment samples: methylene chloride, acetone, PCE, TCE, toluene, ethylbenzene, and total xylenes. Acetone was detected with the most frequency in the sediment samples. It was detected in SD-1, SD-4, SD-5, SD-6, and SD-8. TCE, PCE, ethylbenzene, and total xylenes were detected at the greatest concentrations in SD-3, from the ponded portion of the lagoon. Only PCE was detected in the sediment sample SD-2 collected from the ponded portion of the lagoon. SD-5 contained elevated concentrations of PCE and toluene and SD-4 contained elevated concentrations of PCE. From the limited VOA data obtained from the wetland, the VOA distribution seems to be localized in the area nearest the lagoon.

The distribution of PCBs in sediment is shown in Figure 5-9. The highest concentrations of PCBs were detected at sample locations SD-3, SD-4, and SD-5. This is consistent with the elevated levels of inorganics found in these samples. PCBs were also detected at SD-8; however, there was no detection of PCBs in surrounding samples. Additional samples were collected during the Second Phase program to confirm the presence or absence of PCBs in the vicinity of SD-8 where PCBs were detected at a concentration of 7,510 μg/kg. SD-206 and SD-207 were collected adjacent to the First Phase sample location SD-4, where PCBs were detected at a concentration of 26,000 μg/kg, and SD-5 where PCBs were detected

5.7 POTENTIAL RECEPTOR AREAS

Three potential receptor areas were identified at the NLODS: the lagoon, forested upland areas adjacent to the lagoon, and the forested wetland downgradient and adjacent to the lagoon. The locations of these areas are shown in Figure 5-11. The lagoon and the forested wetland next to the lagoon have been documented as receptors of site-related chemicals based on environmental sampling. Chemical transport pathways also support selection of the lagoon and wetland as receptor areas. Based on observations and environmental sampling, chemicals in wastes disposed of in the lagoon appear to have migrated from the southwestern end of the lagoon to the wetland during periods of high water which overflowed at the low point in the berm of the lagoon.

Based on environmental sampling and expected transport pathways, forested upland areas adjacent to the lagoon and wetland are not direct receptors of site-related chemicals. Site-related chemicals were not detected in surface soils, with the exception of a sample collected at SS-5. This station is located between the lagoon and the wetland; therefore, it may have become contaminated as a result of discharge from the lagoon to the wetland. Because some terrestrial biota in upland areas could frequent contaminated areas and/or ingest contaminated biota, forested upland areas adjacent to the lagoon have been retained as a potential receptor area.

5.7.1 Lagoon

The lagoon, which is approximately 600 feet long and 75 feet wide, has two distinct sections. The northern section primarily contains oil-saturated sludge with little permit will need to be incorporated into any proposed activity that will affect the wetland or any area within 100 linear feet of its boundary. The boundary of the section of wetland BR-11 adjacent to the site was delineated by Mr. Farquhar on May 11, 1989.

The boundary of the wetland as delineated by Mr. Farquhar extends closer to the lagoon than previously indicated on the official New York State Wetlands Map. Based on results of his site visit, Mr. Farquhar revised the state map (see Figure 5-12). Additionally, he classified wetland BR-11 as a Class II wetland, and described the section of wetland adjacent to the lagoon as "Shrub Swamp Forested." The wetland adjacent to the lagoon is also shown in the NWI map (see Figure 5-13). NWI maps are developed by the U.S. Fish and Wildlife Service based on interpretation of aerial photographs. Wetlands are classified according to a system developed by Cowardin (1979).

The NWI map classifies the section of the forested wetland adjacent to the lagoon, as well as the lagoon itself, as a palustrine, forested, broad-leaved deciduous, seasonally saturated wetland (PFOIE). However, based on Jordan's field investigation, the section of wetland near the lagoon may actually be classified as palustrine, forested/scrub-shrub, broad-leaved deciduous wetland (PFO/SSI), and the lagoon may be classified as palustrine open water or palustrine open water/emergent narrow-leaved persistent wetland (POW/EM5).

Because of the relatively low resolution of aerial photograph interpretation techniques compared with a ground survey, it is not unusual for there to be some discrepancy between the NWI maps and actual conditions. The classifications water and emergent vegetation along some of its perimeters, consisting primarily of common cattail (*Typha latifolia*).

As indicated by NYSDEC and noted by Jordan ecologists during First and Third Phase field investigation on-site observations, the section of the wetland adjacent to the lagoon is a forested/shrub wetland. Dominant tree species in the wetland include red maple (*Acer rubrum*) and northern white cedar (*Thuja occidentalis*). American elm (*Ulmus americana*) and black ash (*Fraxinus nigra*) are also common sub-dominant trees. Common shrub species include red-osier dogwood (*Cornus stolonifera*), northern arrowwood (*Viburnum recognitum*), and winterberry (*Ilex verticillata*). The herbaceous layer includes tussock sedge (*Carex stricta*), with sensitive fern (*Onoclea sensibilis*) and cinnamon fern (*Osmunda cinnamomea*). Duckweed (*Lemna minor*), a small floating species, was also observed in some areas. Additional details of flora and fauna and ecological communities are presented in the Risk Assessment.

Upland forested areas primarily contain deciduous hardwood trees and an understory typical of a hardwood forest. Deciduous tree canopy species include gray birch (*Betula populifolia*), bigtooth aspen (*Populus grandidentata*), and trembling aspen (*Populus tremuloides*). Evergreens include eastern white pine (*Pinus strobus*) and red cedar (*Juniperus virginiana*). The shrub layer is sparsely populated with tree saplings and an occasional black cherry (*Prunus serotina*). The herbaceous layer includes white trillium (*Trillium grandiflorum*), red trillium (*Trillium erectum*), trout lily (*Erythronium americanum*), bracken fern (*Pteridium aquilinum*), and christmas fern (*Polystichum acrostichoides*).

appears elevated only in tadpole, earthworm, and cattail samples; zinc appears high only in the earthworm sample. These high levels are expected based on the reported presence of elevated concentrations of PCBs, lead, and zinc in lagoon sediments.

The earthworm sample also contained high concentrations of other inorganics (including aluminum, cadmium, chromium, copper, iron, nickel, and selenium), which were generally not detected or not present at elevated concentrations in other biota samples. The high concentrations of inorganics in the earthworm sample may be attributable in part to lagoon sludge particles inadvertently included in the sample. (Most earthworms were collected directly from the surface of the lagoon.) However, because earthworms ingest and process soil, they also are expected to accumulate high concentrations of chemicals in their tissues.

Plants do not typically uptake hydrophobic, nonpolar chemicals, such as PCBs, because these chemicals tend to sorb strongly to soil organic matter. However, contamination was visible in the form of black, viscous oil on several cattail samples. It is likely that most of the PCBs reported for the cattail samples were due to this surficial contamination. No attempt was made to remove the surficial contamination because organisms ingesting the cattail roots and shoots may also ingest chemicals present in sludge on the surface of the plant material.

An apparent anomaly in the data set is that the leopard frog sample (a composite of two frogs) collected from the lagoon appears relatively uncontaminated, while leopard frog tadpoles contain some of the highest PCB levels detected. A possible explanation for this is in the feeding habits of the leopard frog. Adult leopard frogs feed primarily on insects, including beetles, lepidopteran larvae, wasps, bugs, velocity). Metals will also be removed through various physical and chemical processes. The First Phase biological tissue sampling data is sufficient for evaluating ecological risks posed by site-related chemicals in the Ecological Risk Assessment. In general, the results support the predicted behavior of site-related chemicals in the environment, and provide adequate data of PCB food chain exposure concentrations.

6.0 SUMMARY AND CONCLUSIONS

Based on the findings of the field investigation activities and results of sampling and laboratory analysis, the following general conclusions can be drawn.

6.1 SOIL AND GEOLOGY

- The subsurface soils consist of a glacial till consisting of varying grain sizes from clay to gravel, with cobbles and boulders of an unknown thickness, which extends to the Potsdam Sandstone bedrock. Overlying this stratigraphic unit are soils consisting of fine to coarse sand ranging to silty sand, extending from the ground surface to a depth of approximately 5 to 17 feet.

- The surface stratigraphic unit of fine sand and silt is absent within the lagoon boundaries.

- Seismic refraction conducted at the site indicates that bedrock is approximately 40 to 85 feet bgs, dipping to the southwest.

- Results of the magnetometer survey of the closed North Lawrence Town Landfill indicate the landfilled wastes were apparently dumped and moved to various areas around the perimeter of the landfill. There was no evidence of trenching and there was no apparent systematic use of cover soil.

York State regulations, materials containing PCBs at concentration greater than 50 ppm are defined as a hazardous waste. Based on these data, the lagoon sludge will be subject to federal and state hazardous waste regulations.

- No inorganics were detected at levels of concern in th e eight piezometer soil samples; nor, were any TCL VOAs, SVOAs, or pesticide/PCBs detected in PZ-2, the only piezometer soil sample analyzed for the full TCL.

6.2 GROUNDWATER

- Overburden at the site functions as a single water table aquifer and is largely unconfined.

- Shallow groundwater at the site is influenced by a topographic high creating a groundwater mounding effect. Shallow groundwater flow is interpreted to flow in two directions, toward the south and northeast, from MW-102. Deep groundwater flow is interpreted to flow in a southerly direction.

- Based on the shallow monitoring wells, the hydraulic conductivity for the silty sand unit overlying the glacial till was determined to range from 0.056 to 1.7 ft/day. With a hydraulic gradient ranging from 0.01 to 0.02 ft/ft, the horizontal flow rate is estimated to range from 3.7 to 7.5 ft/yr.

monitoring wells MW-202 and MW-203, the TCE and PCE contamination is attributed to the contaminated lagoon sludge.

6.3 Surface Water and Sediment

- Results of the surface water and sediment sampling and analysis indicate that contamination in the southwestern end of the lagoon and in the wetland southeast of the lagoon migrates in the direction of surface water flow.

- Sediment samples from the lagoon and area of wetland within approximately 300 feet adjacent to the lagoon, are primarily contaminated with lead, barium, mercury, PCBs, and VOAs. The primary contaminants are inorganics, particularly lead, and trace levels to below detection limits of VOAs and PCBs. Contaminant concentration decreases with distance from the lagoon in the direction of surface water flow.

- Sediment samples collected from wetland areas greater than approximately 300 feet from the lagoon are primarily contaminated with lead. The lead concentration decreases with distance from the lagoon and is distributed in the direction of surface water flow. Third Phase RI sampling detected lead in sediments at concentrations ranging from 14 to 170 mg/kg at distances of approximately 3,000 feet from the lagoon, following the direction of surface flow.

- Because several wetland sediment samples failed the TCLP analysis

6.4 Ecosystem Characterization

- Three potential receptor areas were identified: the lagoon, the forested upland areas adjacent to the lagoon, and the wetland adjacent to the lagoon.

- Based on environmental sampling and expected transport pathways, the lagoon and wetland areas adjacent to the lagoon have been documented as receptors of site-related chemicals. The upland areas adjacent to the lagoon and wetlands are not direct receptors.

- The wetland on site is under NYSDEC jurisdiction; therefore the substantive requirements of the Division of Fish and Wildlife wetlands permit will need to be incorporated into any proposed activity that will affect the wetland or any area within 100 feet of its boundary.

- PCBs and some elevated inorganic levels were detected in biota samples collected from the site, indicating probable food chain contamination. The samples collected in the lagoon area had the highest concentrations of contaminants; the farther away from the lagoon, the lower concentrations were.

6.5 Air

- No detectable levels of PCBs in the air were detected at the site.

AA&D	American Auger and Ditching, Inc.
AGC	ambient guidance concentration
ARAR	Applicable, or Relevant and Appropriate, Requirement
ASP	Analytical Services Protocols
AWQC	Ambient Water Quality Criteria
bgs	below ground surface
CFR	Code of Federal Regulations
CLP	Contract Laboratory Protocols
cm/sec	centimeters per second
CRQL	Contract Required Quantitation Limit
CWM	Chemical Waste Management, Inc.
DQO	Data Quality Objective
ECD	electron capture detector
F	Fahrenheit
FID	flame ionization detector
fps	feet per second
FS	Feasibility Study
ft/day	feet per day
ft/ft	feet per foot
ft/yr	feet per year
GC	gas chromatograph(y)
HASP	Health and Safety Plan
HRS	Hazard Ranking System
HSA	hollow-stem auger
ID	inside diameter
Jordan	E.C. Jordan Co.
MCL	Maximum Contaminant Level
mg/kg	milligram per kilogram
Modi	Modi Associates
mph	miles per hour

VOA volatile organic analytes

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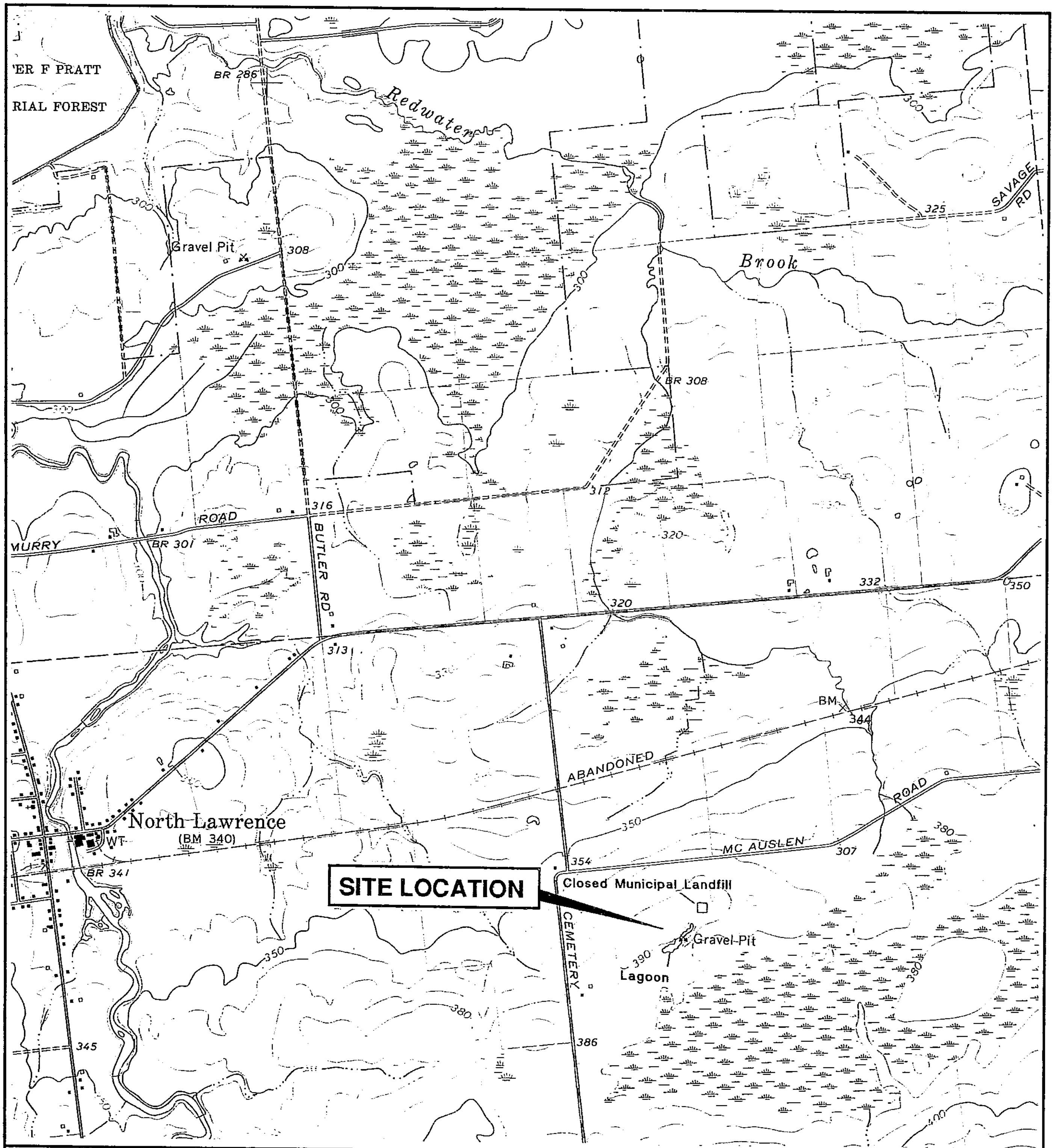
FIGURES



SOURCE: USGS TOPOGRAPHIC 7.5 MINUTE SERIES, NORTH LAWRENCE, NY, 1964

QUADRANGLE LOCATION

SCALE IN FEET

0 2,000 4,000

FIGURE 1-1
SITE LOCATION MAP
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

E.C.JORDAN CO.

6886-03

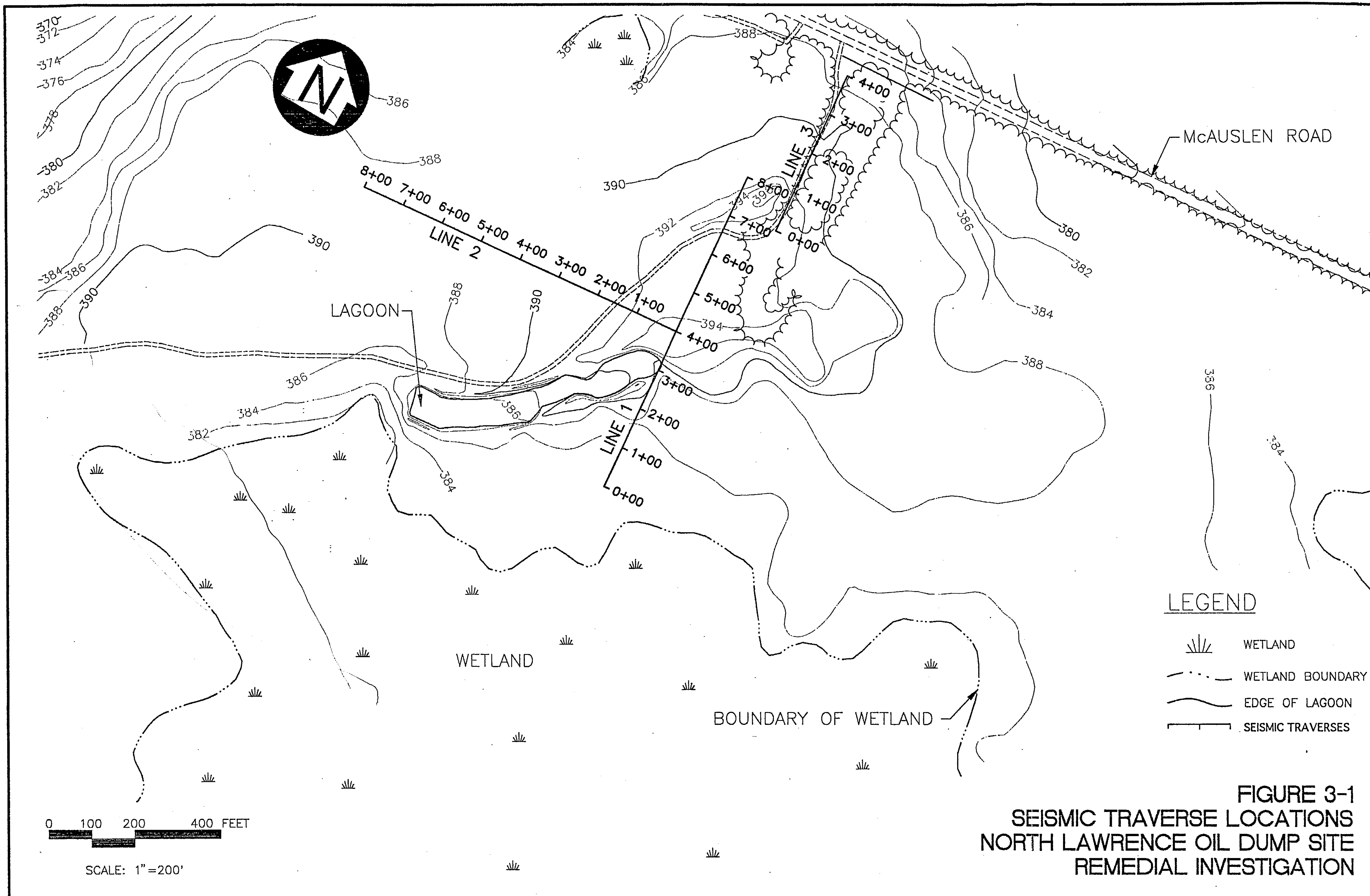


FIGURE 3-1
SEISMIC TRAVERSE LOCATIONS
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

E.C. JORDAN CO.

6886-03\FIG\6886F15\8-21-92

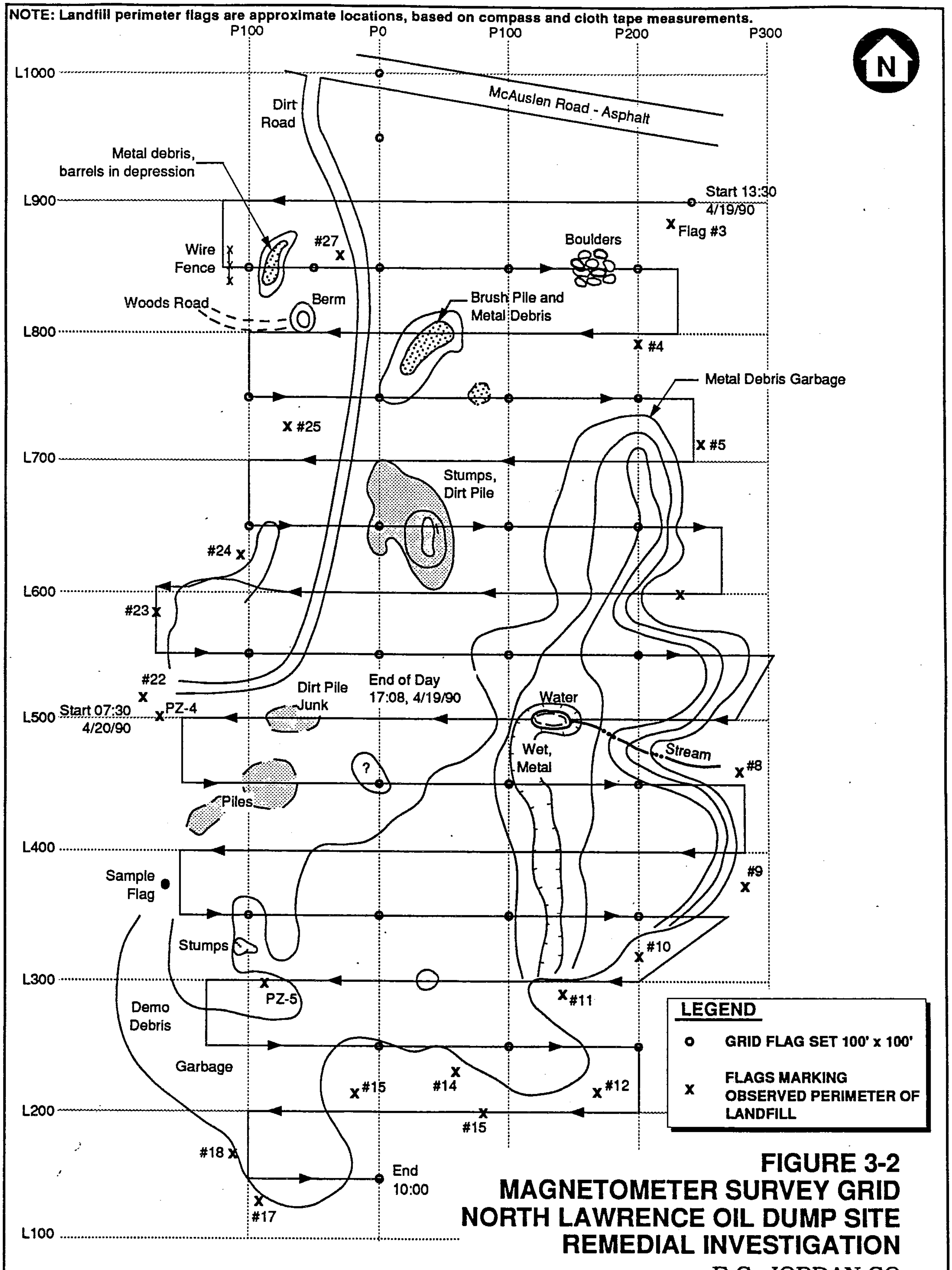


FIGURE 3-2
MAGNETOMETER SURVEY GRID
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

E.C. JORDAN CO.

9204123D

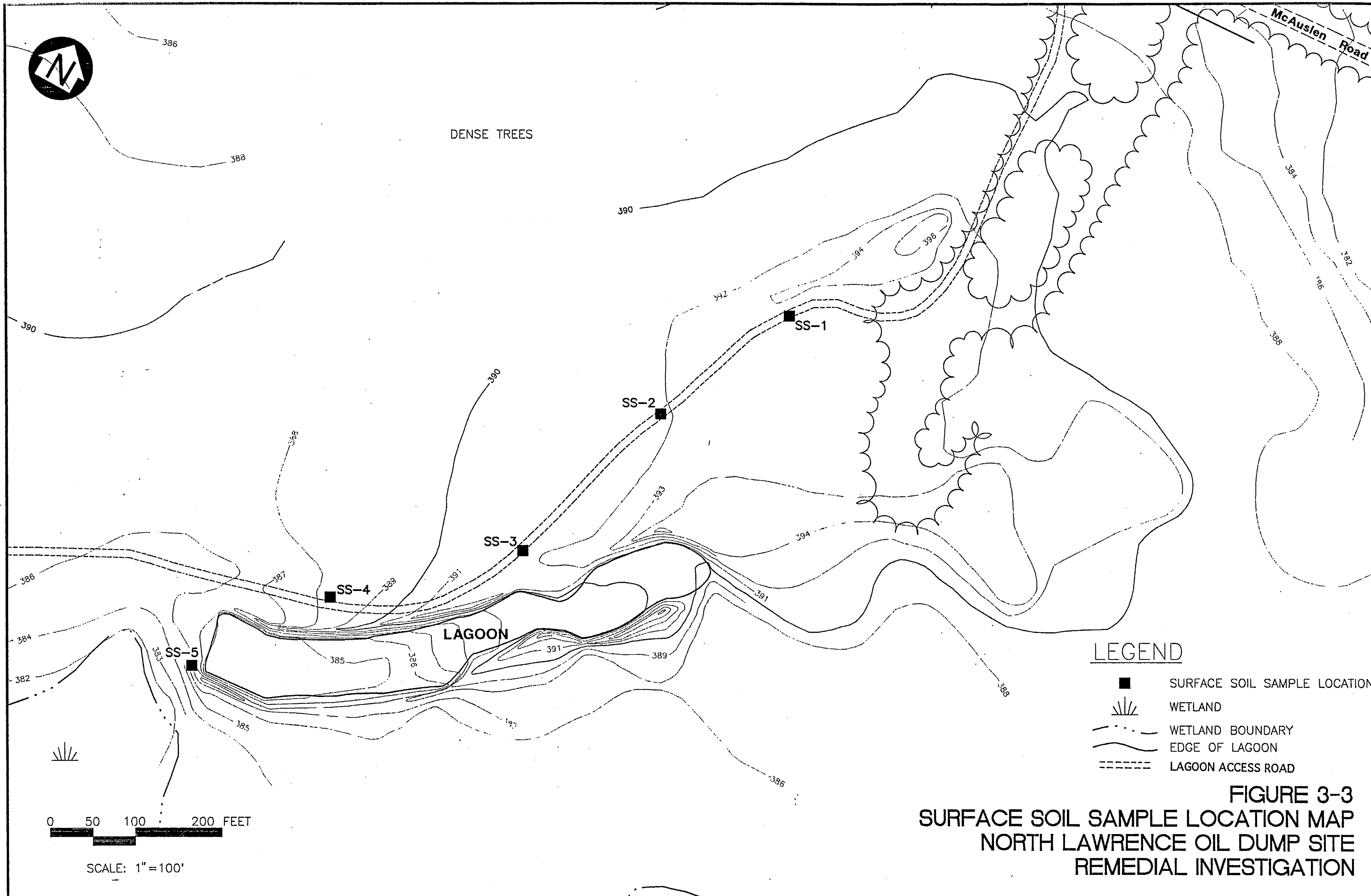


FIGURE 3-3
SURFACE SOIL SAMPLE LOCATION MAP
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

E.C. JORDAN CO.

683-03\FIG\6836F09\3- 3-92

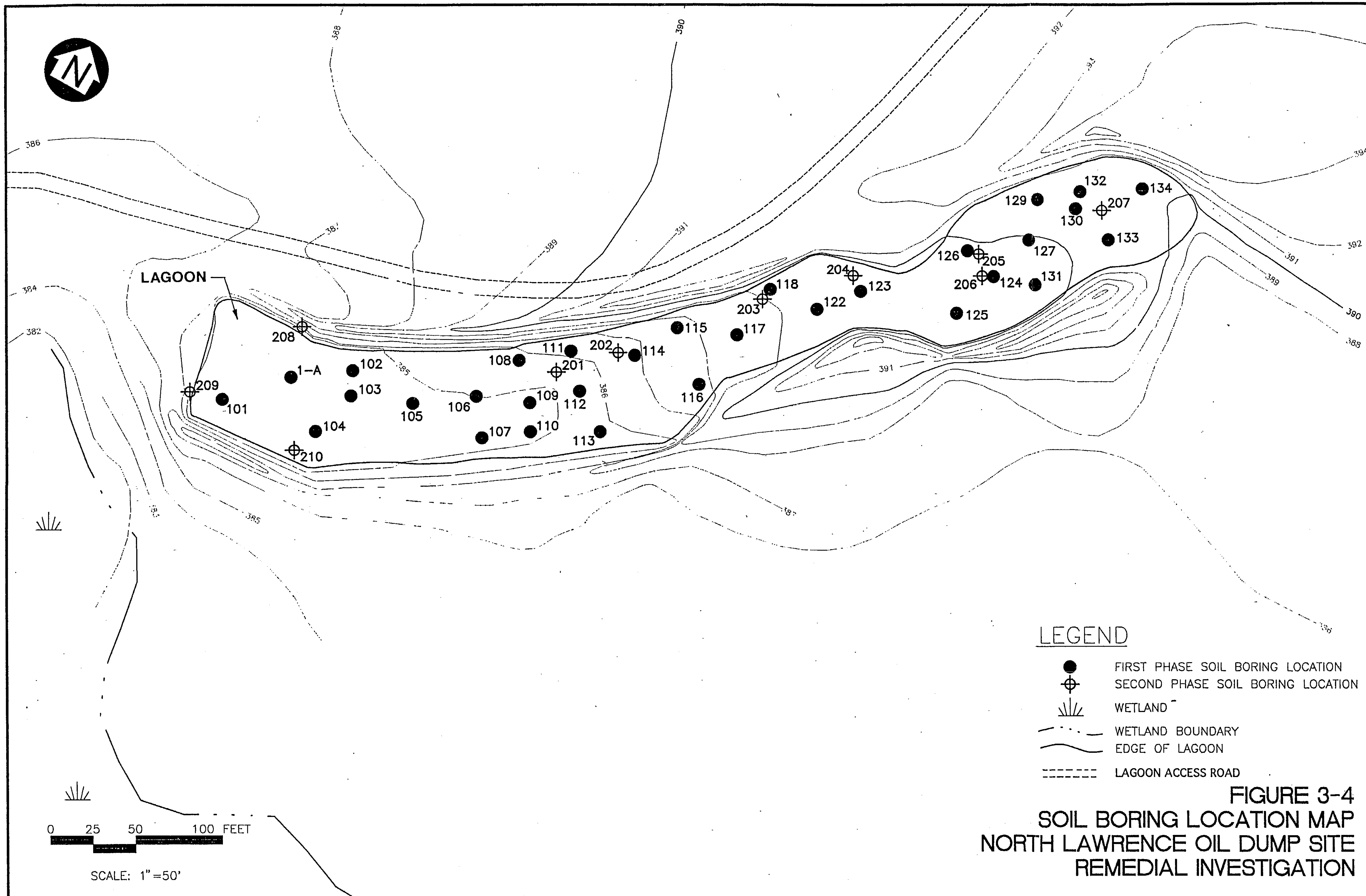


FIGURE 3-4
SOIL BORING LOCATION MAP
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

E.C. JORDAN CO.

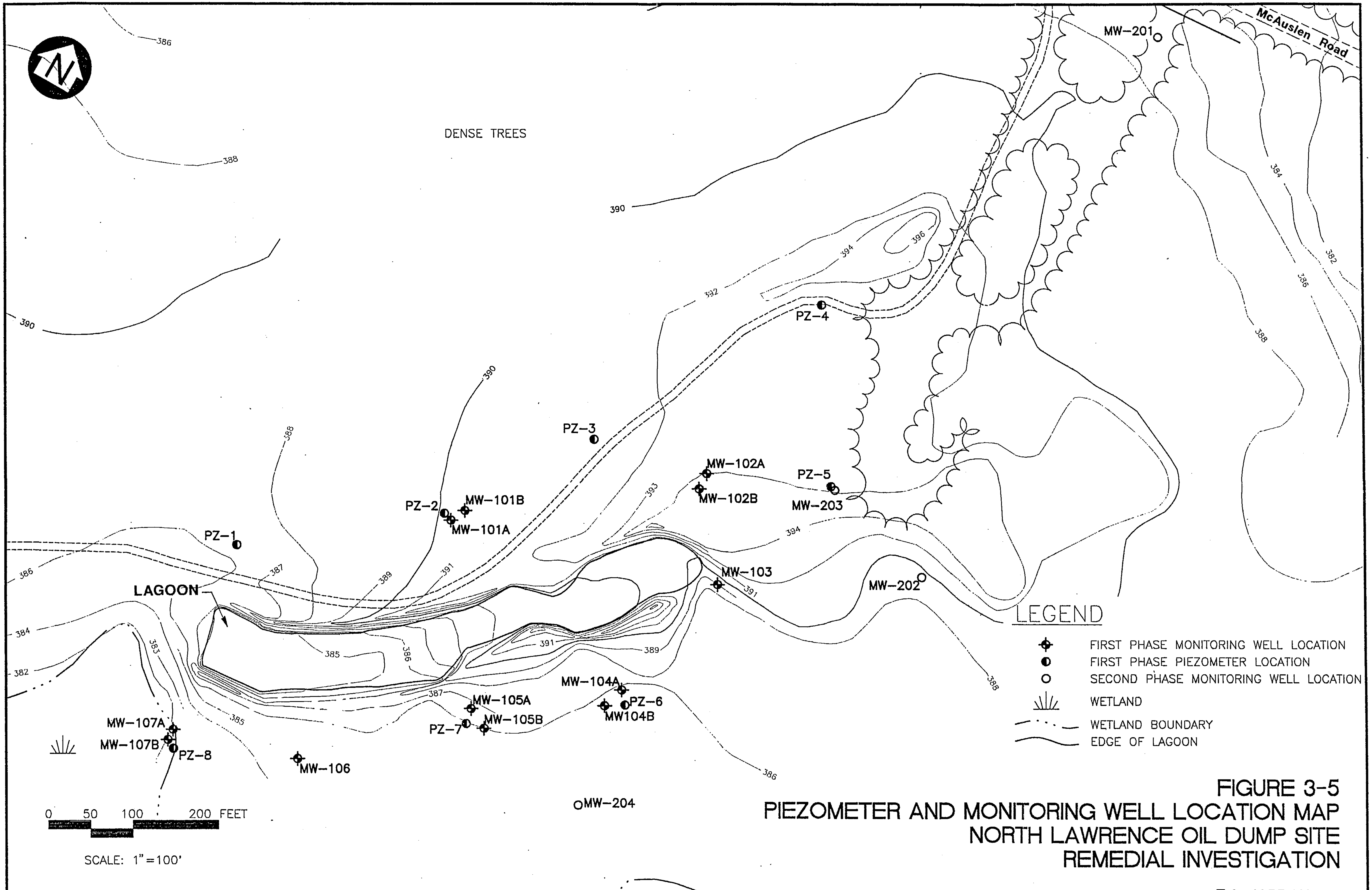


FIGURE 3-5
PIEZOMETER AND MONITORING WELL LOCATION MAP
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

E.C. JORDAN CO.

688-03\FIG\6880F03\8-19-92

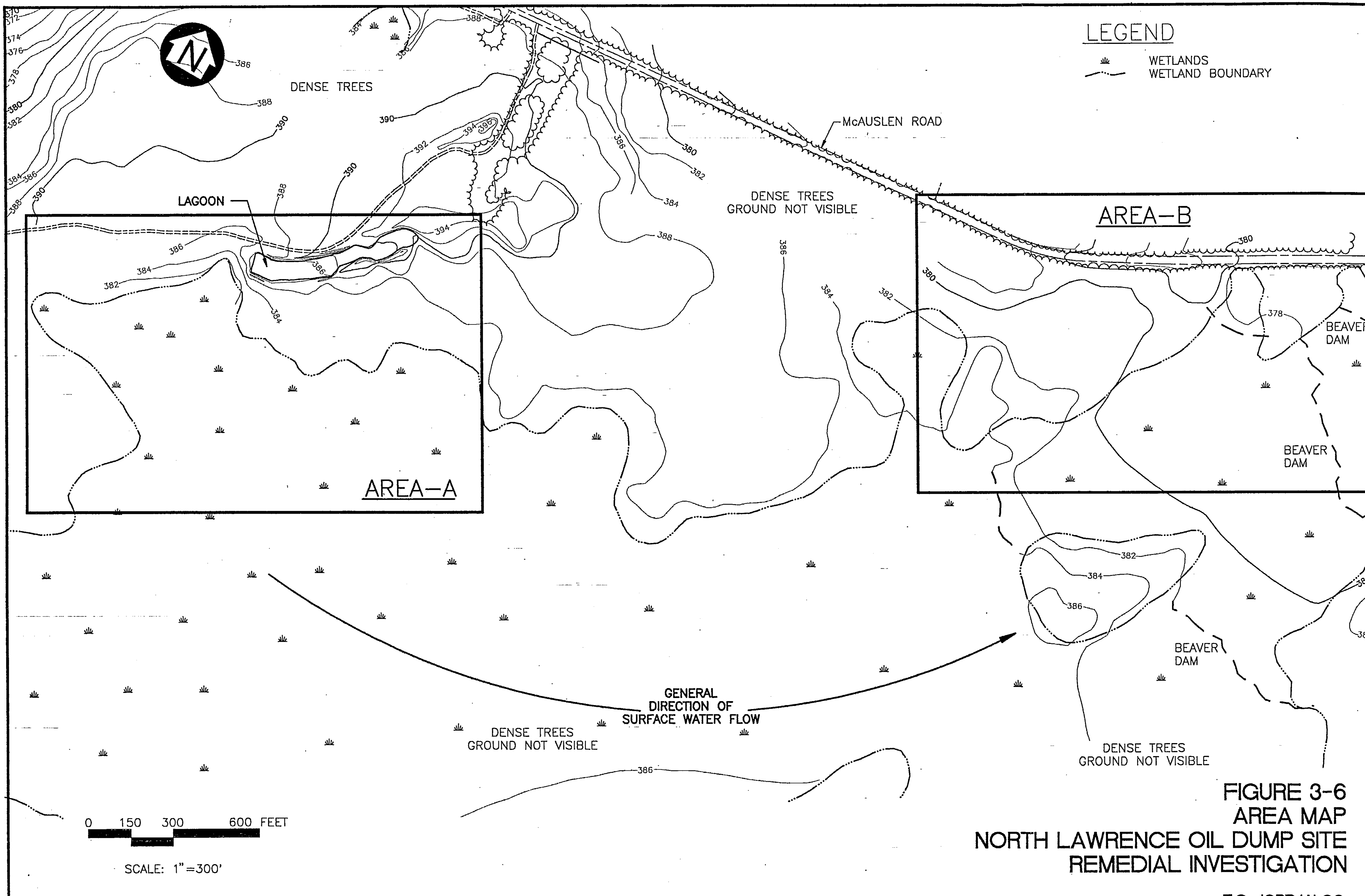


FIGURE 3-6
AREA MAP
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

6886-03\FIG\6886F01\12-22-92

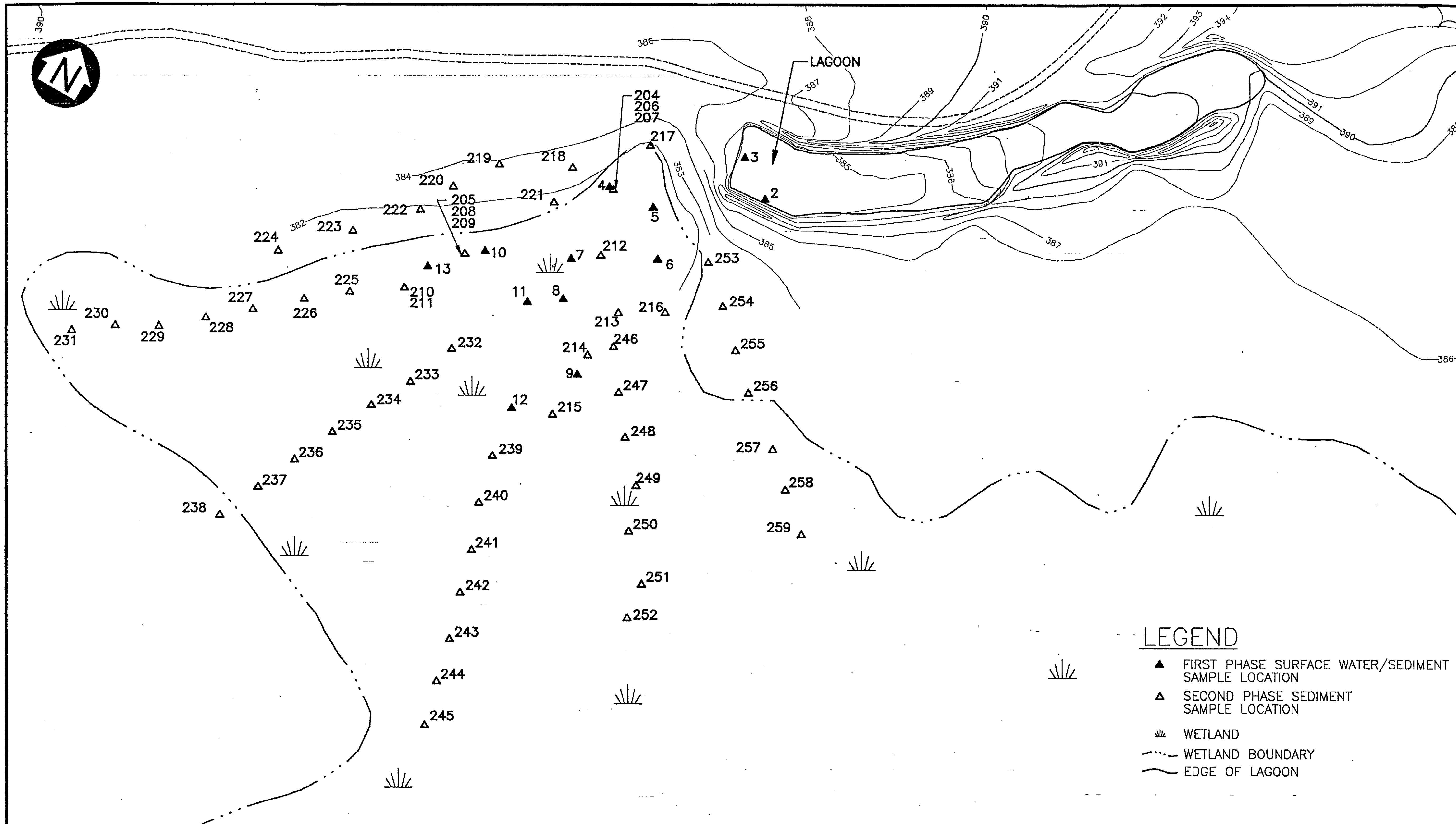


FIGURE 3-7
SURFACE WATER/SEDIMENT SAMPLE LOCATIONS - AREA A
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

E.C. JORDAN CO.

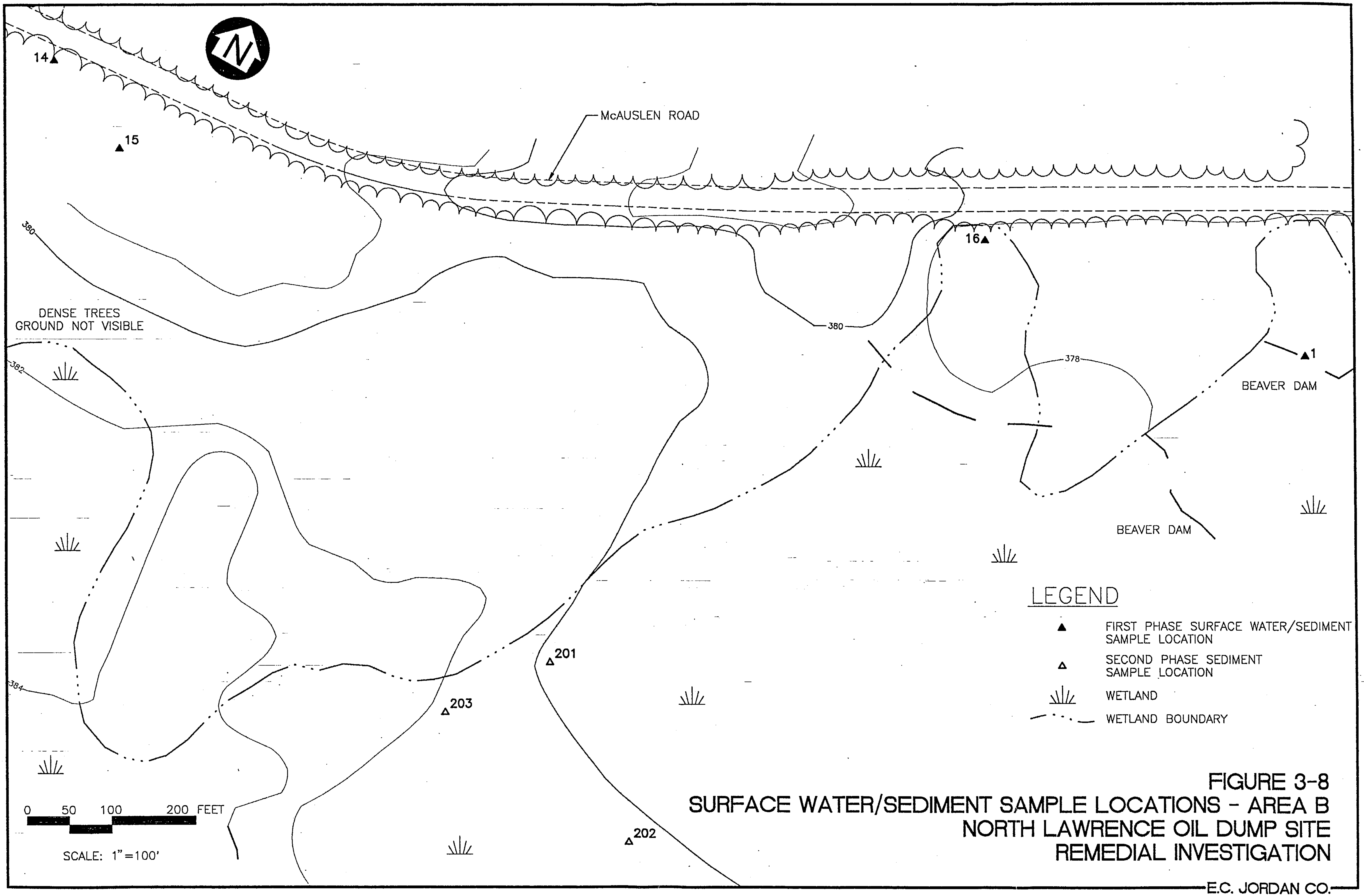
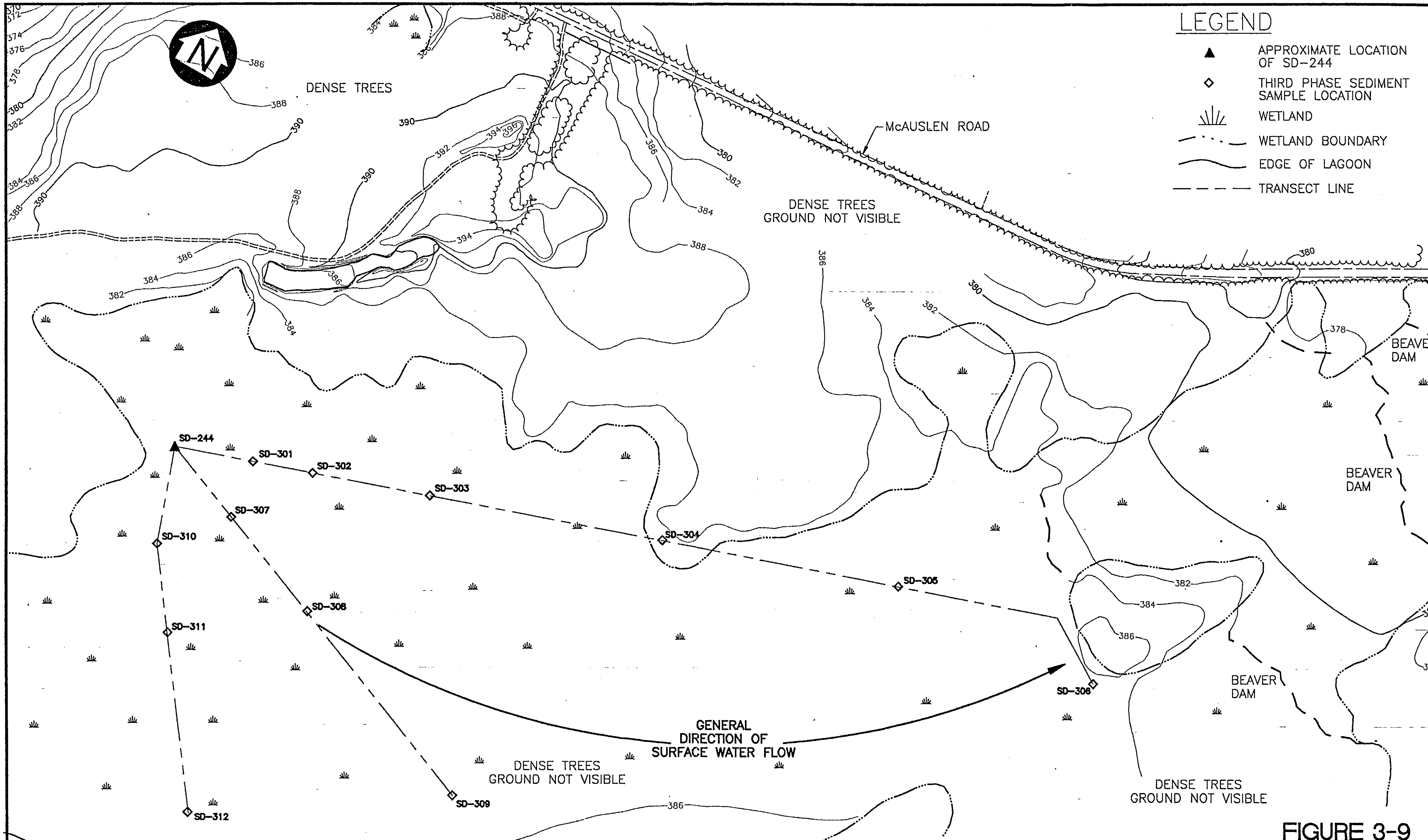


FIGURE 3-8
SURFACE WATER/SEDIMENT SAMPLE LOCATIONS - AREA B
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

6889-03\FIG\6889408\12-22-92



NOTE:
THIRD PHASE SEDIMENT SAMPLE LOCATIONS WERE NOT SURVEYED. LOCATIONS ARE BASED ON FIELD MEASUREMENTS RELATIVE TO SAMPLE LOCATION SD-244.

FIGURE 3-9
THIRD PHASE SEDIMENT SAMPLE LOCATION MAP
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

E.C. JORDAN CO.

6886-03\FIG\6886F27\12-22-92

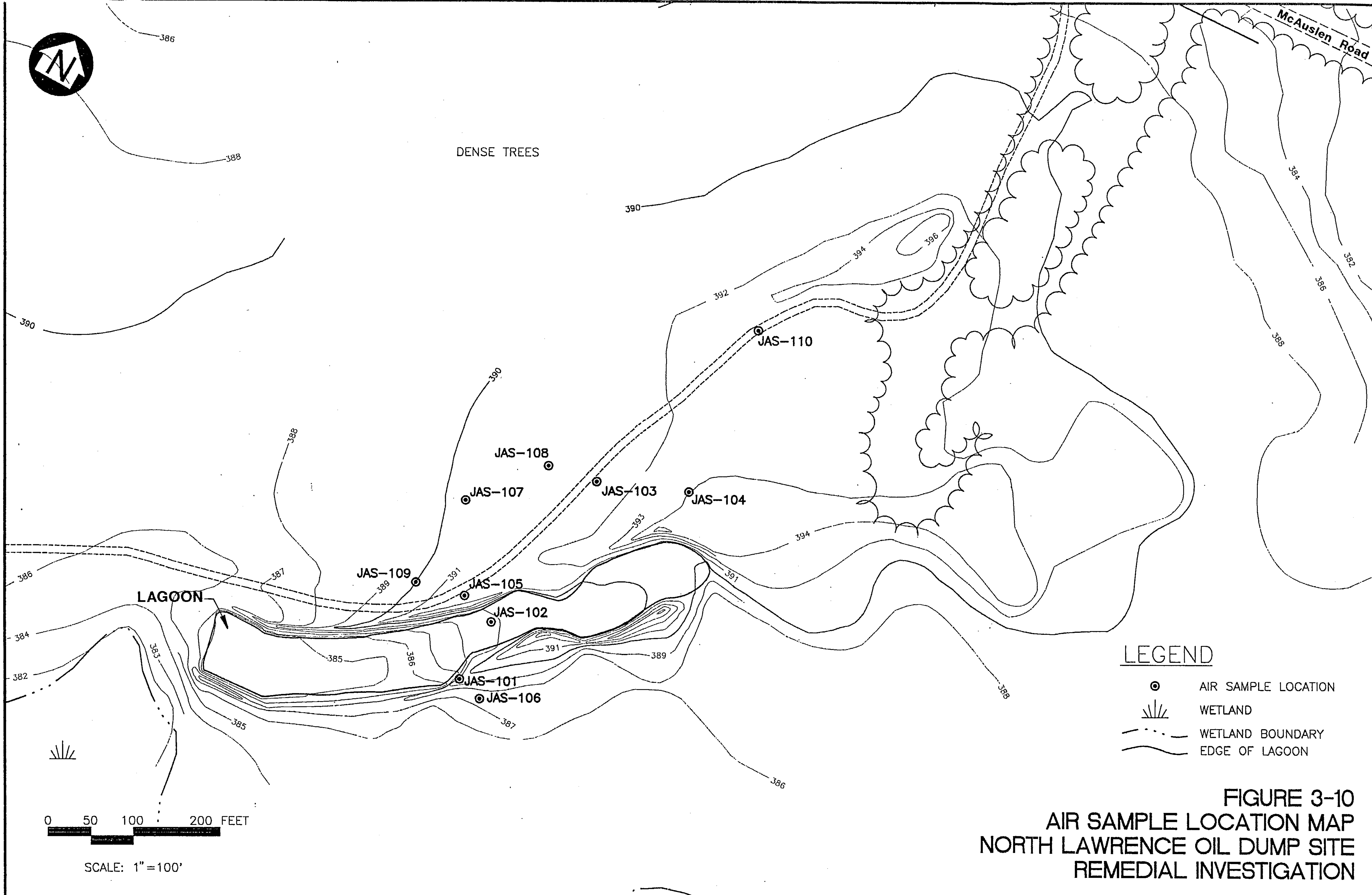


FIGURE 3-10
AIR SAMPLE LOCATION MAP
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

E.C. JORDAN CO.

6886-03\ NC\ 6886F06\ 8-19-92

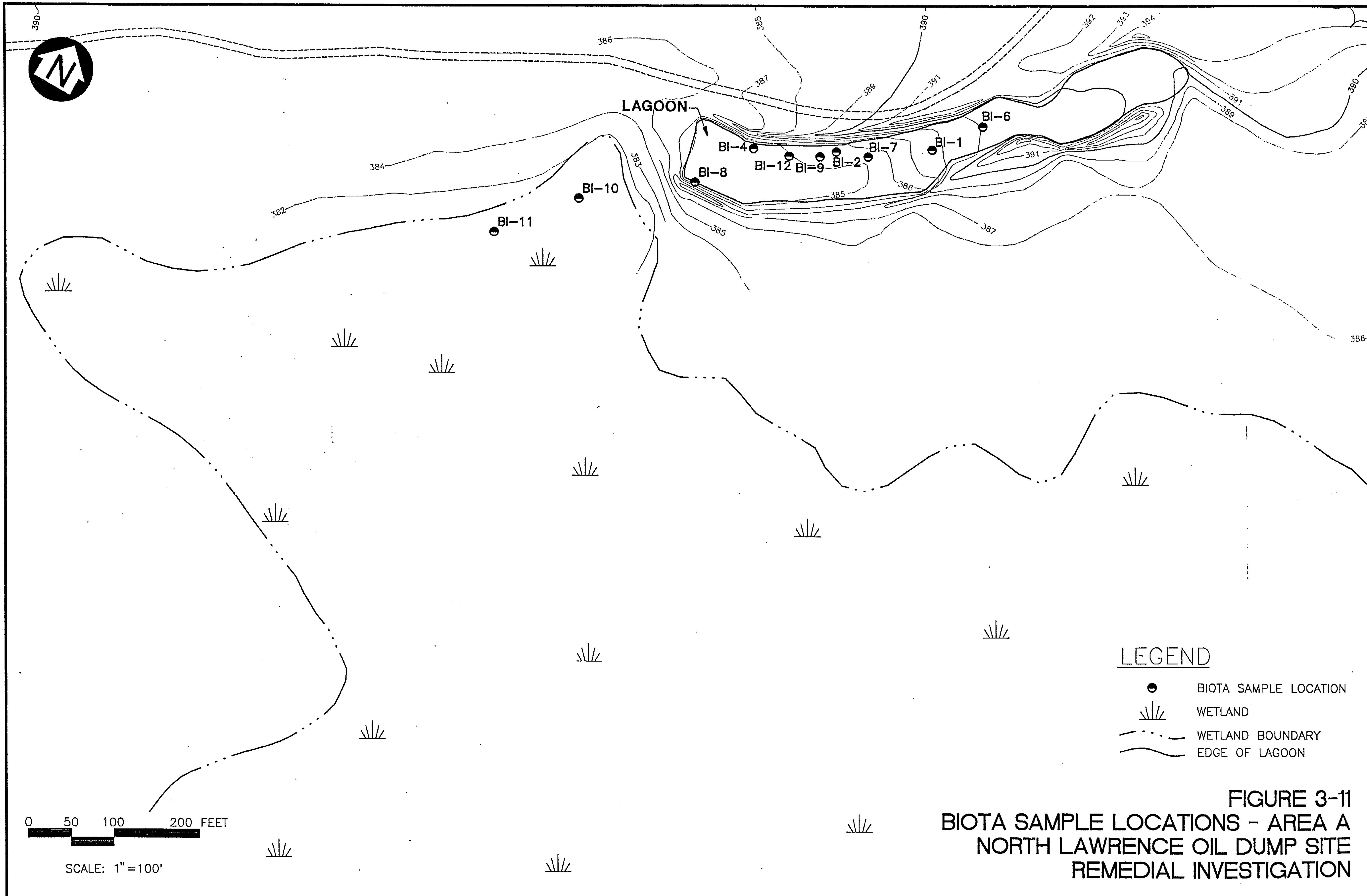


FIGURE 3-11
BIOTA SAMPLE LOCATIONS - AREA A
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

E.C. JORDAN CO.

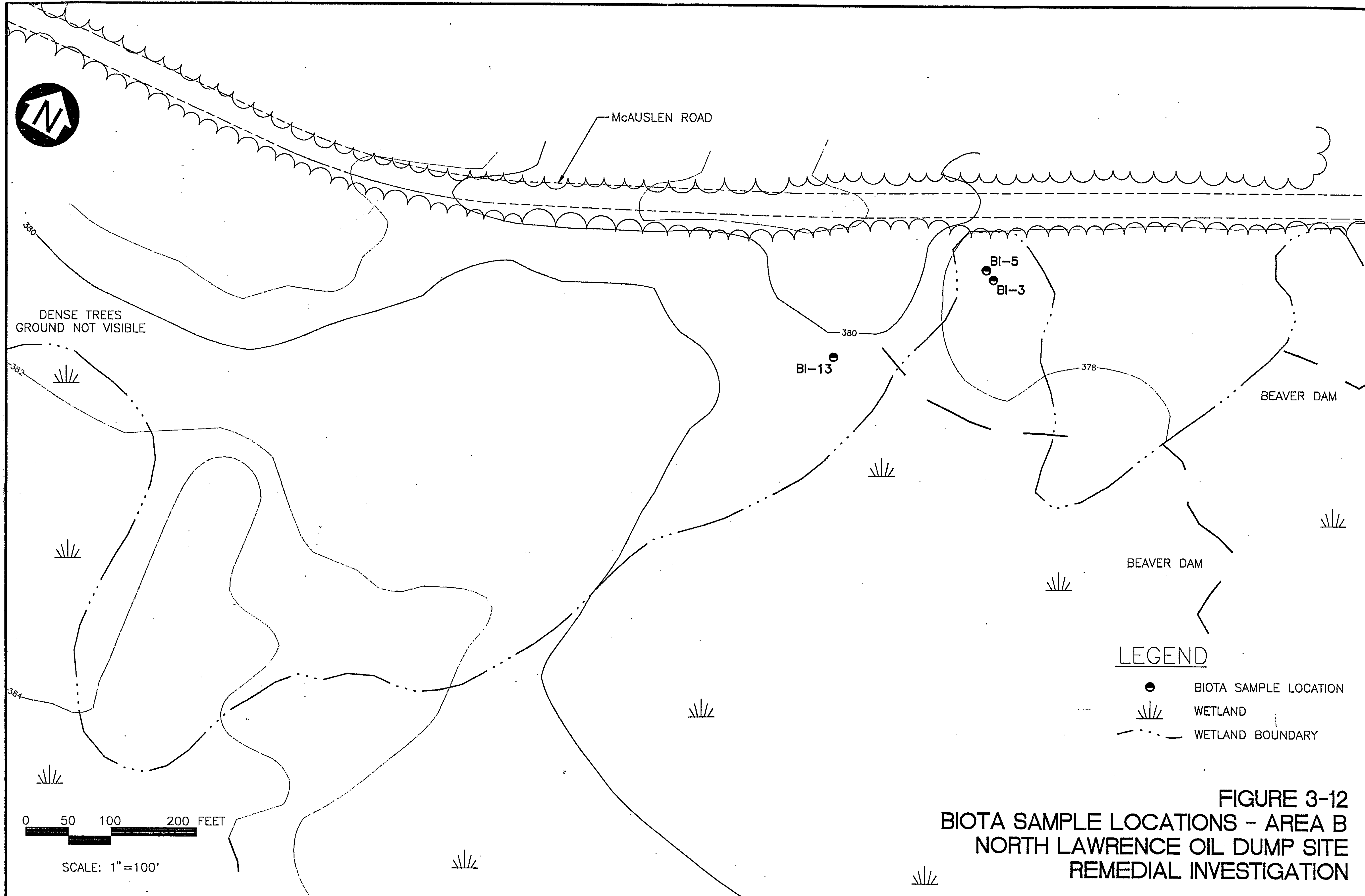


FIGURE 3-12
BIOTA SAMPLE LOCATIONS - AREA B
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

E.C. JORDAN CO.

6886-03\FIG\6886F13\8-19-92

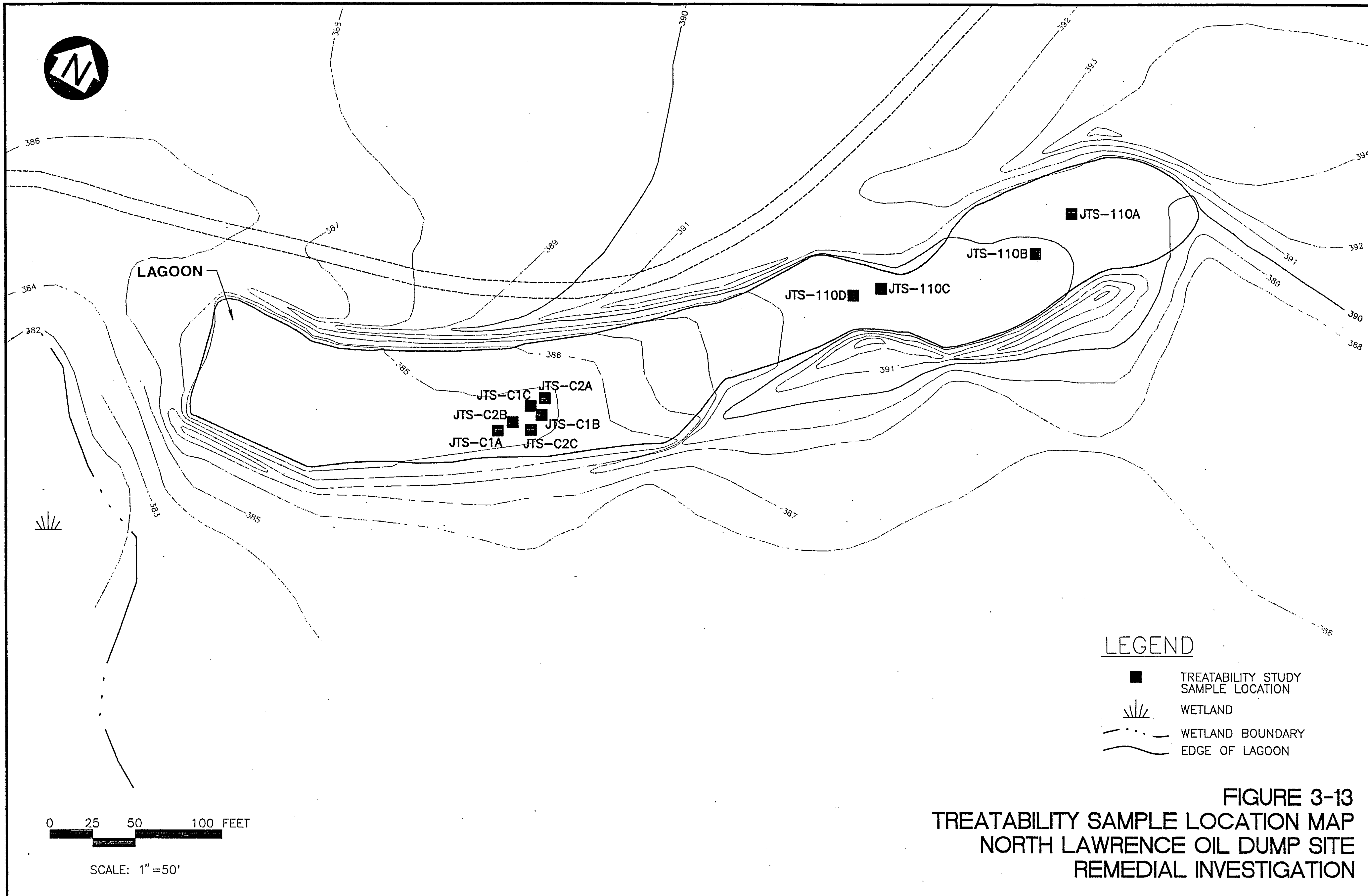
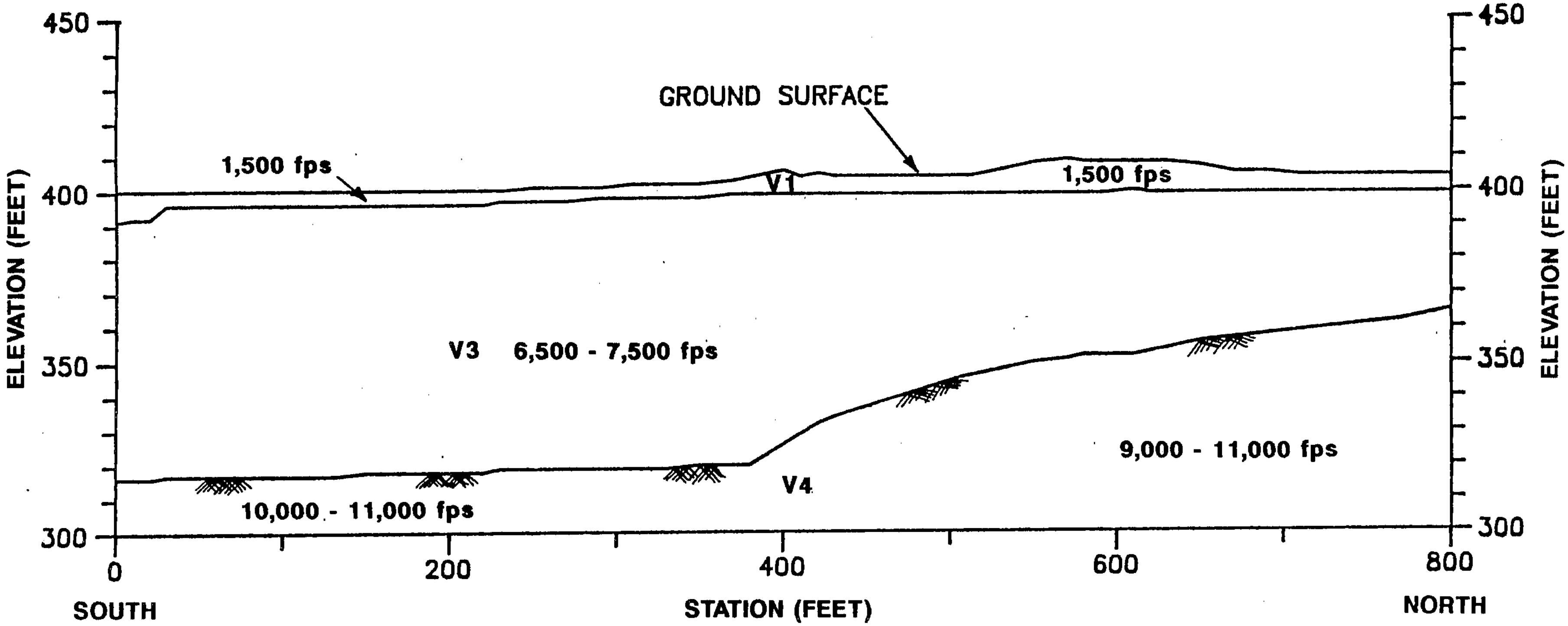


FIGURE 3-13
TREATABILITY SAMPLE LOCATION MAP
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

E.C. JORDAN CO.

6886-03\FIG 6836F07.3-15-92



LEGEND

V1 — 1,200 to 1,800 fps. Loose, unconsolidated and unsaturated topsoil.
V2 — 4,800 to 5,200 fps. Saturated, unconsolidated overburden.
V3 — 6,500 to 7,500 fps. Saturated, dense overburden (glacial till?).
V4 — 9,000 to 14,500 fps. Bedrock. Higher values may indicate relatively more competent zones; lower values may indicate weathered and/or fractured zones.

NOTES: (1) Ground surface is estimated from field observations and available topographic maps.

(2) Seismic velocity values are in feet per second (fps).

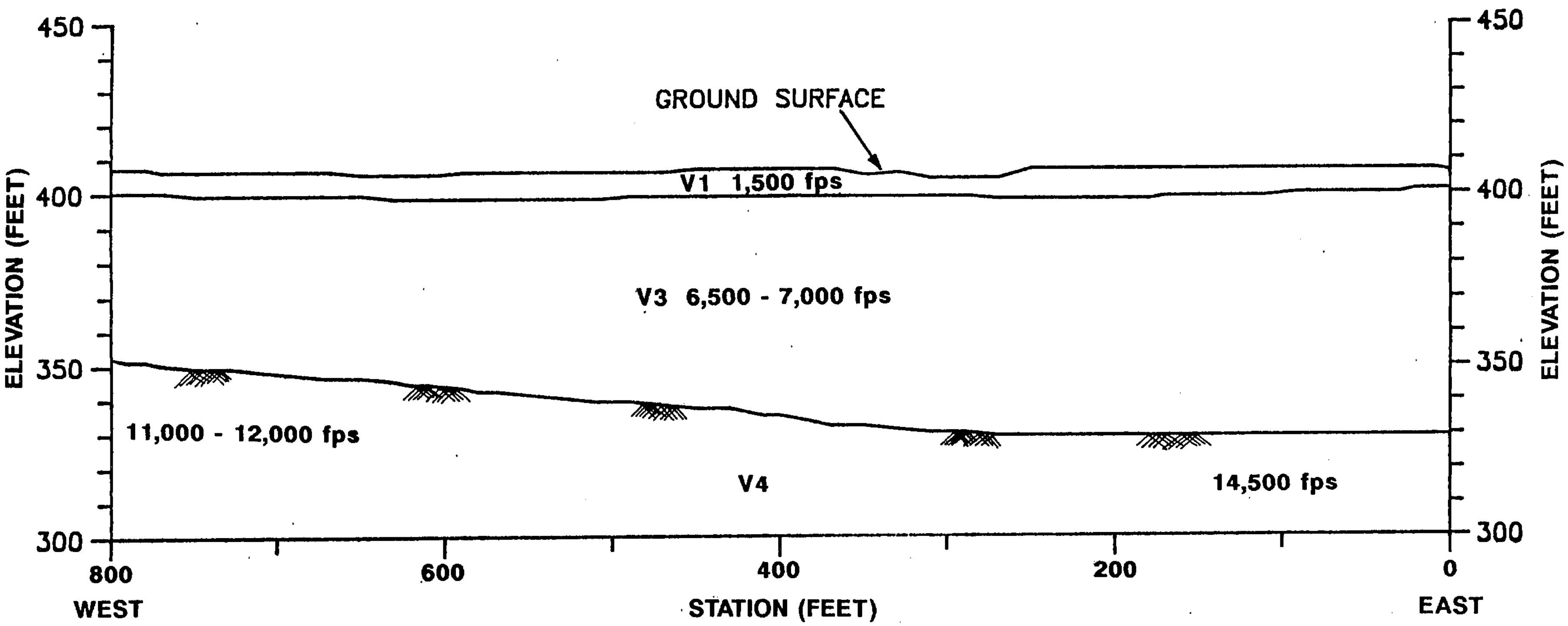
(3) Vertical exaggeration is 2:1.

(4) For orientation of the profile, see Figure 3-1.

FIGURE 4-1
SEISMIC REFRACTION PROFILE - LINE 01
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

E.C.JORDAN CO.

6886-03



LEGEND

V1 – 1,200 to 1,600 fps. Loose, unconsolidated and unsaturated topsoil.
V2 – 4,800 to 5,200 fps. Saturated, unconsolidated overburden.
V3 – 6,500 to 7,500 fps. Saturated, dense overburden (glacial till?).
V4 – 9,000 to 14,500 fps. Bedrock. Higher values may indicate relatively more competent zones; lower values may indicate weathered and/or fractured zones.

NOTES: (1) Ground surface is estimated from field observations and available topographic maps.

(2) Seismic velocity values are in feet per second (fps).

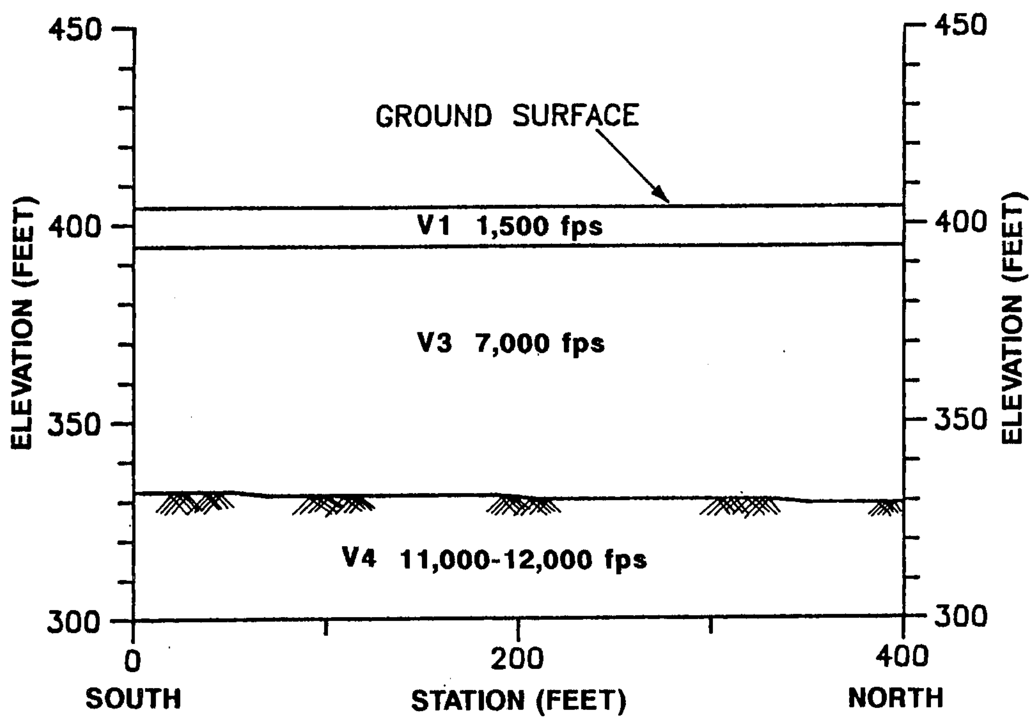
(3) Vertical exaggeration is 2:1.

(4) For orientation of the profile, see Figure 3-1.

FIGURE 4-2
SEISMIC REFRACTION PROFILE - LINE 02
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

E.C.JORDAN CO.

6886-03



LEGEND

V1 – 1,200 to 1,800 fps. Loose, unconsolidated and unsaturated topsoil.
V2 – 4,800 to 5,200 fps. Saturated, unconsolidated overburden.
V3 – 6,500 to 7,500 fps. Saturated, dense overburden (glacial till?).
V4 – 9,000 to 14,500 fps. Bedrock. Higher values may indicate relatively more competent zones; lower values may indicate weathered and/or fractured zones.

NOTES: (1) Ground surface is estimated from field observations and available topographic maps.

(2) Seismic velocity values are in feet per second (fps).

(3) Vertical exaggeration is 2:1.

(4) For orientation of the profile, see Figure 3-1.

FIGURE 4-3
SEISMIC REFRACTION PROFILE - LINE 03
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

E.C.JORDAN CO.

6886-03

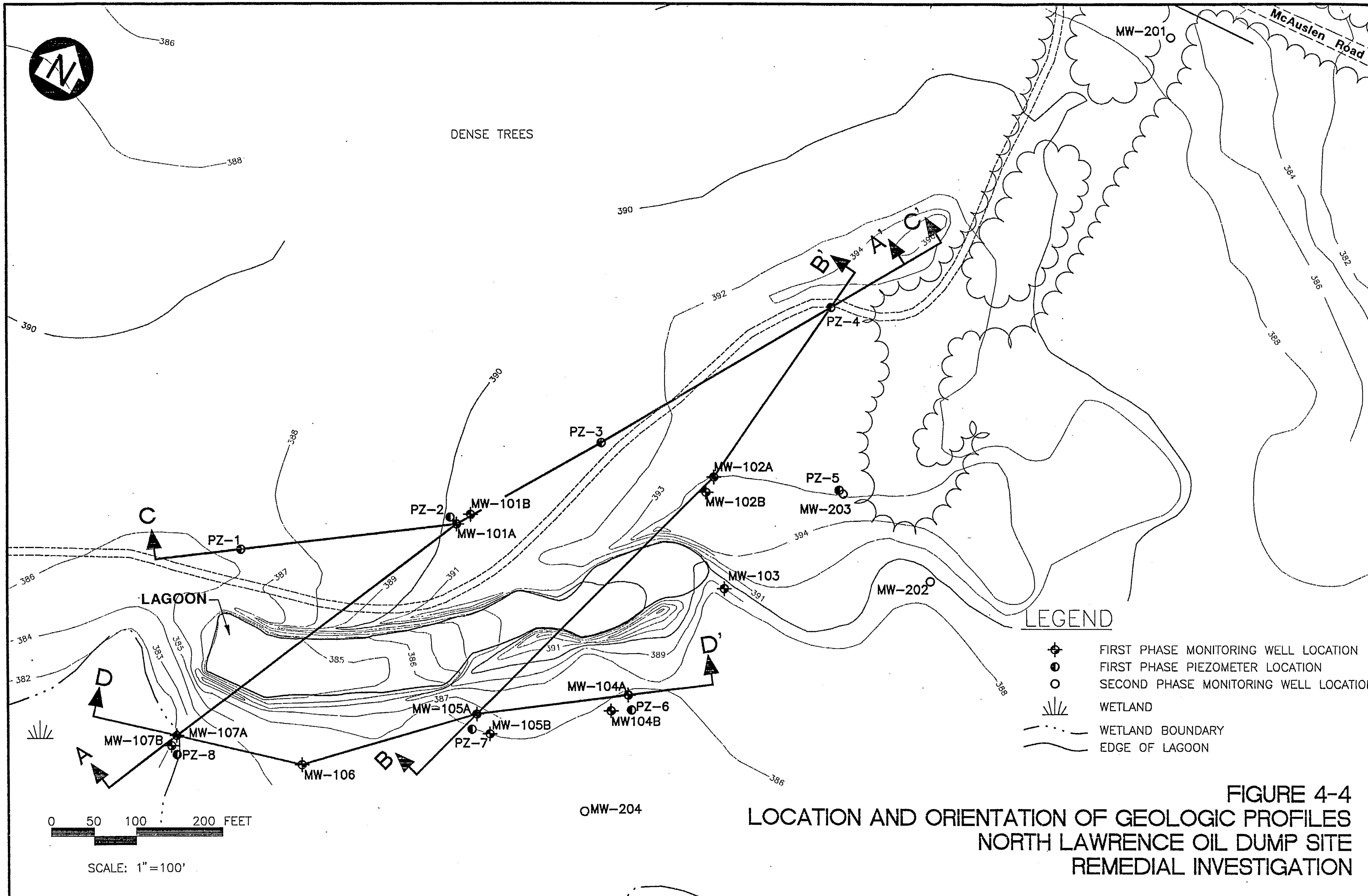
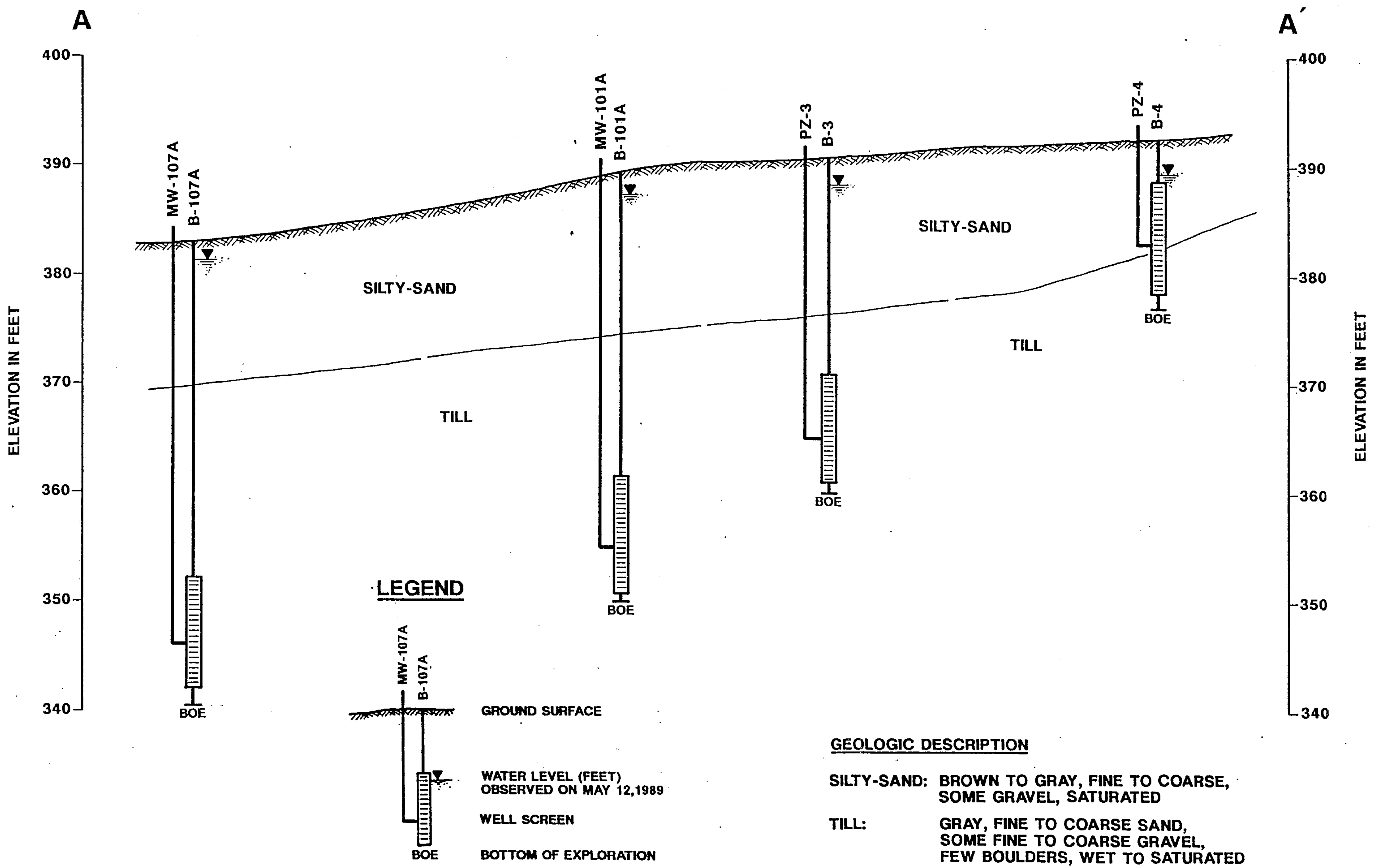


FIGURE 4-4
LOCATION AND ORIENTATION OF GEOLOGIC PROFILES
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION



HORIZONTAL SCALE

0 100 200 FEET

VERTICAL EXAGGERATION 10:1

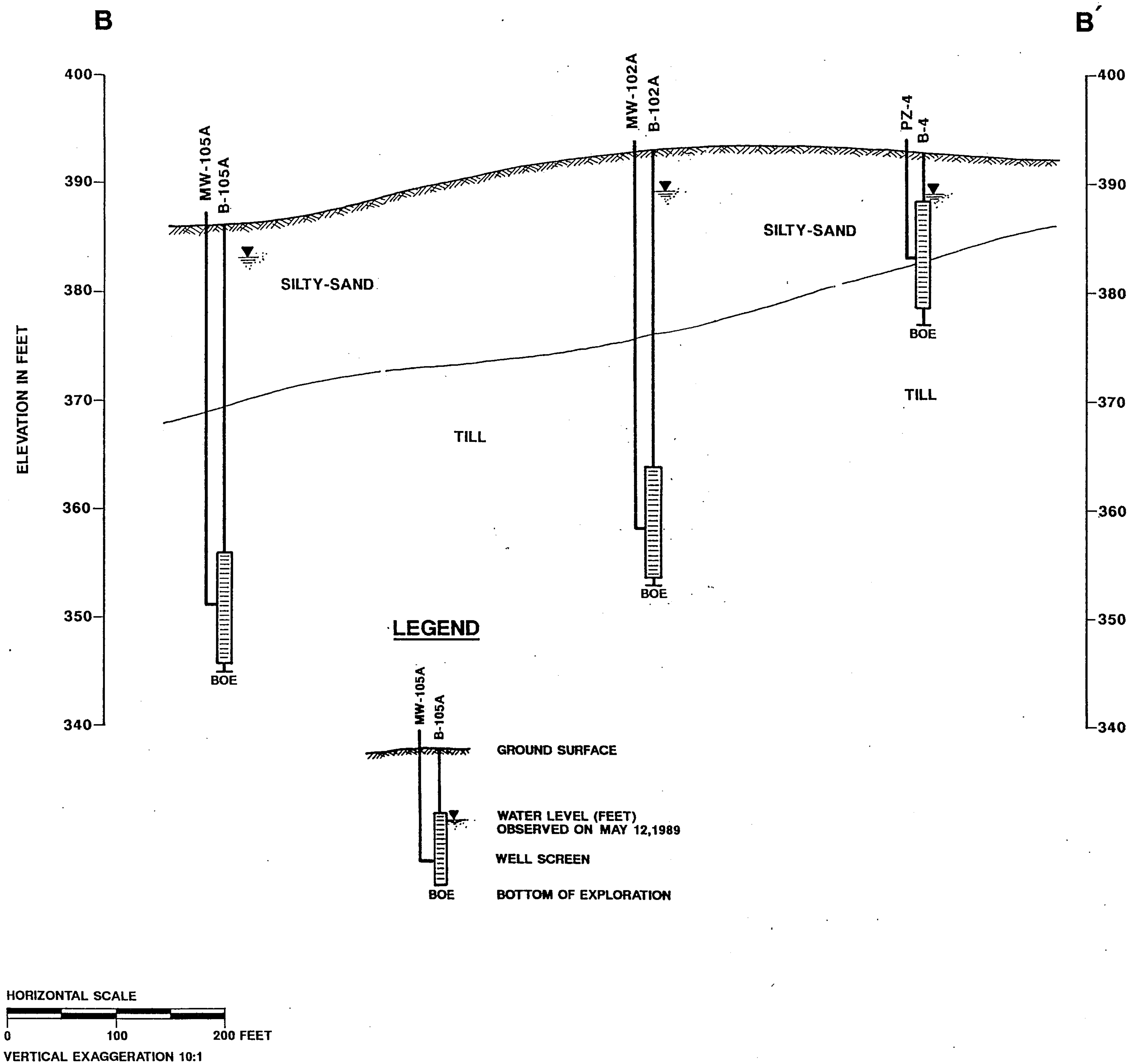
NOTES:

1. ALL GEOLOGIC BOUNDARIES WERE INTERPOLATED AND ARE BEST APPROXIMATIONS BETWEEN BORINGS. ACTUAL GEOLOGIC BOUNDARIES AND MATERIALS BETWEEN BORINGS MAY BE DIFFERENT THAN SHOWN.
2. FOR ORIENTATION OF PROFILE, SEE FIGURE 4-4.

FIGURE 4-5
GEOLOGIC PROFILE A-A´
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

E.C.JORDAN CO.

6886-03



GEOLOGIC DESCRIPTION

SILTY-SAND: BROWN TO GRAY, FINE TO COARSE, SOME GRAVEL, SATURATED

TILL: GRAY, FINE TO COARSE SAND, SOME FINE TO COARSE GRAVEL, FEW BOULDERS, WET TO SATURATED

NOTES:

1. ALL GEOLOGIC BOUNDARIES WERE INTERPOLATED AND ARE BEST APPROXIMATIONS BETWEEN BORINGS. ACTUAL GEOLOGIC BOUNDARIES AND MATERIALS BETWEEN BORINGS MAY BE DIFFERENT THAN SHOWN.
2. FOR ORIENTATION OF PROFILE, SEE FIGURE 4-4.

FIGURE 4-6
GEOLOGIC PROFILE B-B′
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

E.C.JORDAN CO.

6886-03

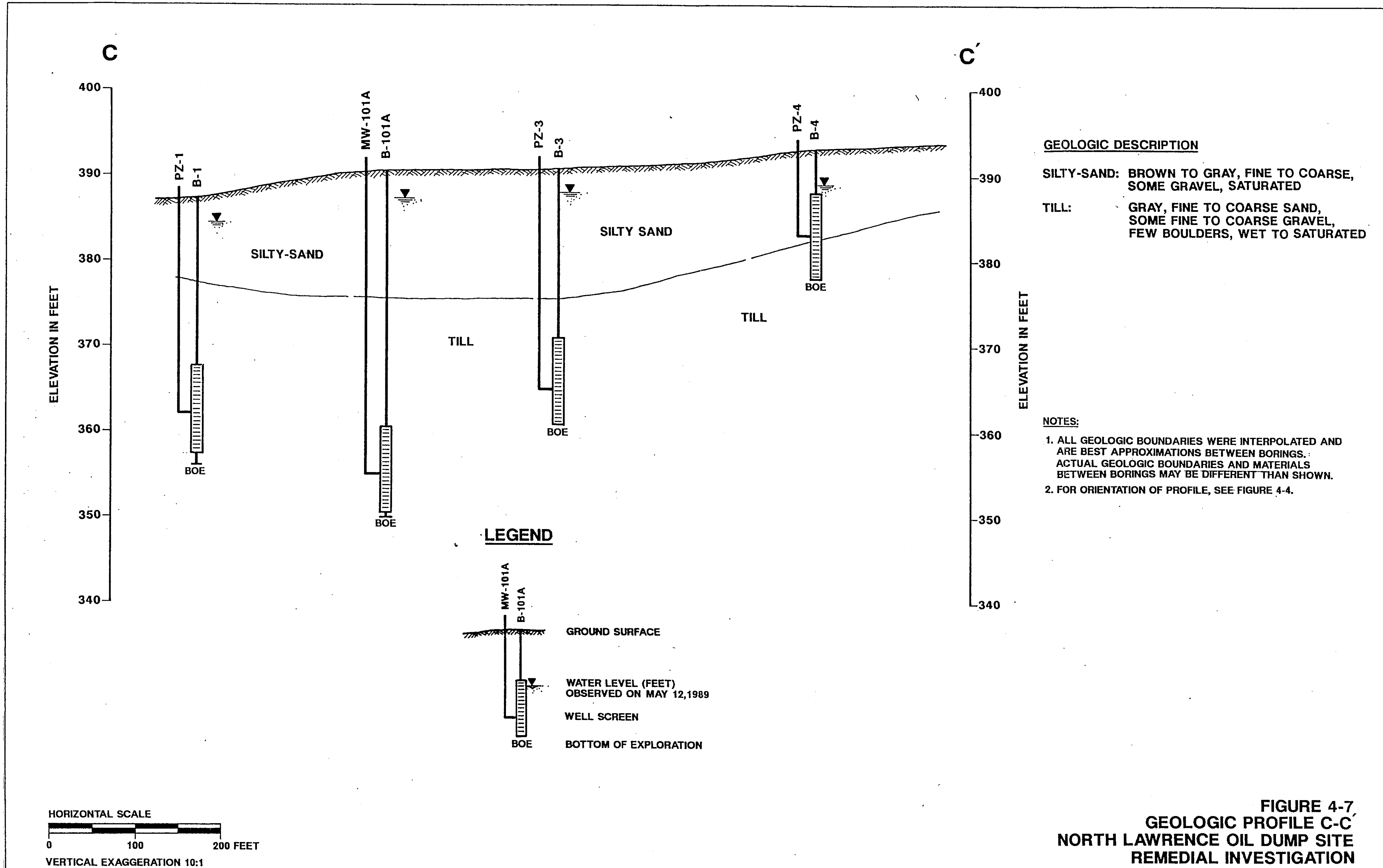
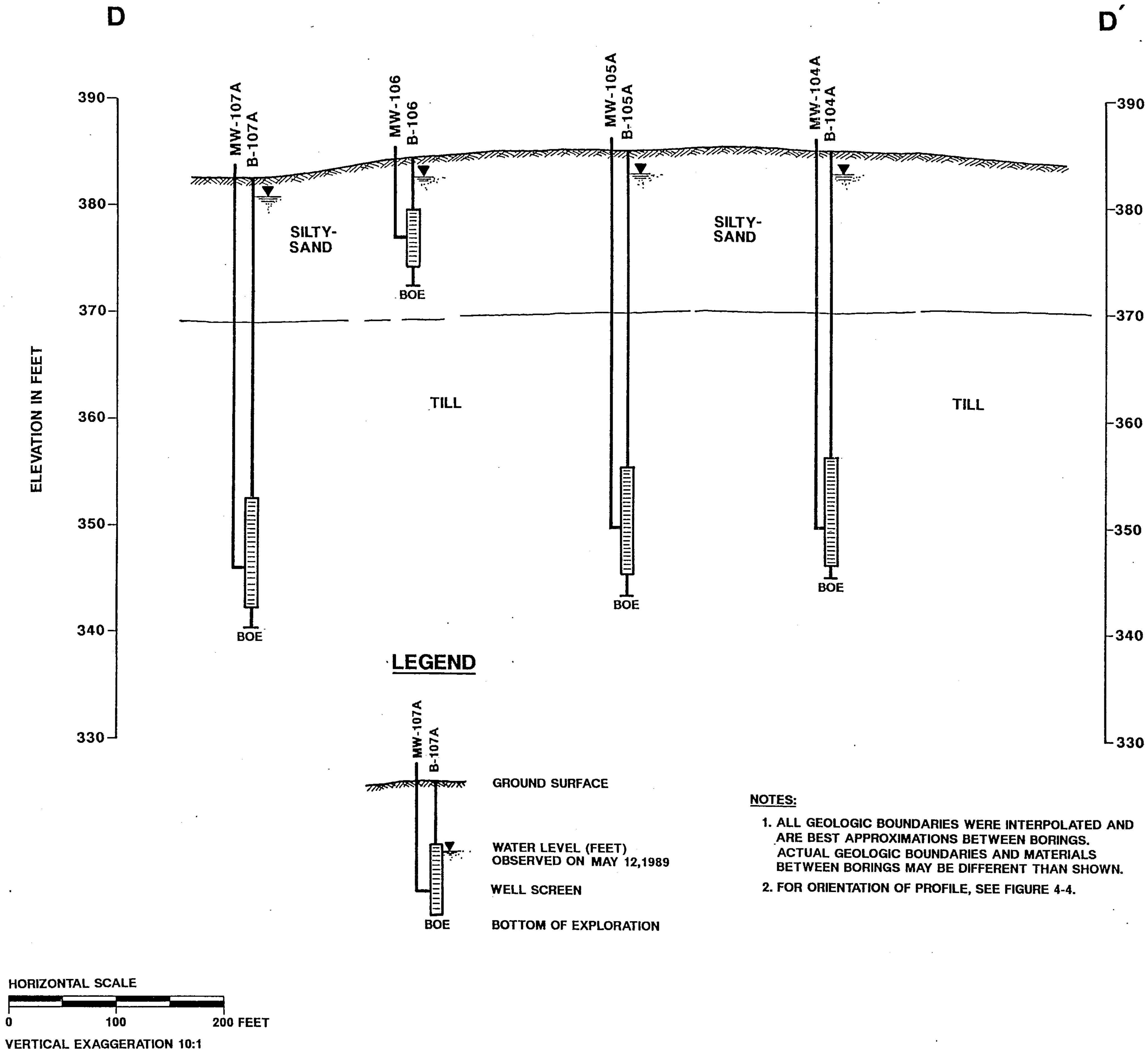


FIGURE 4-7
GEOLOGIC PROFILE C-C′
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

E.C.JORDAN CO.

6886-03



GEOLOGIC DESCRIPTION

SILTY-SAND: BROWN TO GRAY, FINE TO COARSE, SOME GRAVEL, SATURATED

TILL: GRAY, FINE TO COARSE SAND, SOME FINE TO COARSE GRAVEL, FEW BOULDERS, WET TO SATURATED

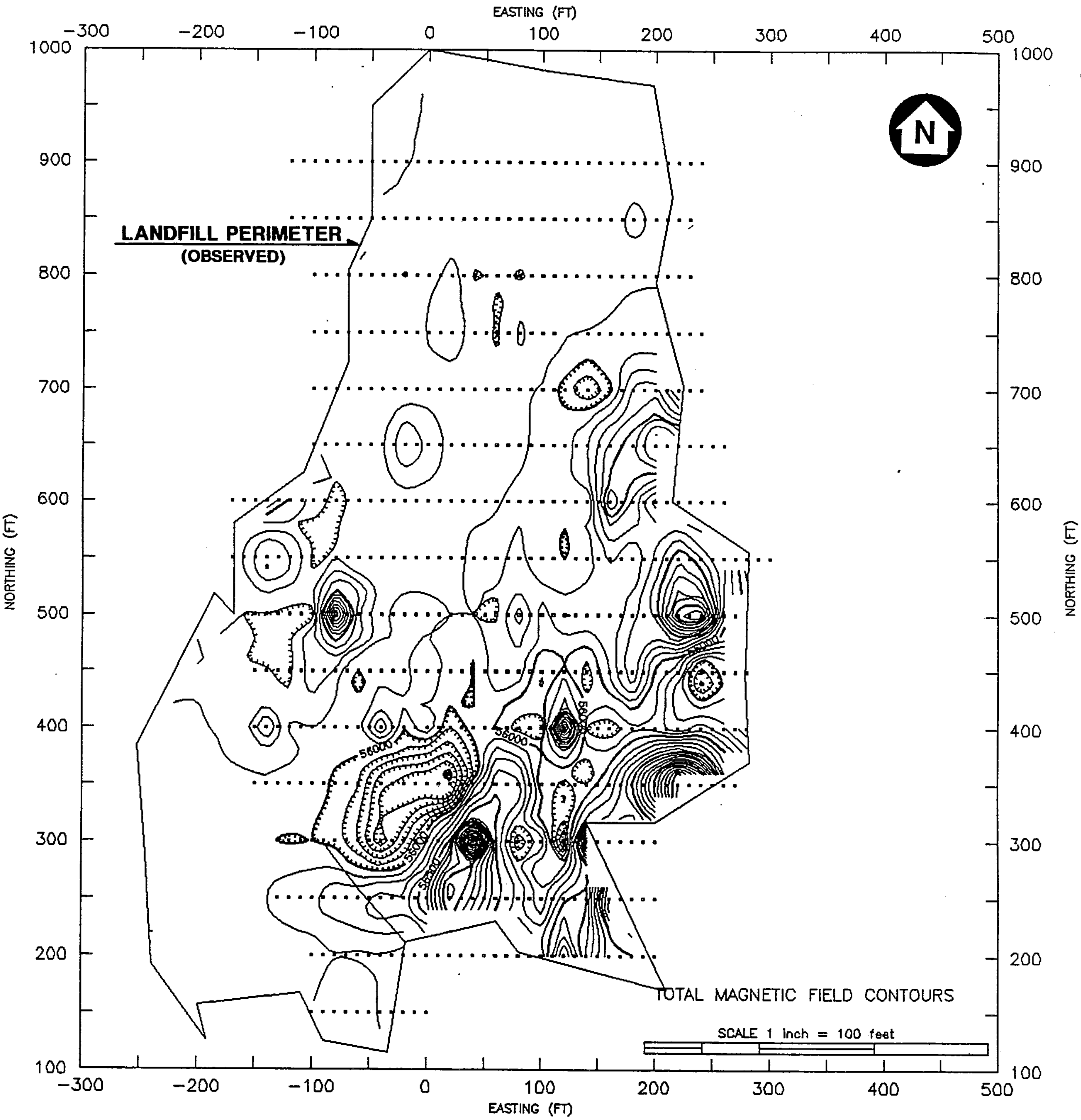
NOTES:

1. ALL GEOLOGIC BOUNDARIES WERE INTERPOLATED AND ARE BEST APPROXIMATIONS BETWEEN BORINGS. ACTUAL GEOLOGIC BOUNDARIES AND MATERIALS BETWEEN BORINGS MAY BE DIFFERENT THAN SHOWN.
2. FOR ORIENTATION OF PROFILE, SEE FIGURE 4-4.

FIGURE 4-8
GEOLOGIC PROFILE D-D´
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

E.C.JORDAN CO.

6886-03



LEGEND

- MAGNETIC STATION

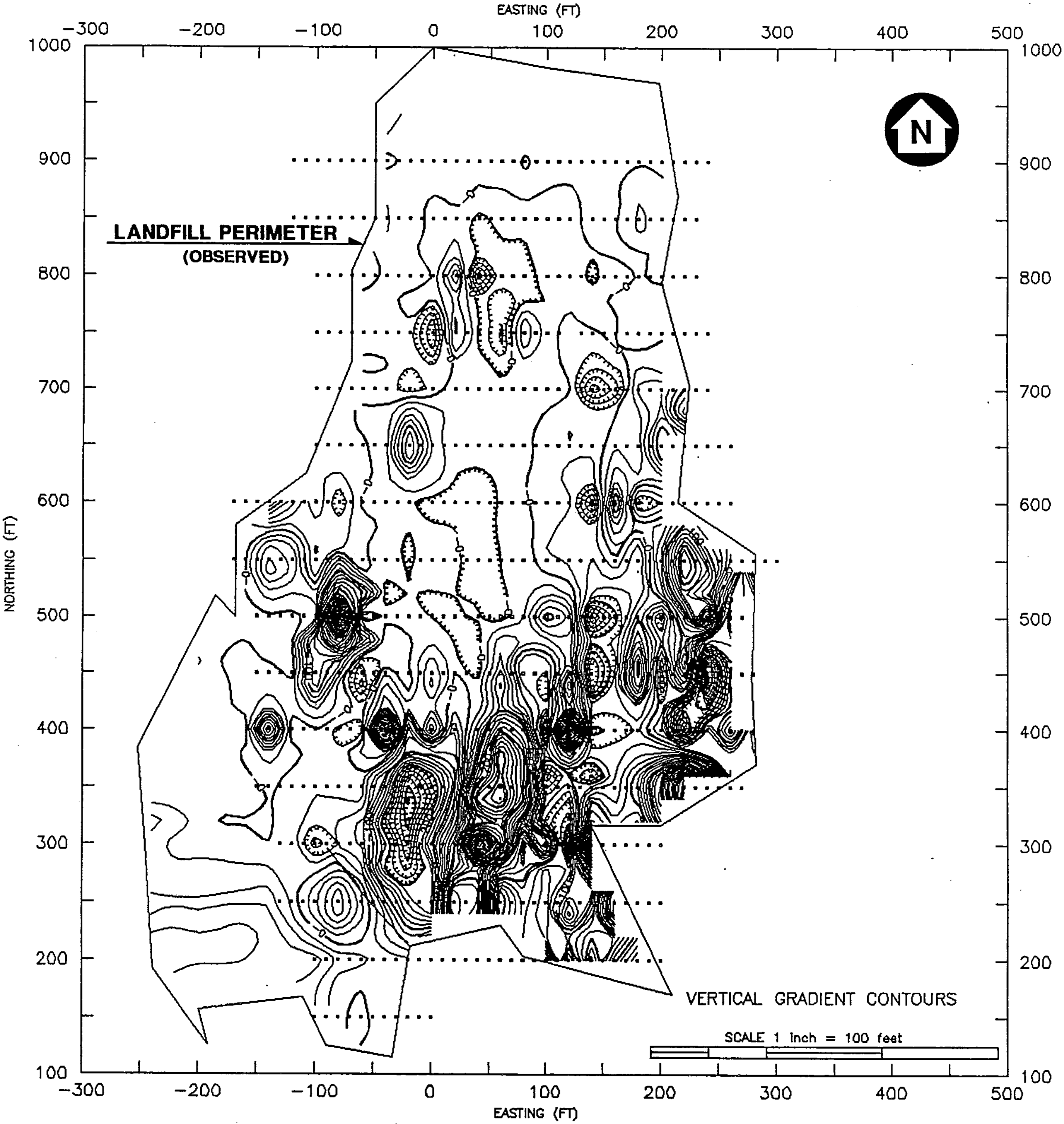
56000 MAGNETIC (TOTAL) FIELD CONTOURS

NOTE: CONTOUR INTERVAL IS 100 GAMMAS/METER.

FIGURE 4-9
MAGNETIC FIELD CONTOURS
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

E.C.JORDAN CO.

5886-03



LEGEND

▪ MAGNETIC STATION

100 VERTICAL GRADIENT CONTOURS

NOTE: CONTOUR INTERVAL IS 20 GAMMAS/METER.

FIGURE 4-10
VERTICAL GRADIENT CONTOURS
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

E.C.JORDAN CO.

6886-03

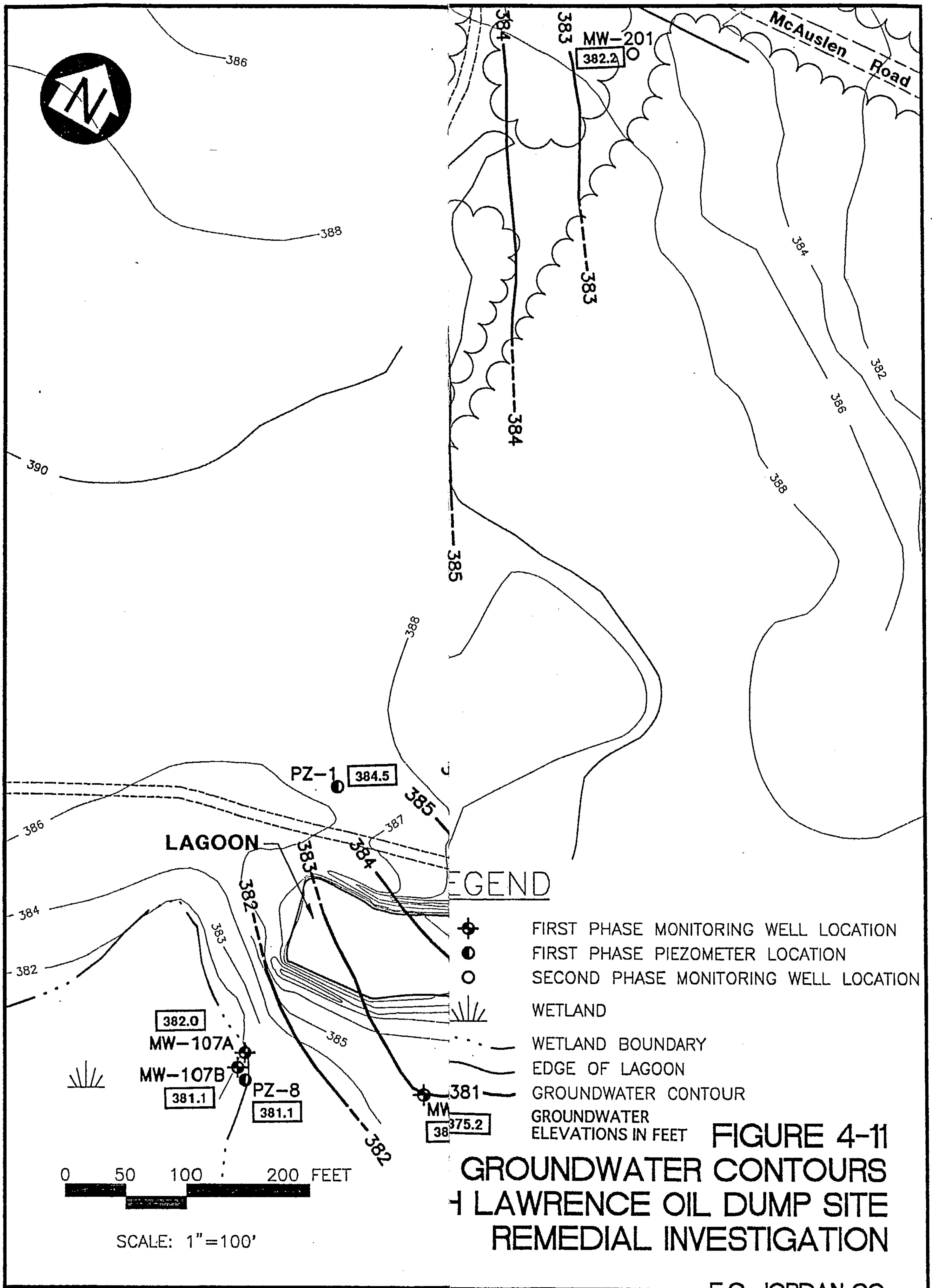


FIGURE 4-11
GROUNDWATER CONTOURS
H LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

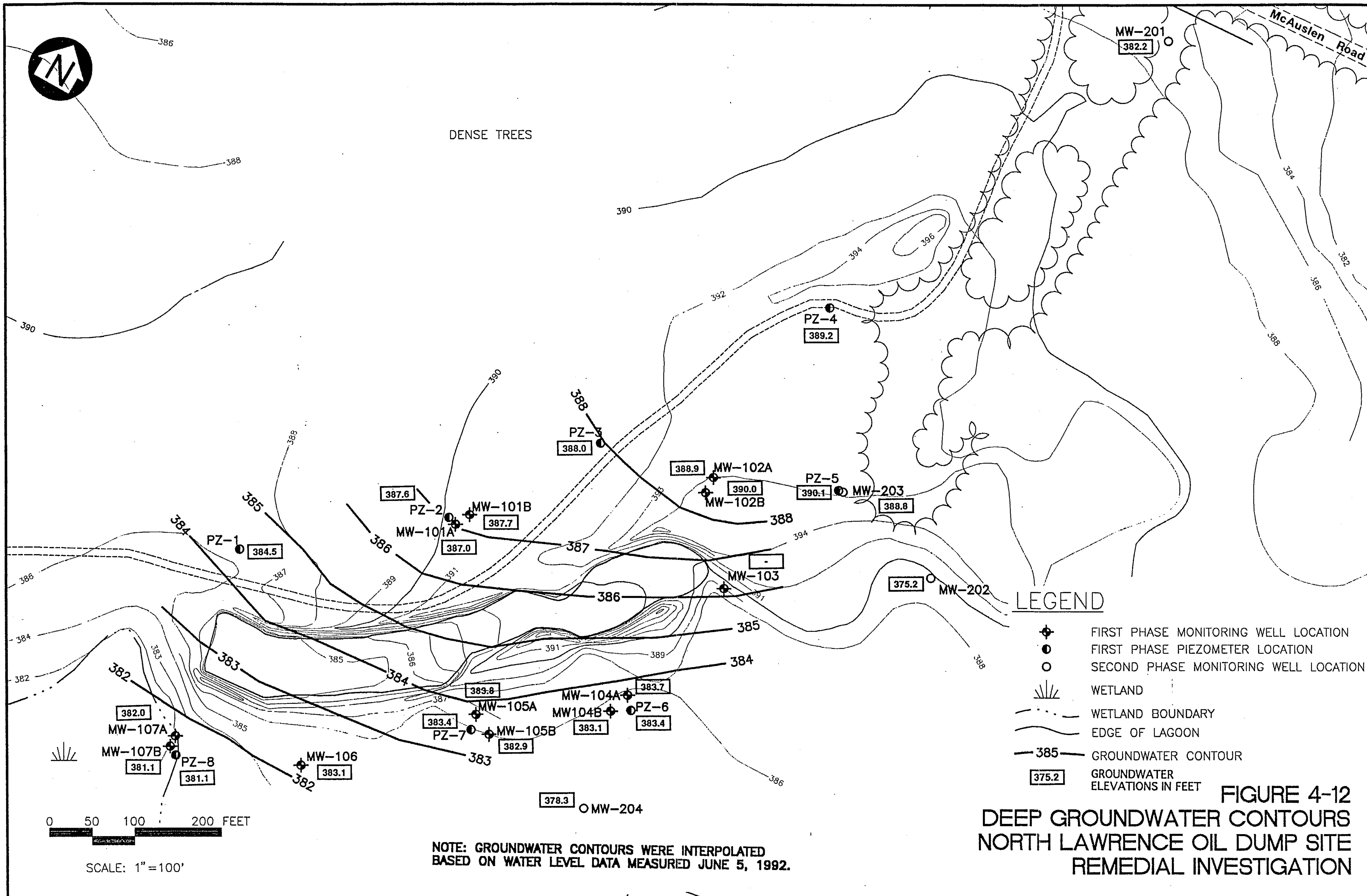
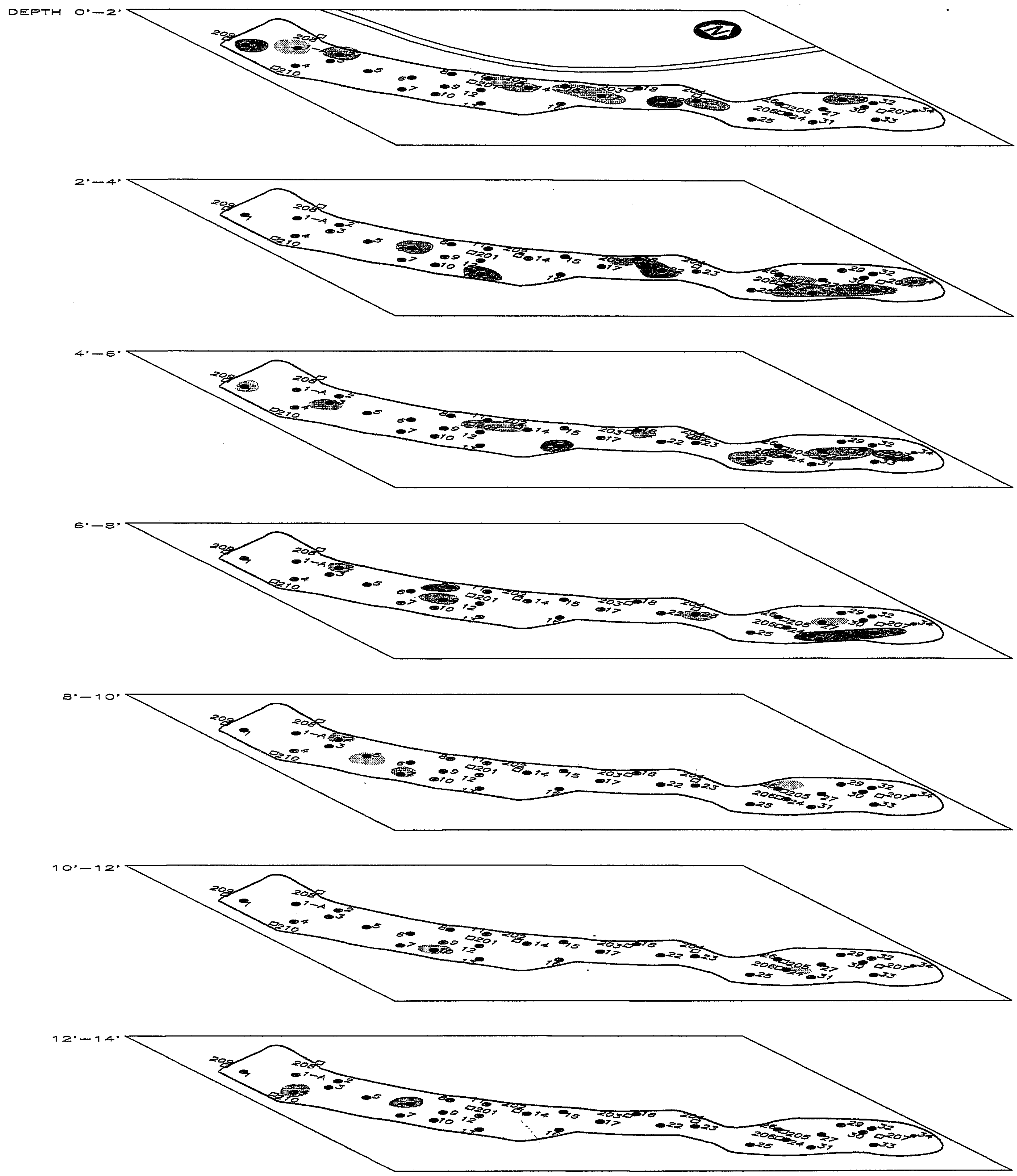


FIGURE 4-12
DEEP GROUNDWATER CONTOURS
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION



CONCENTRATION ug/kg   >10,000   1,000–10,000   100–1,000   1–100   BELOW DETECTION LIMIT

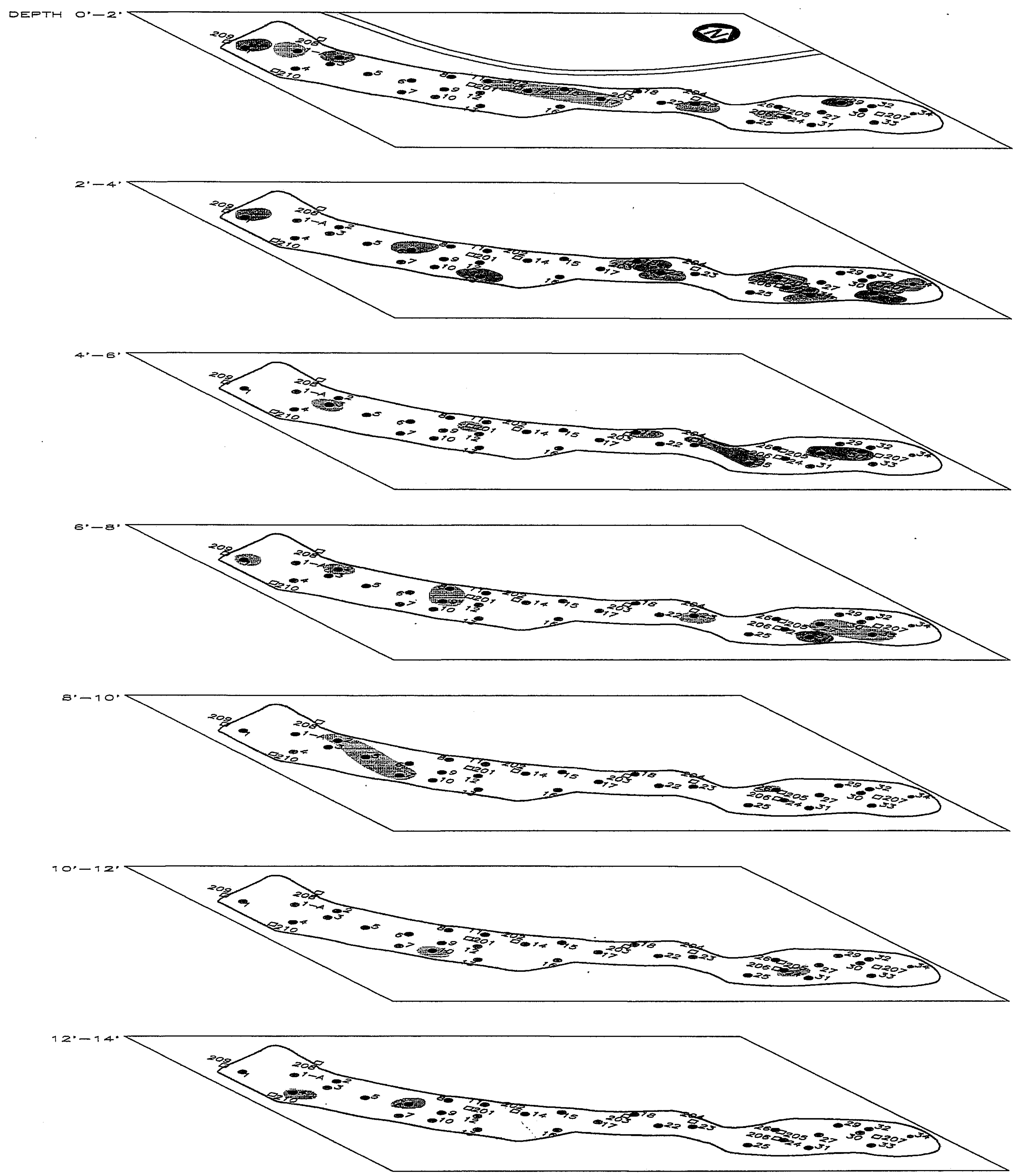
LEGEND

● FIRST PHASE SOIL BORING

□ SECOND PHASE SOIL BORING

FIGURE 5-1
DISTRIBUTION OF PCE AND TCE IN LAGOON
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

E.C. JORDAN CO.



CONCENTRATION ug/kg — >10,000 — 1,000–10,000 — 100–1,000 — 1–100 — BELOW DETECTION LIMIT

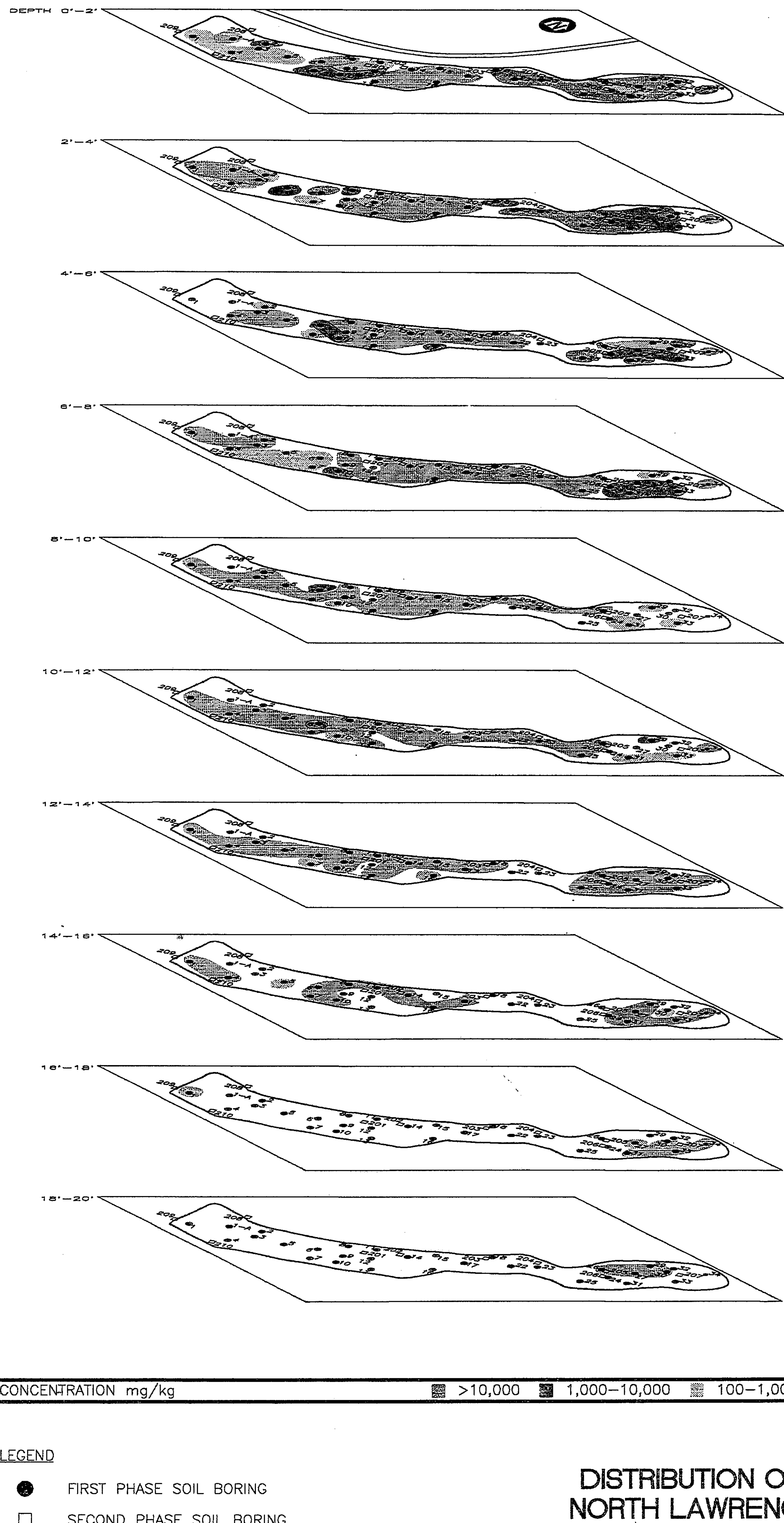
LEGEND

● FIRST PHASE SOIL BORING

□ SECOND PHASE SOIL BORING

FIGURE 5-2
DISTRIBUTION OF SVOAs IN LAGOON
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

E.C. JORDAN CO.



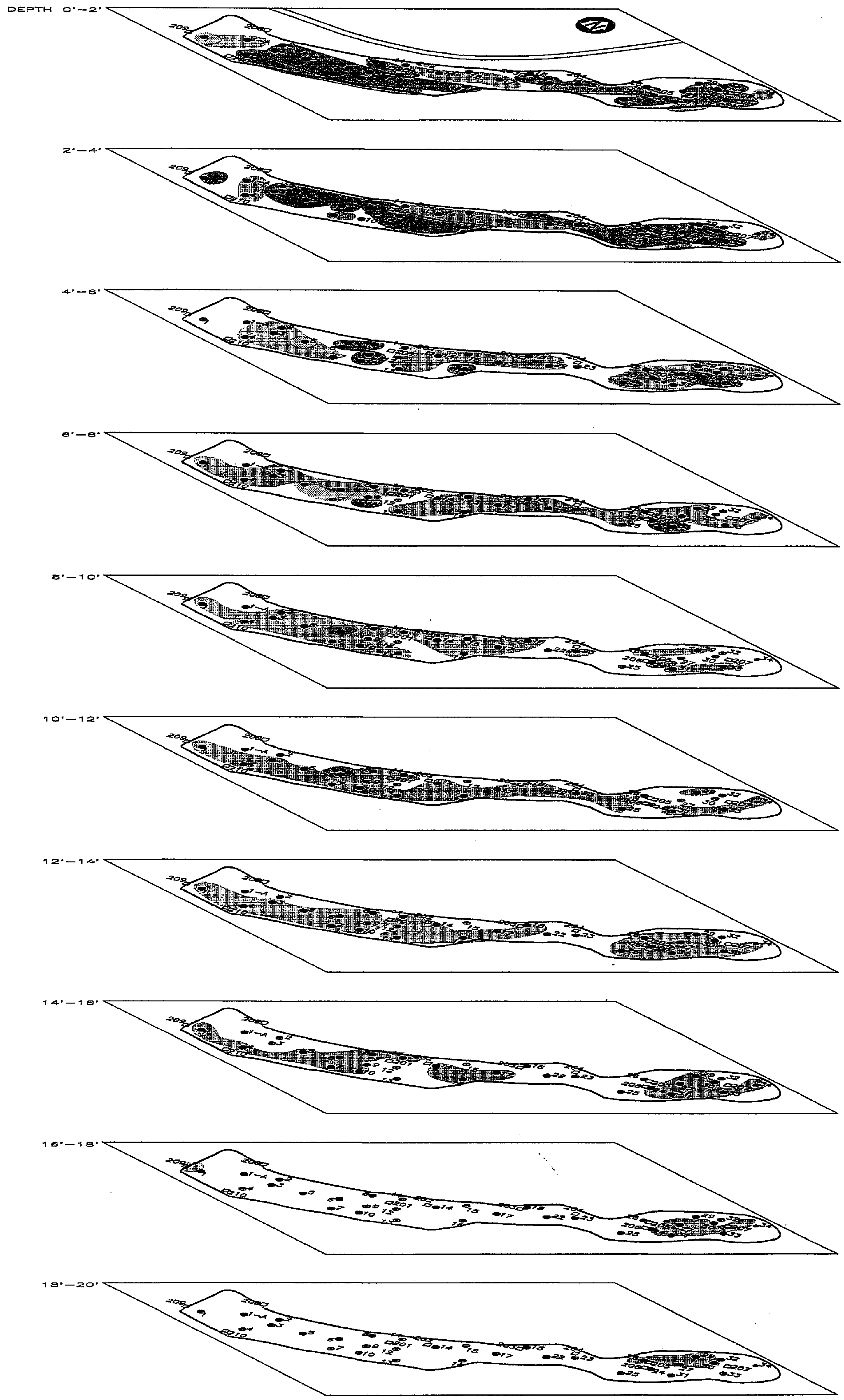
CONCENTRATION mg/kg — >10,000 — 1,000–10,000 — 100–1,000 — BELOW DETECTION LIMIT

LEGEND

- ● FIRST PHASE SOIL BORING
- □ SECOND PHASE SOIL BORING

FIGURE 5-3
DISTRIBUTION OF TPH IN LAGOON
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

E.C. JORDAN CO.



CONCENTRATION ug/kg   >10,000   1,000–10,000   500–1,000   BELOW DETECTION LIMIT

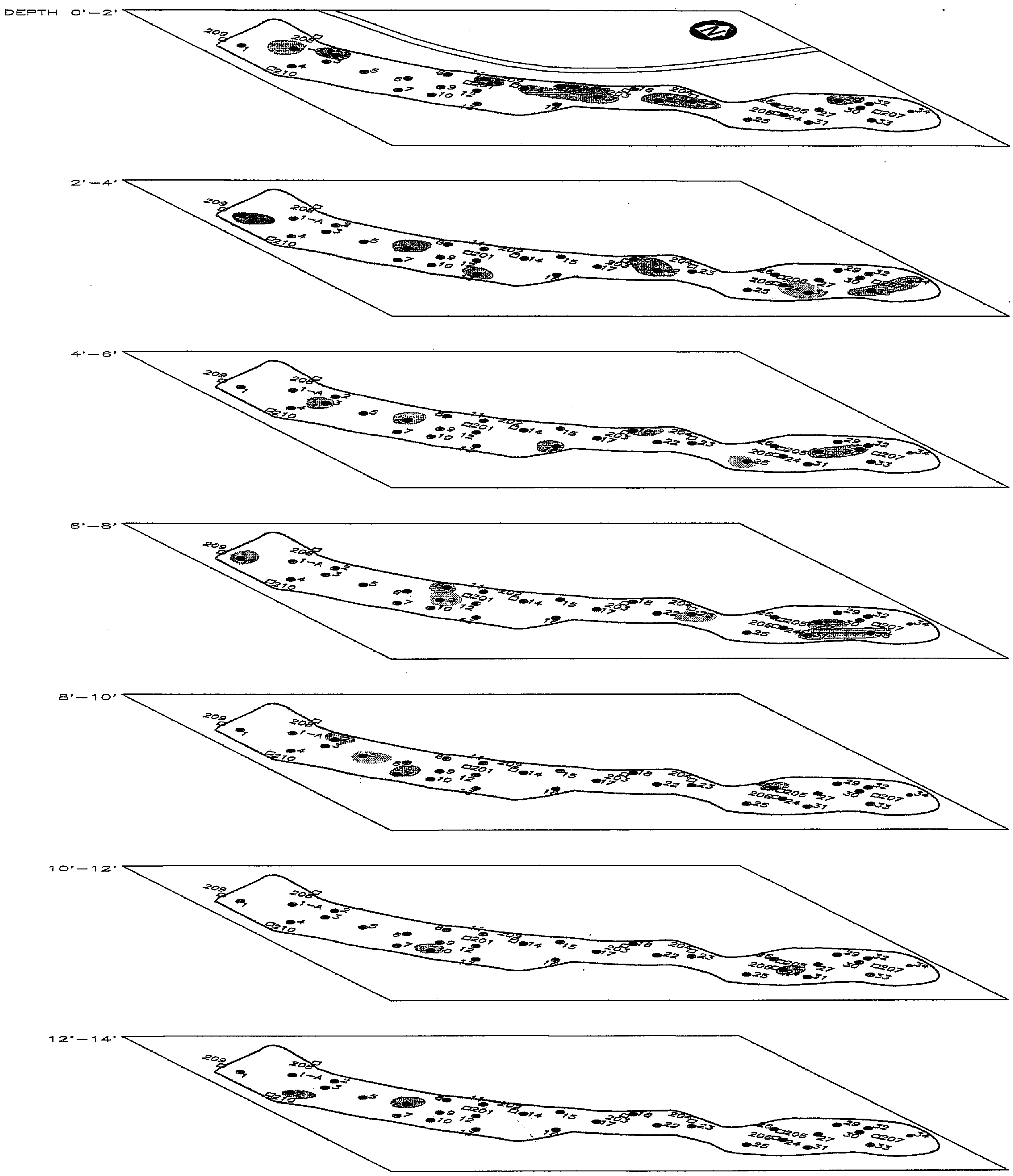
LEGEND

● FIRST PHASE SOIL BORING

□ SECOND PHASE SOIL BORING

FIGURE 5-4
DISTRIBUTION OF PCBs IN LAGOON
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

E.C. JORDAN CO.



CONCENTRATION mg/kg   >10,000   1,000–10,000   100–1,000   1–100   BELOW DETECTION LIMIT

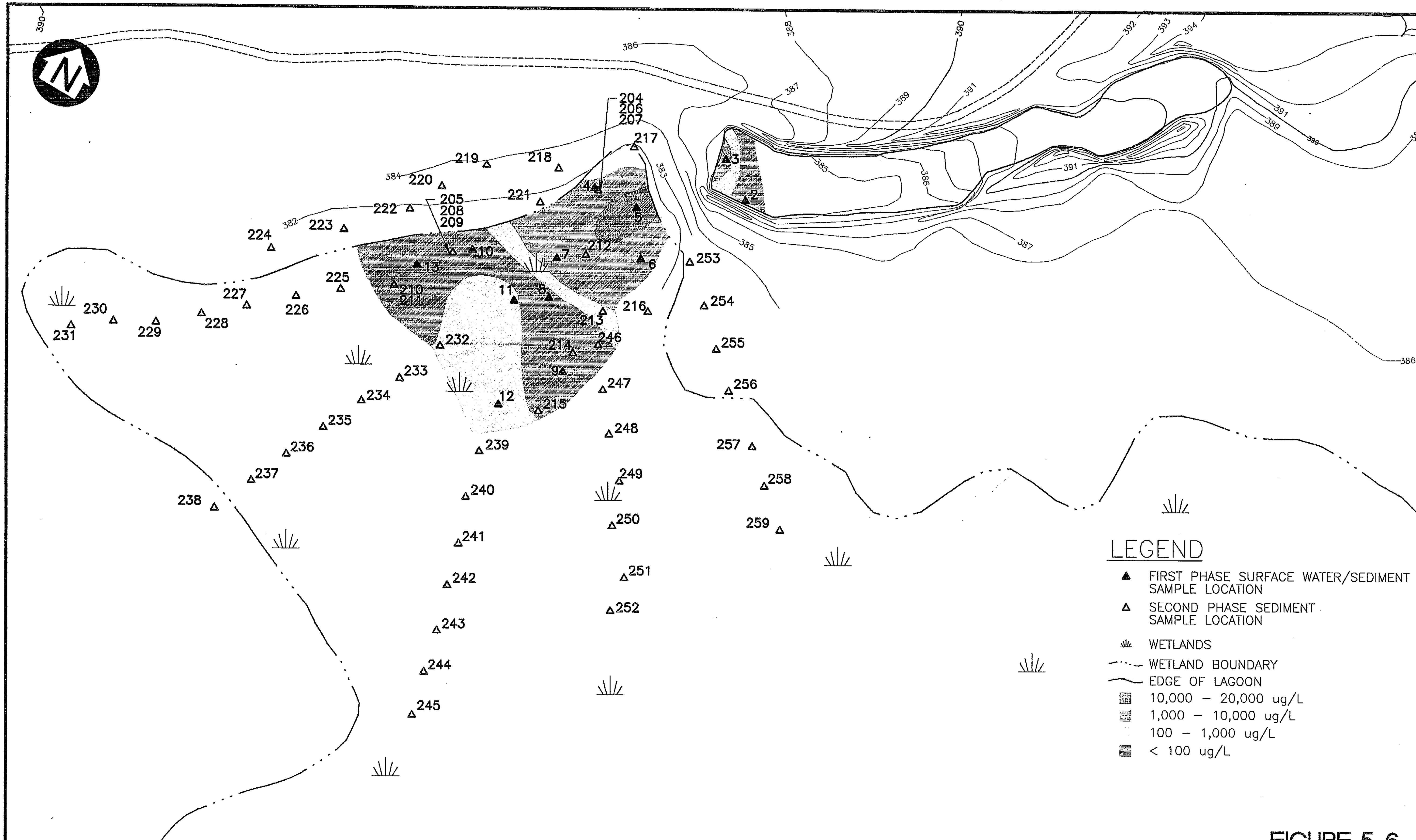
LEGEND

● FIRST PHASE SOIL BORING

□ SECOND PHASE SOIL BORING

FIGURE 5-5
DISTRIBUTION OF LEAD IN LAGOON
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

E.C. JORDAN CO.



NOTE :
CONTAMINANT DISTRIBUTION WAS INTERPOLATED AND IS BEST APPROXIMATION BETWEEN SAMPLE POINTS. SITE CONDITIONS MAY VARY WITH TIME AND COULD BE DIFFERENT THAN SHOWN.

FIGURE 5-6
DISTRIBUTION OF LEAD IN SURFACE WATER
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

E.C. JORDAN CO.

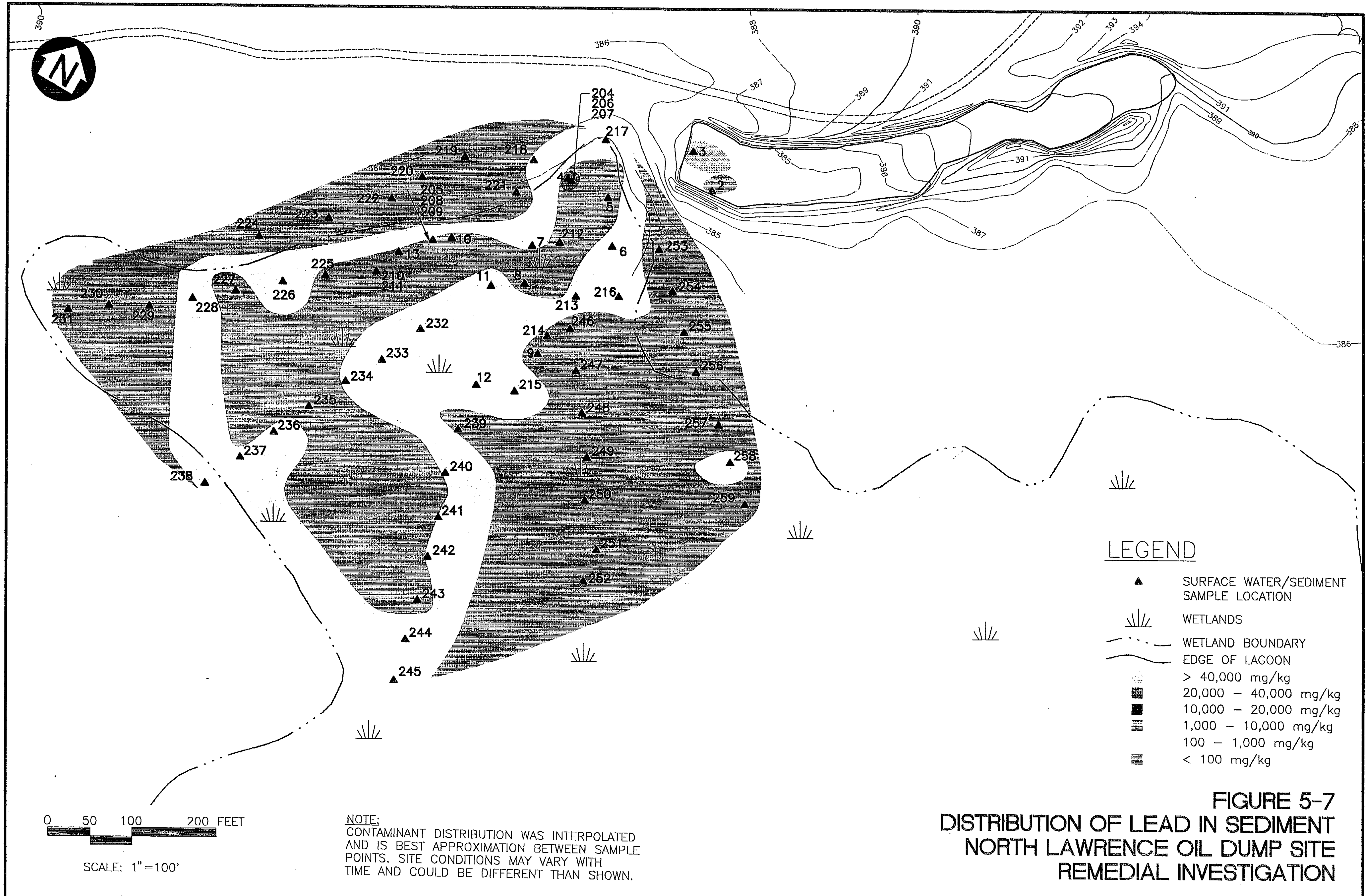
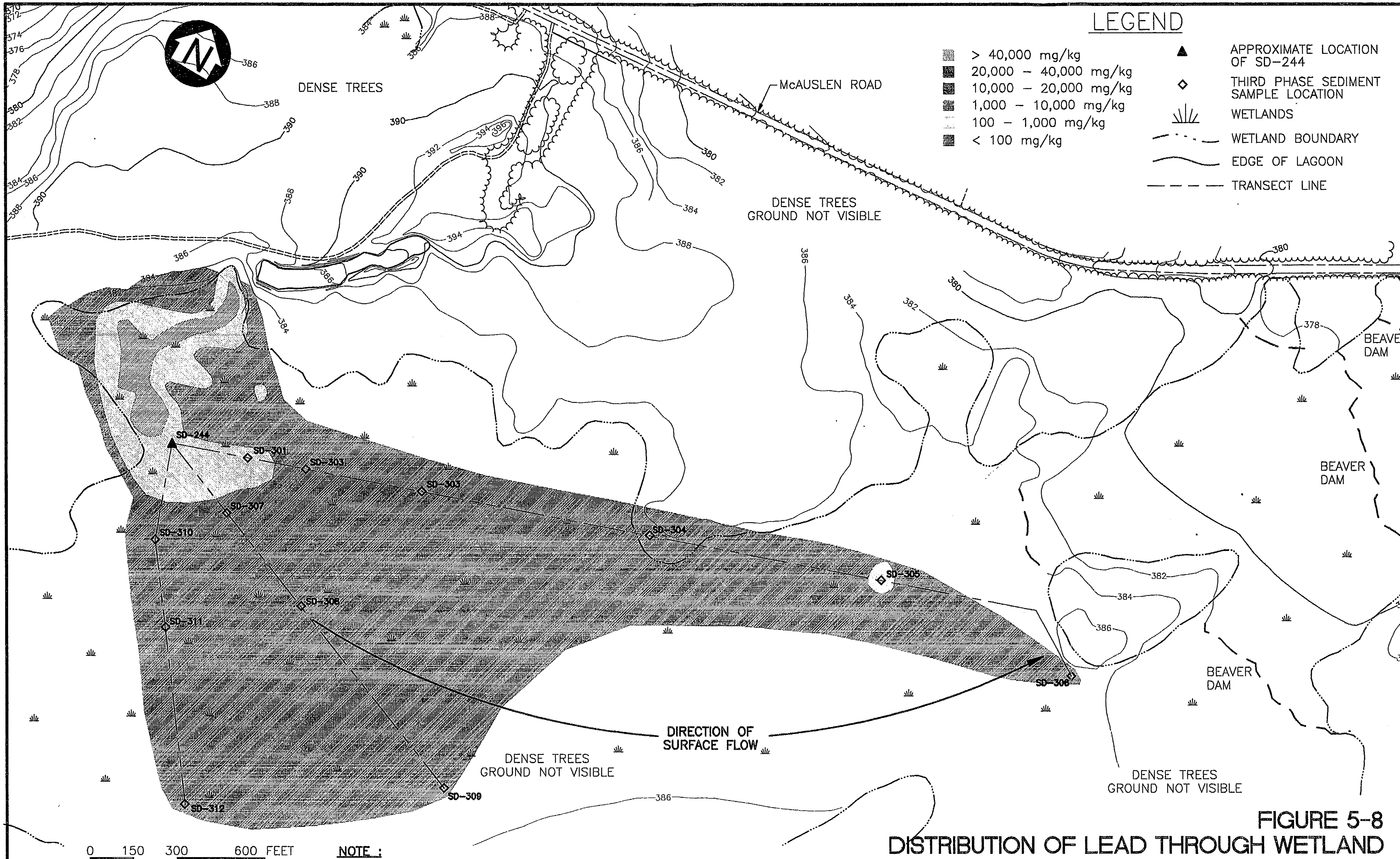


FIGURE 5-7
DISTRIBUTION OF LEAD IN SEDIMENT
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

E.C. JORDAN CO.

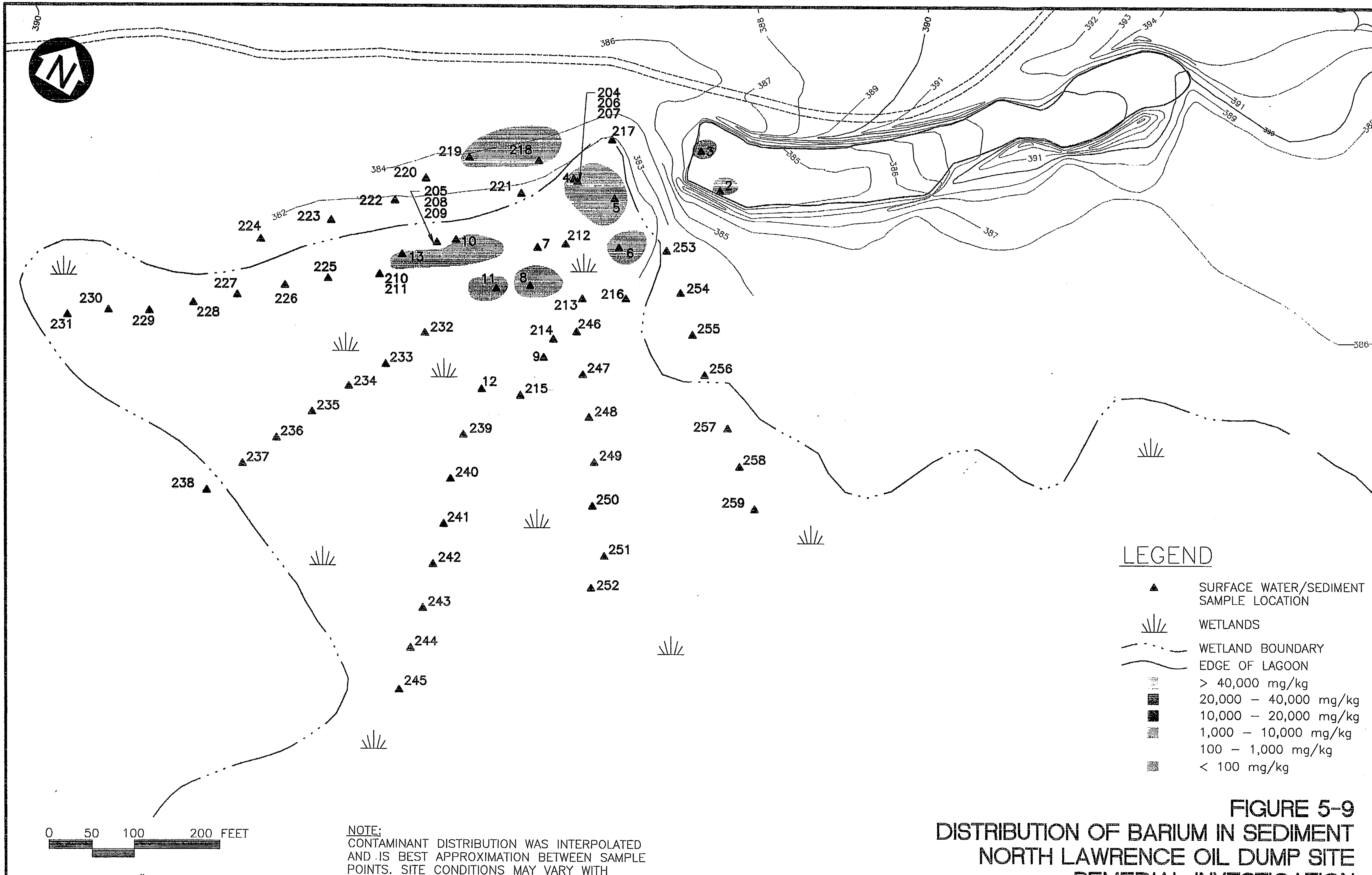


NOTE :

CONTAMINANT DISTRIBUTION WAS INTERPOLATED AND IS BEST APPROXIMATION BETWEEN SAMPLE POINTS. SITE CONDITIONS MAY VARY WITH TIME AND COULD BE DIFFERENT THAN SHOWN.

FIGURE 5-8
DISTRIBUTION OF LEAD THROUGH WETLAND
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

E.C. JORDAN CO.



NOTE:
CONTAMINANT DISTRIBUTION WAS INTERPOLATED AND IS BEST APPROXIMATION BETWEEN SAMPLE POINTS. SITE CONDITIONS MAY VARY WITH TIME AND COULD BE DIFFERENT THAN SHOWN.

FIGURE 5-9
DISTRIBUTION OF BARIUM IN SEDIMENT
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

E.C. JORDAN CO.

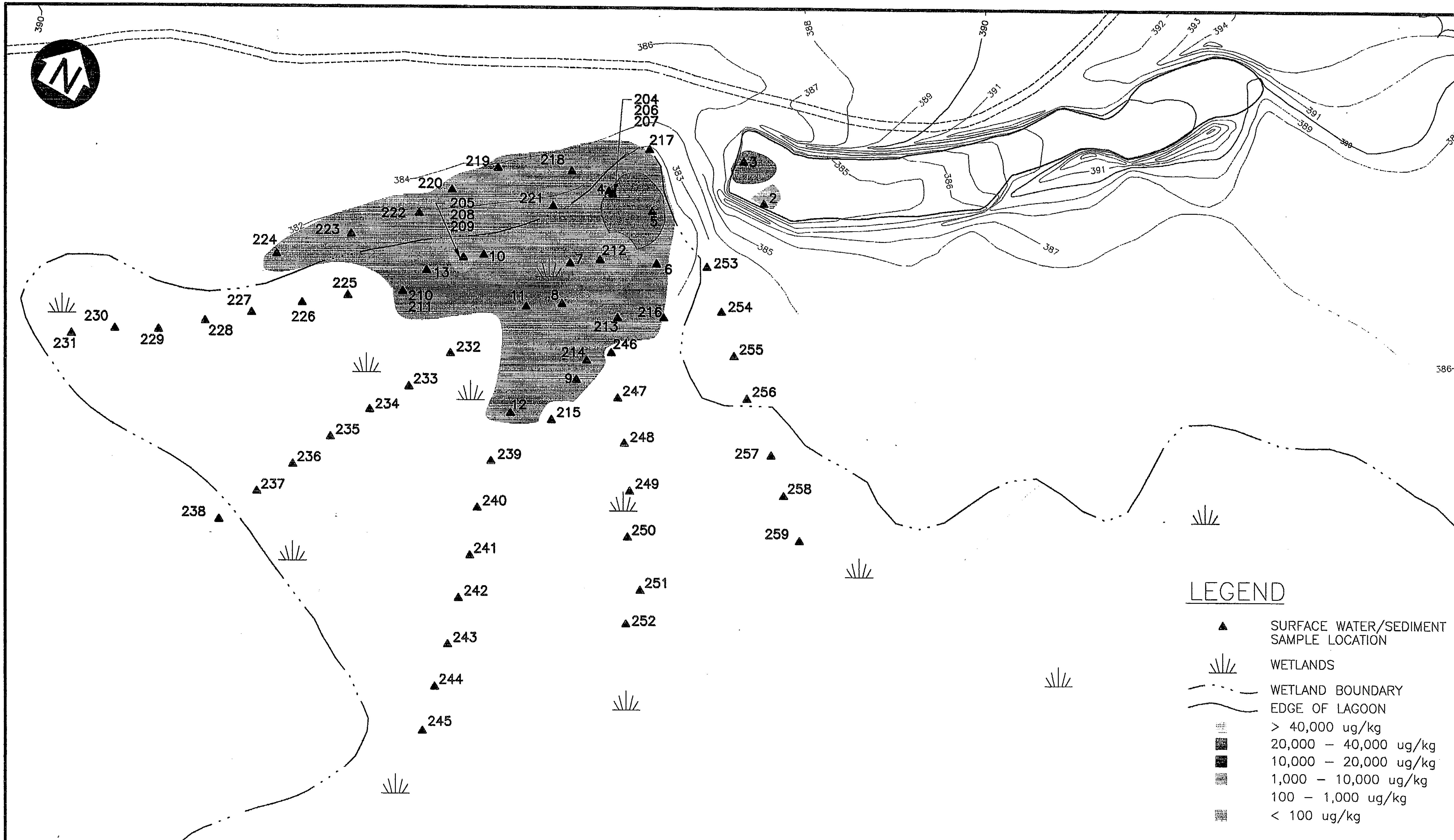


FIGURE 5-10
DISTRIBUTION OF PCBs IN SEDIMENT
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

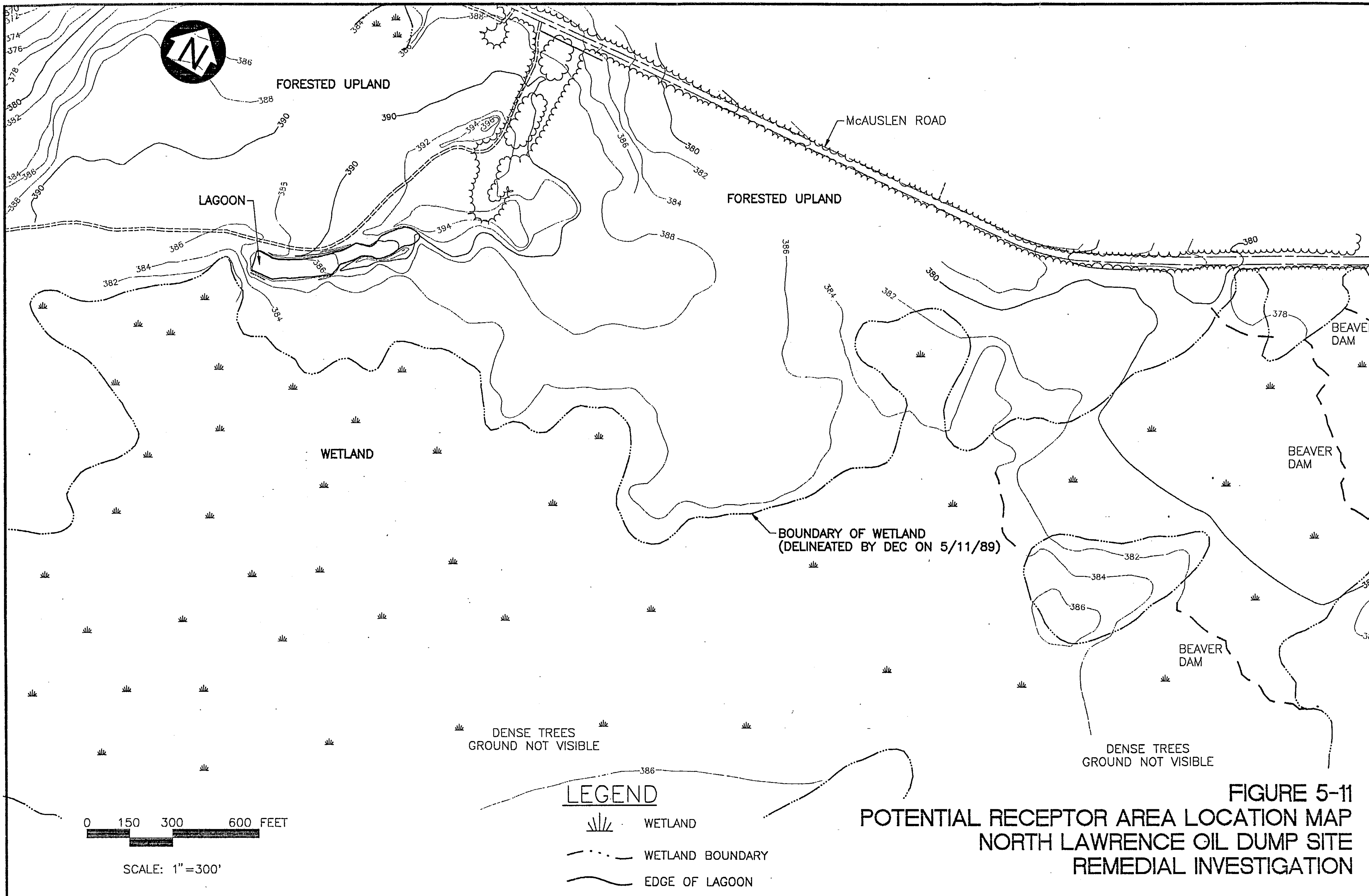


FIGURE 5-11
POTENTIAL RECEPTOR AREA LOCATION MAP
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

E.C. JORDAN CO.

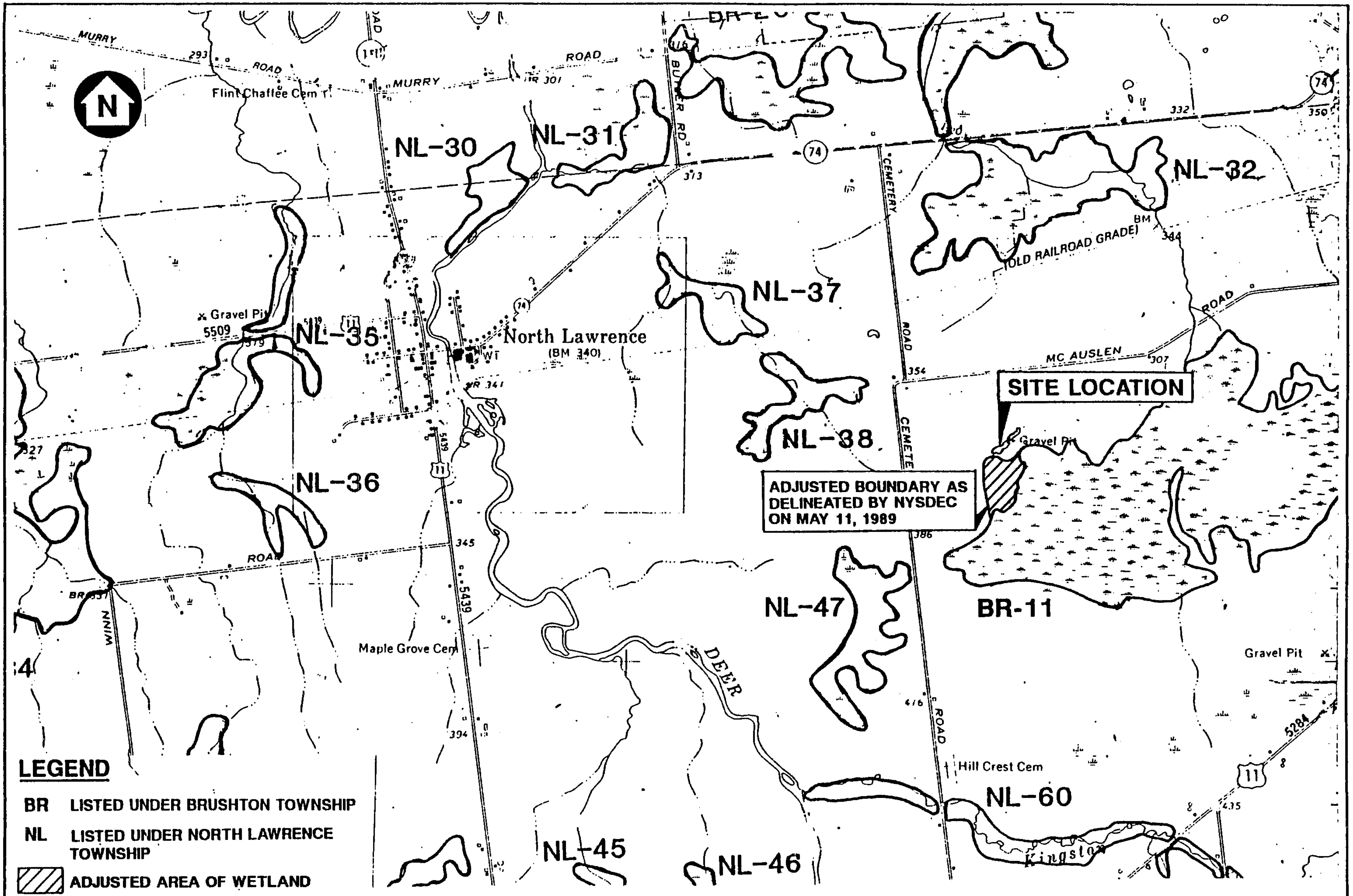
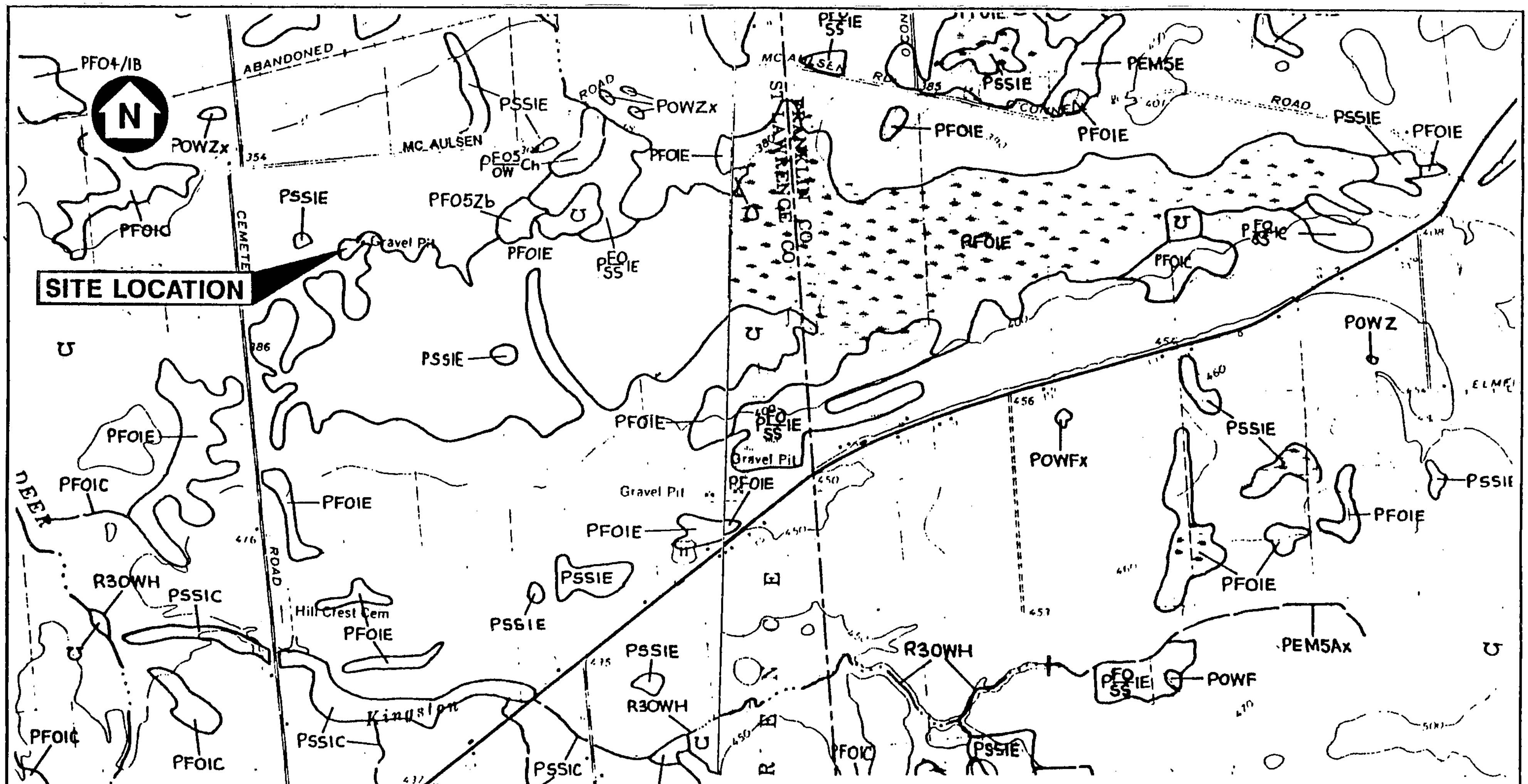


FIGURE 5-12
NEW YORK STATE FRESHWATER WETLANDS MAP
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

SOURCE:
NEW YORK STATE FRESHWATER WETLANDS MAP, ST. LAWRENCE COUNTY, MAP 12 OF 69, OCTOBER 21, 1987.

E.C.JORDAN CO.

6886-03



LEGEND

P	PALUSTRINE	Z	INTERMITTENTLY EXPOSED/ PERMANENT
FOI	FORESTED, BROAD-LEAF DECIDUOUS	F	SEMIPERMANENT
SSI	SCRUB-SHRUB, BROAD-LEAF DECIDUOUS	C	SEASONAL
FOS	FORESTED, DEAD	A	TEMPORARY
EM5	EMERGENT, NARROW-LEAF, PERSISTENT	Ʊ	UPLAND
OW	OPEN WATER	b	BEAVER
E	SEASONAL SATURATED	x	EXCAVATED

SCALE IN FEET

0 2000 4000

FIGURE 5-13
NATIONAL WETLANDS INVENTORY MAP
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

E.C.JORDAN CO.

6886-03

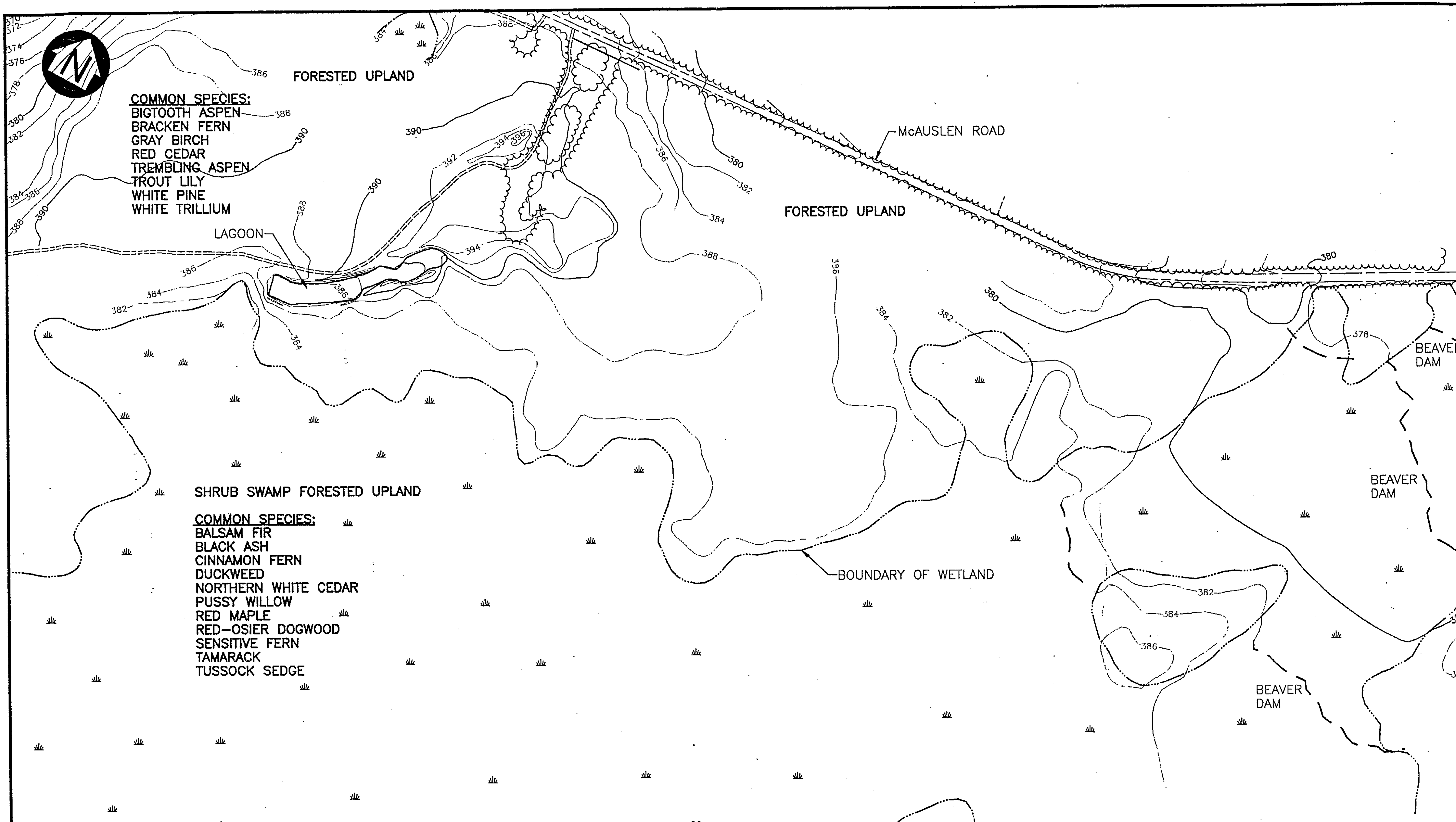


FIGURE 5-14
VEGETATION COVER MAP
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

E.C. JORDAN CO.

6886-03\FIG\688617\8-19-92

TABLE 3-1

SUBSURFACE EXPLORATION PROGRAM

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

BORING	DEPTH OF BORING (feet bgs)	NO. SPLIT-SPOON SAMPLES	NO. GC SAMPLES[1]	NO. ANALYTICAL SAMPLES	DEPTH ANAL SAMPLE (feet bgs)	LABORATORY ANALYSIS				
						VOA	SVOA	P/PCB	INOR	TOC
SOIL BORINGS										
<u>First Phase</u>										
TB-101	16.0	9	9	2[2]	0, 4.0	X	X	X	X	
TB-1A	4.0	2	2	1	0	X	X	X	X	
TB-102	10.0	5	5	2[2]	0, 6.0	X	X	X	X	
TB-103	16.0	7	7	1	0	X	X	X	X	
TB-104	16.0	8	8	1	11.0	X	X	X	X	
TB-105	16.0	8	8	1	8.0	X	X	X	X	
TB-106	16.0	8	8	2[2]	2.0, 12.0	X	X	X	X	
TB-107	14.0	8	8	1	8.0	X	X	X	X	
TB-108	16.0	8	8	1	6.0	X	X	X	X	
TB-109	14.0	7	7	1	6.0	X	X	X	X	
TB-110	16.0	8	7	1	10.0	X	X	X	X	
TB-111	16.0	8	8	1+D	0	X	X	X	X	
TB-112	6.0	3	3	0	--					
TB-113	13.7	7	7	1	2.0	X	X	X	X	
TB-114	15.1	8	8	1	0	X	X	X	X	
TB-115	10.0	5	5	1+D	0	X	X	X	X	
TB-116	15.9	8	8	1	4.0	X	X	X	X	
TB-117	15.5	8	8	1+D	0	X	X	X	X	
TB-118	12.6	7	7	2[2]	2.0, 4.0	X	X	X	X	
TB-122	8.8	5	5	2[2]	0, 2.0	X	X	X	X	
TB-123	10.6	5	5	2[2]	0, 6.0	X	X	X	X	
TB-124	14.0	8	7	2[2]	2.0, 10.0	X	X	X	X	
TB-125	12.5	7	6	1	4.0	X	X	X	X	
TB-126	14.1	8	8	1	7.0	X	X	X	X	
TB-127	14.0	8	8	2[2]	4.0, 5.0	X	X	X	X	
TB-129	14.6	9	9	1+D	0	X	X	X	X	
TB-130	15.25	7	7	1	4.0	X	X	X	X	
TB-131	15.0	9	9	2[2]	2.0, 6.0	X	X	X	X	
TB-132	7.0	2	2	0	--					
TB-133	14.1	9	9	2[2]	2.0, 5.0	X	X	X	X	
TB-134	14.6	9	8	1	2.0	X	X	X	X	

(continued)

TABLE 3-1
SUBSURFACE EXPLORATION PROGRAM
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

BORING	DEPTH OF BORING (feet bgs)	NO. SPLIT-SPOON SAMPLES	NO. GC SAMPLES[1]	NO. ANALYTICAL SAMPLES	DEPTH ANAL SAMPLE (feet bgs)	LABORATORY ANALYSIS				
						VOA	SVOA	P/PCB	INOR	TOC
Second Phase										
SB-201	8.0	2	NA	2	0			X		X
					4.0	X	X			
					6.0			X		X
SB-202	6.0	1	NA	1	0		X			
					4.25	X		X		X
SB-203	4.0	1	NA	1	0			X		X
					2.0	X	X			
SB-204	6.0	1	NA	1	0			X		X
					4.0	X	X			
SB-205	6.0	2	NA	2	2.0	X				
					4.0		X	X		X
SB-206	6.0	2	NA	2	0		X			
					4.0	X		X		X
SB-207	6.0	3	NA	3	0			X		X
					2.0		X			
					4.0	X				
Hand Auger Borings										
SB-208	2.0	--	NA	1	0					X
SB-209	2.0	--	NA	1	0					X
SB-210	2.0	--	NA	1	0					X
PIEZOMETERS										
JPZ-1	31.6	7	0	1	20.0				X	
JPZ-2	15.0	3	0	1	10.0	X	X	X	X	
JPZ-3	31.4	7	1	1	30.0				X	
JPZ-4	16.4	4	0	1	10.0				X	
JPZ-5	16.8	4	0	1	5.0				X	
JPZ-6	17.0	4	0	1	10.0				X	
JPZ-7	31.8	7	0	1	25.0				X	
JPZ-8	15.0	4	0	1	3.0				X	
MONITORING WELLS										
First Phase										
MW-101A	40.8	4	2	0	NA					
MW-101B	10.0	1	1	0	NA					
MW-102A	40.4	8	1	0	NA					
MW-102B	10.0	1	1	0	NA					

(continued)

TABLE 3-1
SUBSURFACE EXPLORATION PROGRAM
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

BORING	DEPTH OF BORING (feet bgs)	NO. SPLIT-SPOON SAMPLES	NO. GC SAMPLES[1]	NO. ANALYTICAL SAMPLES	DEPTH ANAL SAMPLE (feet bgs)	LABORATORY ANALYSIS				
						VOA	SVOA	P/PCB	INOR	TOC
MW-103	10.0	2	2	0	NA					
MW-104A	40.8	6	2	0	NA					
MW-104B	10.0	1	1	0	NA					
MW-105A	42.0	2	1	0	NA					
MW-105B	10.0	1	1	0	NA					
MW-106	12.0	3	3	0	NA					
MW-107A	41.8	4	2	0	NA					
MW-107B	10.0	1	1	0	NA					
B-108	8.0	3	3	0	NA					
Second Phase										
MW-201	28.0	6	NA	NA	NA					
MW-202	18.0	3	NA	NA	NA					
MW-203	22.0	4	NA	NA	NA					
MW-204	12.0	4	NA	NA	NA					

NOTES:

1	GC samples were analyzed for both polychlorinated biphynels and total petroleum hydrocarbons.
2	One of 10 samples sent for laboratory analysis to confirm field screening results.
bgs	below ground surface
D	duplicate
GC	Gas Chromatograph
INOR	Inorganics
NA	Not Applicable
P/PCB	pesticides/polychlorinated biphynels
SVOA	semivolatile organic analytes
TOC	total organic carbon
VOA	volatile organic analytes

TABLE 3-2
SEDIMENT SAMPLING PROGRAM
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

PURPOSE	SAMPLE	DEPTH	LABORATORY ANALYSIS					
			VOA	SVOA	PCBs	INORG	TOC	TCLP
First Phase								
Characterize the nature and distribution of contaminants in the wetland	SD-1 to SD-16	Surface	X	X	X	X	X[1]	
Second Phase								
Determine background concentrations of lead in wetlands sediment	SD-201	Surface				X		
	SD-202	Surface				X		
	SD-203	Surface				X		
Characterize sediment contamination leaching potential	SD-204	Surface						X
	SD-205	Surface						X
Define depth of contamination	SD-206	6 inches bgs			X	X	X	
	SD-207	12 inches bgs			X	X	X	
	SD-208	6 inches bgs			X	X	X	
	SD-209	12 inches bgs			X	X	X	
	SD-210	6 inches bgs			X	X	X	
	SD-211	12 inches bgs			X	X	X	
Determine distribution of PCBs in center of wetland	SD-212	Surface			X		X	
	SD-213	Surface			X		X	
	SD-214	Surface			X		X	
Determine lateral distribution of PCBs and lead	SD-215 to SD-224	Surface			X	X	X	
Determine perimeter of lead contamination in wetland sediments	SD-225 to SD-259	Surface				X		

NOTES:

1	Only six samples (SD-1, SD-2, SD-3, SD-5, SD-8, and SD-11) were analyzed for TOC.
INORG	inorganics
PCB	polychlorinated biphynels
SVOC	semivolatile organic analytes
TCLP	Toxicity Characteristic Leachate Procedure
TOC	total organic carbon
VOA	volatile organic analytes

TABLE 3–3
AIR SAMPLING LOCATIONS AND DURATION
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

SAMPLE ID	DATE	SAMPLE LOCATION	SAMPLE DURATION	TOTAL VOLUME (LITERS)
JAS1010000	4/12/89	Upwind of Drilling Activity	350 min. x 200 cc/min.	70
JAS1020000	4/12/89	Edge of Drilling Activity	385 min. x 200 cc/min.	77
JAS1030000	4/12/89	Downwind of Drilling Activity	347 min. x 200 cc/min.	69
JAS1040000	4/12/89	Downwind of Drilling Activity	485 min. x 150 cc/min.	72
JAS1050000	4/13/89	Edge of Drilling Activity	427 min. x 200 cc/min.	85
JAS1060000	4/13/89	Upwind of Drilling Activity	398 min. x 200 cc/min.	80
JAS1070000	4/13/89	Downwind of Drilling Activity	421 min. x 200 cc/min.	84
JAS1080000	4/13/89	Downwind of Drilling Activity	390 min. x 200 cc/min.	78
JAS1090000	4/14/89	Background Air Sampling	363 min. x 200 cc/min.	73
JAS1100000	4/14/89	Background Air Sampling	303 min. x 200 cc/min.	61
JAS1110000	4/14/89	Duplicate of JAS1100000	324 min. x 200 cc/min.	65
JAS1120000	4/14/89	Duplicate of JAS1090000	307 min. x 200 cc/min.	61

Notes:
min. = minute
cc/min. = cubic centimeters per minute.

TABLE 3–4

BIOTA SAMPLING METHODS

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

SAMPLE	ORGANISM	LOCATION	SAMPLING TECHNIQUE
BI–1	Mice	Lagoon	Snap and live traps
BI–2	Tadpoles	Lagoon	Minnow trap
BI–3	Fish	Wetland outlet	Minnow trap
BI–4	Turtle	Lagoon	Dip net
BI–5	Frog	Wetland outlet*	Minnow trap
BI–6	Earthworms	Lagoon	Hand collection
BI–7	Cattails	Lagoon center	Hand collection
BI–8	Cattails	Lagoon south	Hand collection
BI–9	Cattail	Lagoon+	Minnow trap
BI–10	Cattails	Wetland near SW/SD–4	Hand collection
BI–11	Cattails	Wetland near SW/SD–7	Hand collection
BI–12	Cattails	Lagoon	Dip net
BI–13	Frogs	Wetland outlet	Hand collection

Notes:

* = Listed on lab sheet as FISH.

\+ = Listed on lab sheet as CATTAIL.

SW/SD–4 = First Phase surface water and sediment sample location.

TABLE 3–5

PRECISION AND ACCURACY ACCEPTANCE CRITERIA

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

FRACTION	MATRIX SPIKE COMPOUND	PERCENT RECOVERY		RELATIVE PERCENT DIFFERENCE	
		WATER	SOIL/SEDIMENT	WATER	SOIL/SEDIMENT
VOA	1,1-Dichloroethene	61–145	59–172	14	22
VOA	Trichloroethene	71–120	62–137	14	24
VOA	Chlorobenzene	75–130	60–133	13	21
VOA	Toluene	76–125	59–139	13	21
VOA	Benzene	76–127	66–142	11	21
BN	1,2,4–Trichlorobenzene	39–98	38–107	28	23
BN	Acenaphthene	46–118	31–137	31	19
BN	2,4-Dinotrotoluene	24–96	28–89	38	47
BN	Pyrene	26–127	35–142	31	36
BN	N-nitroso-di-n-propylamine	41–116	41–126	38	38
BN	1,4-Dichlorobenzene	36–97	28–104	28	27
ACID	Pentachlorophenol	9–103	17–109	50	47
ACID	Phenol	12–89	26–90	42	35
ACID	2–Chlorophenol	27–123	25–102	40	50
ACID	4-Chloro-3-methylphenol	23–97	26–103	42	33
ACID	4–Nitrophenol	10–80	11–114	50	50
PESTICIDES/PCBs	gamma–BHC(Lindane)	56–123	46–127	15	50
PESTICIDES/PCBs	Heptachlor	40–131	35–130	20	31
PESTICIDES/PCBs	Aldrin	40–120	34–132	22	43
PESTICIDES/PCBs	Dieldrin	52–126	31–134	18	38
PESTICIDES/PCBs	Endrin	56–121	42–139	21	45
PESTICIDES/PCBs	4,4'–DDT	38–127	23–134	27	50

FIELD DUPLICATE PRECISION RELATIVE PERCENT DIFFERENCE CRITERIA – INORGANICS

	WATER	SOIL
For sample results > 5 x CRQL	30	50
For sample results < 5 x CRQL	2 x CRQL	4 x CRQL

SPIKE RECOVERY LIMITS – INORGANICS

	WATER	SOIL/SEDIMENT
All analytes	75–125	75–125

LABORATORY DUPLICATE PRECISION CRITERIA

RELATIVE PERCENT DIFFERENCE – INORGANICS

	WATER	SOIL/SEDIMENT
Results > 5 x CRQL	20	35
Results < 5 x CRQL	CRDL	2 x CRDL

FIELD DUPLICATE PERCENT DIFFERENCE – INORGANICS

	WATER	SOIL/SEDIMENT
Results > 5 x CRQL	30	50
Results < 5 x CRQL	2 x CRDL	4 x CRDL

Notes:

CRDL = Contract Required Detection Limit.

CRQL = Contract Required Quantitation Limit.

TABLE 3-6
CHEMICAL-SPECIFIC ARARs AND SCGs

NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN RI/FS
GROUNDWATER/ SURFACE WATER				
Federal	SDWA - MCLs [40 CFR 141.11 - 141.16]	Applicable	MCLs have been promulgated for several common organic and inorganic contaminants. These levels regulate the concentration of contaminants in public drinking water supplies, but may also be considered relevant and appropriate for groundwater aquifers used for drinking water.	Because groundwater is used for drinking water in the vicinity of NLODS, the SDWA is applicable. Contaminant concentrations have been compared to their MCLs.
	SDWA - MCLGs [40 CFR 141.50 - 141.51]	Relevant and Appropriate	MCLGs are standards at which there are no known or anticipated public health effects. These are guidance values.	The 1990 National Contingency Plan states that non-zero MCLGs are to be used as goals. Therefore, MCLGs, while not directly applicable, are relevant and appropriate. The concentrations of contaminant detected in groundwater at the NLODS will be compared to their MCLGs.
	Federal AWQC	Relevant and Appropriate	Federal AWQC include (1) health-based criteria developed for 95 carcinogenic and noncarcinogenic compounds and (2) water quality parameters. AWQC, for the protection of human health, provide levels for exposure from drinking water and consuming aquatic organisms and from consuming just fish. Remedial actions involving contaminated surface water or groundwater must consider the uses of the water and the circumstances of the release or threatened release; this determines whether AWQC are relevant and appropriate.	AWQC will be used, where appropriate, in the development of clean-up levels for surface water and sediments or effluent limits for the discharge of treated groundwater or treatment process water.
	RCRA - Subpart F: Groundwater Protection Standards [40 CFR Part 264.94]	Relevant and Appropriate	This requirement outlines standards, in addition to background concentrations and MCLs, to be used in establishing clean-up levels for remediating groundwater contamination.	These requirements are relevant and appropriate if certain conditions relating to transport and exposure are met.

(Continued)

TABLE 3-6
CHEMICAL-SPECIFIC ARARs AND SCGs

NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN RI/FS
State	New York State Department of Health Drinking Water Supplies [10 NYCRR Part 5]	Applicable	The Department of Health has promulgated concentration-based standards for organic and inorganic contaminants and monitoring requirements for the protection of drinking water supplies. These rules also apply to groundwater aquifers that are sources of drinking water supply.	Because groundwater in the vicinity of NLODS is used as a drinking water supply, this regulation is applicable. Contaminant concentrations have been compared to New York State drinking water MCLs.
	New York Water Classifications and Quality Standards [6 NYCRR Parts 701 - 703]	Applicable	New York State has classified surface water bodies and groundwater based on use. Water Quality Standards have been set to protect the designated uses of water.	Because groundwater in the vicinity of NLODS is used as a drinking water supply, this regulation is applicable. Groundwater at NLODS is classified as Class GA. Contaminant concentrations have been compared to Class GA groundwater standards. Redwater Brook is classified as Class B. Applicable surface water quality standards were compared to contaminant concentrations detected in wetland surface water samples.
Federal Guidance and Criteria To Be Considered	USEPA Reference Doses (RfDs)	To Be Considered	RfDs are considered the levels unlikely to cause significant adverse health effects associated with a threshold mechanism of action in human exposure for a lifetime.	USEPA RfDs are used to characterize risks due to noncarcinogens in various media.
	USEPA Human Health Carcinogen Assessment Group Cancer Slope Factors (CSFs)	To Be Considered	Carcinogenic effects present the most up-to-date information on cancer risk potency derived from USEPA's Human Health Carcinogen Assessment Group.	USEPA CSFs are used to compute the individual incremental cancer risk resulting from exposure to certain compounds.
	TSCA - PCB Spill Cleanup Policy	To Be Considered	TSCA outlines appropriate response actions for PCB-contaminated sites. TSCA regulations only apply to PCB concentrations greater than 50 ppm.	PCBs were disposed of at NLODS prior to February 1978; therefore, TSCA regulations do not apply. However, TSCA Spill Policy disposal options will be considered in the Feasibility Study.

(Continued)

TABLE 3-6
CHEMICAL-SPECIFIC ARARs AND SCGs

NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN RI/FS
AIR				
Federal	Clean Air Act [40 CFR 50]	Applicable	Primary ambient air quality standards define levels of air quality to protect public health. Secondary ambient air quality standards protect public welfare from known or anticipated adverse effects from pollutants.	Particulate standard for matter less than 10 microns is 150 $\mu g/m^3$, 24-hour average concentration.
State	New York Ambient Air Quality Standards [6 NYCRR 257]	Applicable	State standards promulgated for the protection of public health.	Particulate standard for matter less than 10 microns is 250 $\mu g/m^3$, 24-hour average concentration.
State Guidance and Criteria To Be Considered	New York State Air Guide - 1; Guidelines for the Control of Toxic Ambient Air Contaminants	To be Considered	The Air Guide presents numerical toxicity guidance values to be used in the development and evaluation of concentrations of toxic compounds emitted into the air.	If a remedial actions create a source of emission of hazardous compounds, the values in Air Guide-1 may be used in developing acceptable concentrations of air emissions.
SOIL/SEDIMENT				
Federal Criteria and Guidance to be Considered	Interim Guidance on Establishing Soil Lead Clean-up Levels at Superfund Sites [OSWER Directive #9355.4-02]	To be Considered	This guidance sets forth interim soil clean-up levels for lead, in lieu of any USEPA-verified toxicological values (i.e., RFDs, CSFs). Interim guidance recommends clean-up levels for total lead of 500 to 1,000 mg/kg, depending on site-specific setting and conditions.	This guidance may be evaluated in support of establishing clean-up levels if no other federal or state standards exist, or if site-specific conditions warrant these levels based on the exposure assessment.
State Criteria and Guidance to be Considered	Proposed New York State Petroleum Contaminated Soil Guidance	To be Considered	This guidance sets forth conditions by which non-hazardous petroleum contaminated soil (including sediment) can be de-classified as a solid waste and to establish criteria by which the de-classified soil can be considered acceptable to return to the original excavation or disposed of in accordance with acceptable disposal practices.	This guidance may potentially be considered based on the outcome of the hazardous waste determination that will be conducted as part of the FS. Guidance on sampling, target clean-up levels, treatment, and final disposal would only be considered if (1) waste materials are not determined to be hazardous, (2) if no other promulgated values are available for establishing clean-up level, and (3) other conditions set forth are appropriate for the circumstances at NLODS.

(Continued)

TABLE 3-6
CHEMICAL-SPECIFIC ARARs AND SCGs

NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

MEDIA	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN RI/FS
	NYSDEC Division of Technical and Administrative Guidance Memorandum: Determination of Soil Cleanup Objectives and Cleanup Levels [HWR-92-4606]	To be Considered	This TAGM provides a basis and procedure to determine soil cleanup levels at New York State Superfund sites when cleanup to predisposal conditions is not feasible. The basis for cleanup levels include protection of public health, protection of groundwater or drinking water quality, background levels, and detection limits.	NYSDEC determined that TAGM 4046 was applicable establishing the cleanup objective for VOAs detected in the lagoon area of the NLODS. Environmental concentrations protective of groundwater quality is the objective used as a basis for determining target cleanup levels for VOAs during the Third Phase FS.

ACRONYMS:

ARARS	Applicable or Relevant and Appropriate Requirements
AWQC	Ambient Water Quality Criteria
CFR	Code of Federal Regulations
CPF	Cancer Potency Factor
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
mg/L	milligrams per liter
NLODS	North Lawrence Oil Dump Site
NYCRR	New York Code of Rules and Regulations
NYSDEC	New York State Department of Environmental Conservation
PCB	polychlorinated biphenyl
ppm	parts per million
RCRA	Resource Conservation and Recovery Act
RfD	Risk Reference Dose
RI/FS	Remedial Investigation/Feasibility Study
SCG	Standards, Criteria, and Guidelines
SDWA	Safe Drinking Water Act
TAGM	Technical Administrative and Guidance Memorandum
TSCA	Toxic Substances Control Act
$\mu g/L$	micrograms per liter
$\mu g/m^3$	micrograms per cubic meter
USEPA	U.S. Environmental Protection Agency
VOAs	volatile organic analytes

(Continued)

TABLE 3-7
LOCATION-SPECIFIC ARARs AND SCGs

NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

SITE FEATURE	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN RI/FS
State	New York Freshwater Regulations [6 NYCRR Parts 662 - 665]	Applicable	These regulations require permit applications to be filed with the regulating authority (i.e., NYSDEC or the local government) for activities that may impinge upon or substantially affect a wetland or adjacent areas. The regulations apply to wetlands encompassing an area of 12.4 acres or more, or wetlands with unusual local importance regardless of size.	Because a New York State-regulated wetland is on-site, these requirements are applicable. The substantive requirements of state and local permits will be addressed during the development and detailed analysis of remedial alternatives that propose activities within the wetlands area on-site.

ACRONYMS:

ARARS Applicable or Relevant and Appropriate Requirements
CWA Clean Water Act
CFR Code of Federal Regulations
EO Executive Order
NYCRR New York Code of Rules and Regulations
NYSDEC New York State Department of Environmental Conservation
RI/FS Remedial Investigation/Feasibility Study
SCG Standards, Criteria, and Guidelines
USEPA U.S. Environmental Protection Agency

TABLE 3-7
LOCATION-SPECIFIC ARARs AND SCGs

NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

SITE FEATURE	REQUIREMENT	STATUS	REQUIREMENT SYNOPSIS	CONSIDERATION IN RI/FS
WETLANDS				
Federal	CWA Section 404	Applicable	Section 404 of the CWA regulates the discharge of dredged or fill material into U.S. waters, including wetlands. The purpose of Section 404 is to ensure that proposed discharges are evaluated with respect to impact on the aquatic ecosystem. If a remedial alternative involves discharge of dredged or fill material to a wetland, a permit must be obtained from the U.S. Army Corps of Engineers.	During the identification, screening, and evaluation of alternatives, the effects to the on-site wetlands will be evaluated.
	U.S. Army Corps of Engineers Permit Program Regulations (33 CFR Part 320-330)	Applicable	These regulations prescribe the statutory authorities, and general and special policies and procedures applicable to the review of applications for Department of Army permits for controlling certain activities in U.S. waters including discharge of dredged or fill material.	If remediation is required within the wetland, the performance requirements of a Department of Army permit will need to be attained. The Department of Army permit requires demonstrations that (1) dredging and filling of the wetlands will cause minimal adverse impacts, (2) a less environmentally damaging alternative does not exist, and (3) the project is in the overall public interest.
	Guidelines for the Specification of Disposal Sites for Dredged or Fill Materials [40 CFR Part 230]	Applicable	These guidelines maintain that no dredged or fill material discharge will be permitted if there is a practicable alternative with less impact to the aquatic ecosystem. Discharge will also not be permitted unless steps are taken to minimize potential adverse impacts, or if it will cause or contribute to significant degradation of U.S. waters.	If a remedial alternative involves discharging dredged or fill material to a wetland, this regulation will be applicable. Potential short- or long-term effects must be determined, based on various physical, chemical, and biological parameters. Effects on human use characteristics such as aesthetics and recreation also need to be addressed.
	40 CFR Part 6, Appendix A (National Environmental Policy Act; Wetland Executive Order 11990)	Relevant and Applicable	Sets forth USEPA policy for carrying out the provisions of the Wetlands Executive Order (EO 11990). Under this order, federal agencies are required to minimize the destruction, loss, or degradation of wetlands, and preserve and enhance natural and beneficial values of wetlands.	This requirement will be considered during the development of alternatives. If remediation is required within the on-site wetland and no practical alternative exists, potential harm must be minimized and action taken to restore the natural and beneficial values of the wetland.
	Fish and Wildlife Coordination Act	Applicable	This Act requires that the U.S. Fish and Wildlife Services, National Marine Fisheries Services, and other related state agencies be consulted before a body of water is modified.	The requirements of this act will be attained through compliance with Section 404 of the Clean Water Act.

TABLE 3–8

BACKGROUND SOIL CONCENTRATION RANGES

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

COMPOUND	NEW YORK REGION[1] (mg/kg)	EASTERN UNITED STATES[2] (mg/kg)
Aluminum	1,000 – 25,000	700 – > 10,000
Arsenic	3 – 12	<0.1 – 73
Barium	15 – 600	10 – 1,500
Beryllium	0 – 1.75	<1 – 7
Cadmium	0.01 – 2	NA
Calcium	130 – 35,000	100 – 28,000
Chromium	1.5 – 40	1 – 1,000
Cobalt	2.5 – 60	<0.3 – 70
Copper	1 – 15	<1 – 700
Iron	17,500 – 25,000	10 – >10,000
Lead	10 – 37	<10 – 300
Magnesium	1,700 – 6,000	50 – 5,000
Manganese	50 – 5,000	<2 – 7,000
Mercury	0.042 – 0.066	0.01 – 0.34
Nickel	0.5 – 25	<5 – 700
Potassium	8,500 – 43,000	5 – 3,700
Selenium	<0.1 – 0.125	<0.1 – 3.9
Silver	NA	NA
Sodium	6,000 – 8,000	50 – 5,000
Vanadium	25 – 60	<7 – 300
Zinc	37 – 60	<20 – 2,000

NOTES:

[1] Concentrations obtained from "Background Concentrations of 20 Elements in Soils with Special Regard for New York State". (no date) Paper prepared by E. Carol McGovern, NYSDEC Wildlife Resources Center.

[2] Shacklette, M.T. and J.G. Boerngen, 1984. "Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States"; USGS Professional Paper 1270.

mg/kg = milligrams per kilogram

NA = Not Available.

TABLE 3-9

SURFACE WATER SAMPLE FIELD PARAMETERS

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

SAMPLE LOCATION	DATE	TEMP. (deg. C)	SPECIFIC CONDUCTIVITY (micromhos/cm)	pH
SW-1	5/10/89	13.6	146	9.0
SW-2	5/10/89	14.2	180	8.5
SW-3	5/10/89	14.2	180	8.5
SW-4	5/9/89	11.5	243	7.0
SW-5	5/9/89	10.1	110	5.1
SW-6	5/9/89	9.4	322	5.9
SW-7	5/9/89	14.6	177	7.2
SW-8	5/9/89	11.3	202	6.3
SW-9	5/9/89	10.4	191	7.2
SW-10	5/9/89	11.4	233	6.4
SW-11	5/9/89	8.9	174	6.7
SW-12	5/9/89	7.3	170	6.6
SW-13	5/9/89	13.5	220	6.5
SW-14	5/9/89	15.7	103	7.5
SW-15	5/9/89	14.2	122	7.2
SW-16	5/9/89	14.5	128	7.8

Notes:

cm = centimeter
Temp. = temperature
deg. C = degree celsius

TABLE 3-10
GROUNDWATER SAMPLE FIELD PARAMETERS
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

SAMPLE LOCATION	DATE	TEMP. (deg. C)	SPECIFIC CONDUCTIVITY (micromhos/cm)	pH
FIRST PHASE SAMPLING				
MW-101A	5/11/89	7.6	434	9.0
MW-101B	5/11/89	8.0	368	9.3
MW-102A	5/10/89	8.2	333	10.9
MW-102B	5/10/89	7.0	280	9.6
MW-103	5/10/89	9.0	410	10.2
MW-104A	5/10/89	7.9	563	9.2
MW-104B	5/10/89	7.7	607	8.0
MW-105A	5/10/89	8.3	421	8.4
MW-105B	5/10/89	8.6	468	9.1
MW-106	5/11/89	6.3	227	9.7
MW-107A	5/11/89	7.3	465	9.2
MW-107B	5/11/89	6.8	479	9.5
SECOND PHASE SAMPLING				
MW-101A	1/14/92	4.7	407	6.6
MW-101B	1/14/92	6.6	370	7.0
MW-102A	1/14/92	8.2	219	8.8
MW-102B	1/14/92	5.9	290	7.9
MW-103	1/14/92	4.2	425	7.9
MW-104A	1/15/92	7.0	400	7.5
MW-104B	1/15/92	7.0	*	7.5
MW-105A	1/14/92	7.8	362	7.9
MW-105B	1/14/92	5.4	471	7.5
MW-106	1/15/92	4.3	182	8.9
MW-107A	1/15/92	6.5	*	8.0
MW-107B	1/15/92	4.7	407	6.6
MW-201	1/13/92	7.6	345	8.1
MW-202	1/13/92	6.3	661	7.3
MW-203	1/14/92	7.9	389	7.7
MW-204	1/15/92	2.1	*	7.1

Notes:

*	= Specific conductivity probe would not work due to extremely cold ambient air temperatures.
C	= Celsius
cm	= centimeter
deg.	= degree
Temp.	= temperature

TABLE 4-1
WATER LEVEL DATA
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

LOCATION	GROUND SURFACE (ft. MSL)	RISER ELEVATION (ft. MSL)	1989								
			3-20	3-22	3-23	3-24	3-24	3-27	3-28	3-30	4-3
PZ-1	387.16	388.93	384.03	384.03	384.08	384.13	384.08	385.30	386.10	–	386.12
PZ-2	390.41	392.53	386.18	386.18	386.13	386.22	386.03	386.92	387.32	–	388.88
PZ-3	391.04	392.79	386.94	386.54	386.79	386.84	386.79	388.09	388.68	–	389.29
PZ-4	393.08	396.15	386.25	386.15	386.20	386.25	386.20	386.83	387.20	–	388.47
PZ-5	393.29	395.56	389.36	388.01	389.01	389.08	388.96	390.89	391.41	–	390.90
PZ-6	384.47	386.74	383.19	383.08	383.08	383.24	383.14	384.17	384.27	–	384.62
PZ-7	385.21	386.92	383.32	383.05	383.22	383.27	383.22	384.07	384.42	–	384.68
PZ-8	382.86	394.82	381.57	381.57	381.62	381.62	381.62	381.97	382.02	–	377.79
MW-101A	390.66	392.88	–	–	–	–	–	–	–	387.96	388.34
MW-101B	390.44	392.78	–	–	–	–	–	–	–	388.11	388.96
MW-102A	393.72	395.86	–	–	–	–	–	–	–	389.31	389.80
MW-102B	394.26	396.30	–	–	–	–	–	–	–	389.97	390.37
MW-103	387.87	390.16	–	–	–	–	–	–	–	388.05	–
MW-104A	385.52	387.03	–	–	–	–	–	–	–	–	–
MW-104B	384.85	386.58	–	–	–	–	–	–	–	–	–
MW-105A	385.82	387.72	–	–	–	–	–	–	–	–	–
MW-105B	385.54	387.65	–	–	–	–	–	–	–	384.06	384.50
MW-106	384.85	386.85	–	–	–	–	–	–	–	384.36	384.37
MW-107A	382.51	384.50	–	–	–	–	–	–	–	–	382.89
MW-107B	382.62	385.24	–	–	–	–	–	–	–	381.82	381.92
MW-201	386.90	388.56	–	–	–	–	–	–	–	–	–
MW-202	388.90	391.21	–	–	–	–	–	–	–	–	–
MW-203	393.30	395.11	–	–	–	–	–	–	–	–	–
MW-204	380.90	382.69	–	–	–	–	–	–	–	–	–

(continued)

TABLE 4–1
WATER LEVEL DATA
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

LOCATION	GROUND SURFACE (ft. MSL)	RISER ELEVATION (ft. MSL)	1989							
			4–10	4–11	4–13	4–14	5–9	5–10	5–11	5–12
PZ–1	387.16	388.93	385.73	–	385.53	385.49	384.73	384.55	384.61	384.77
PZ–2	390.41	392.53	389.03	–	388.92	388.85	387.93	387.76	387.89	388.12
PZ–3	391.04	392.79	389.29	–	389.21	389.11	387.92	387.76	388.01	388.27
PZ–4	393.08	396.15	389.40	–	389.19	389.10	389.44	389.22	–	389.38
PZ–5	393.29	395.56	391.00	–	390.82	390.74	389.81	389.59	389.57	389.75
PZ–6	384.47	386.74	384.20	–	384.16	384.18	383.23	383.09	383.30	383.46
PZ–7	385.21	386.92	384.24	–	384.19	384.17	383.12	382.85	383.15	383.31
PZ–8	382.86	394.82	381.57	–	381.52	381.53	380.61	380.54	380.62	380.72
MW–101A	390.66	392.88	388.44	388.35	388.35	388.28	387.38	387.29	387.27	387.44
MW–101B	390.44	392.78	389.19	389.03	389.09	388.98	388.07	387.94	387.97	388.23
MW–102A	393.72	395.86	390.14	–	390.04	389.96	389.12	–	390.36	389.38
MW–102B	394.26	396.30	391.10	391.03	391.02	390.96	390.07	–	390.23	390.12
MW–103	387.87	390.16	388.21	388.09	388.05	388.02	386.94	386.93	386.96	386.95
MW–104A	385.52	387.03	–	–	384.75	384.30	383.32	383.25	383.38	383.56
MW–104B	384.85	386.58	–	–	383.89	384.31	383.24	383.25	383.26	383.46
MW–105A	385.82	387.72	384.82	384.72	384.74	384.73	383.71	382.65	383.12	383.87
MW–105B	385.54	387.65	383.84	383.73	*	383.79	382.64	382.67	382.78	383.04
MW–106	384.85	386.85	383.95	383.84	383.88	383.85	382.83	382.93	382.77	383.55
MW–107A	382.51	384.50	382.64	382.58	382.60	382.53	381.61	381.57	381.55	381.69
MW–107B	382.62	385.24	381.59	381.56	381.56	381.57	380.67	380.81	380.76	380.79
MW–201	386.90	388.56	–	–	–	–	–	–	–	–
MW–202	388.90	391.21	–	–	–	–	–	–	–	–
MW–203	393.30	395.11	–	–	–	–	–	–	–	–
MW–204	380.90	382.69	–	–	–	–	–	–	–	–

(continued)

TABLE 4–1
WATER LEVEL DATA
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

LOCATION	GROUND SURFACE (ft. MSL)	RISER ELEVATION (ft. MSL)	1991			1992		
			11–13	11–16	11–20	1–13–92	1–15–92	6–5–92
PZ-1	387.16	388.93	380.26	380.59	381.48	383.78	–	384.45
PZ-2	390.41	392.53	381.38	381.19	383.40	386.25	384.89	387.57
PZ-3	391.04	392.79	380.94	381.03	382.68	386.38	–	387.95
PZ-4	393.08	396.15	379.01	DRY	379.38	386.60	386.69	389.15
PZ-5	393.29	395.56	379.83	–	380.89	386.34	386.61	390.13
PZ-6	384.47	386.74	379.60	380.63	–	382.59	–	383.35
PZ-7	385.21	386.92	380.57	381.57	382.31	383.22	–	383.37
PZ-8	382.86	384.82	380.00	381.20	380.90	381.05	–	381.12
MW-101A	390.66	392.88	381.12	381.42	383.05	385.88	386.43	387.04
MW-101B	390.44	392.78	381.42	381.60	383.73	386.39	387.04	387.72
MW-102A	393.72	395.86	380.56	380.76	383.81	386.91	387.11	388.94
MW-102B	394.26	396.30	DRY	384.42	382.30	387.94	387.65	389.99
MW-103	387.87	390.16	380.44	384.49	383.32	385.66	–	–
MW-104A	385.52	387.03	379.79	380.42	380.83	392.98	–	383.74
MW-104B	384.85	386.58	379.70	381.03	381.08	382.51	–	383.07
MW-105A	385.82	387.72	380.62	381.87	382.37	383.56	–	383.83
MW-105B	385.54	387.65	380.46	382.26	382.31	382.87	–	382.87
MW-106	384.85	386.85	380.65	382.34	382.52	382.72	383.60	383.07
MW-107A	382.51	384.50	380.17	381.26	381.18	381.67	Frozen	381.96
MW-107B	382.62	385.24	380.02	381.19	380.94	381.12	381.29	381.12
MW-201	386.90	388.56	–	–	369.41	377.16	–	382.22
MW-202	388.90	391.21	–	378.31	378.79	381.8	382.08	387.58
MW-203	393.30	395.11	–	–	379.53	385.83	–	388.76
MW-204	380.90	382.69	–	–	380.44	Frozen	–	380.54

Notes:
ft. MSL = feet mean sea level
* = Bailed prior to water levels being collected.

TABLE 5-1
METEOROLOGIC DATA
WIND DIRECTION TRENDS DURING THE WEEK OF APRIL 12, 1989
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

SECTOR		TOTAL OF HOURLY AVERAGES	PERCENT OF TIME SPENT IN SECTOR
North	= 360 or 0 and includes 338 to 22	4	3
Northeast	= 45 and includes 23 to 67	3	2
East	= 90 and includes 68 to 112	9	6
Southeast	= 135 and includes 113 to 157	3	2
South	= 180 and includes 158 to 202	18	13
Southwest	= 225 and includes 203 to 247	55	39
West	= 270 and includes 248 to 292	41	29
Northwest	= 315 and includes 293 to 337	9	6
	TOTAL HOURS	142	

TABLE 5-2

SUMMARY OF PESTICIDE/PCB DATA FOR FIRST PHASE SURFACE SOIL SAMPLES

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

SAMPLE LOCATION	PARAMETER (µg/kg) AROCLOR-1260
CRQL	160
SS-1	-
SS-2	-
SS-3	-
SS-4	-
SS-5	4600
SS-5 (DUP)	6000

Notes:

- = Not Detected

CRQL = Contract Required Quantitation Limit

DUP = Duplicate Sample

µg/kg = micrograms per kilogram

TABLE 5-3

SUMMARY OF VOLATILE ORGANIC ANALYSES FOR FIRST PHASE SOIL BORING SAMPLES

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

PARAMETER (µg/kg)	CRQL (µg/kg)	TB–1A (0–4 ft. bgs)	TB–101* (0–2 ft. bgs)	TB–101 (4–8 ft. bgs)	TB–102* (0–2 ft. bgs)	TB–102 (6–8 ft. bgs)	TB–102 (8–10 ft. bgs)	TB–103* (0–6 ft. bgs)	TB–104 (11–15 ft. bgs)	TB–105 (8–10 ft. bgs)	TB–106* (2–4 ft. bgs)	TB–106 (12–14 ft. bgs)
2–Butanone	10	–	R	R	R	R	R	R	R	R	R	R
Trichloroethene	5	–	–	29	4500	–	–	–	–	150	21000	–
Benzene	5	–	–	–	–	–	–	–	–	12 J	–	–
4–Methyl–2–Pentanone	10	–	–	–	–	–	–	–	–	26 J	–	–
Tetrachloroethene	5	150 J	2200	9	6200	–	–	–	–	180	56000	–
1,1,2,2–Tetrachloroethane	5	–	–	–	–	–	–	–	–	–	–	–
Toluene	5	29 J	1000	–	4700	–	–	–	–	210	42000	–
Chlorobenzene	5	16 J	–	–	–	–	–	–	–	6	–	–
Ethylbenzene	5	120 J	2200	–	3300	–	–	–	–	98	23000	–
Total Xylenes	5	440 D	14000	27	19000	26	–	2200	–	1000 D	130000	–
TOTALS		755	19400	65	37700	26	–	2200	–	1682	272000	–

(continued)

TABLE 5–3

SUMMARY OF VOLATILE ORGANIC ANALYSES FOR FIRST PHASE SOIL BORING SAMPLES

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

PARAMETER (µg/kg)	CRQL (µg/kg)	TB–107 (8–10 ft. bgs)	TB–108 (6–8 ft. bgs)	TB–109 (6–8 ft. bgs)	TB–110 (10–12 ft. bgs)	TB–111 (0–2 ft. bgs)	TB–111 DUP (0–2 ft. bgs)	TB–113 (2–6 ft. bgs)	TB–114 (0–2 ft. bgs)	TB–115 (0–2 ft. bgs)	TB–115 DUP (0–2 ft. bgs)	TB–116 (4–6 ft. bgs)
2–Butanone	10	–	–	–	R	R	R	–	–	–	–	R
Trichloroethene	5	–	410 EJ	2900 D	–	–	–	750 D	–	–	–	170
Benzene	5	–	10	170	–	–	–	39	–	–	–	–
4–Methyl–2–Pentanone	10	–	–	170	–	–	–	18	–	–	–	–
Tetrachlorethene	5	13	710 EJ	11000 D	–	–	–	5400 D	–	11	9	830
1,1,2,2–Tetrachloroethane	5	–	12 J	87	–	–	–	8	–	–	–	–
Toluene	5	7	530 EJ	4000 D	–	–	–	2800 D	–	8	7	28
Chlorobenzene	5	–	–	–	–	–	–	–	–	–	–	–
Ethylbenzene	5	6	220 J	2300 D	–	–	–	540 D	–	–	–	230
Total Xylenes	5	40	1200 EJ	14000 D	–	–	–	8900 D	–	16	11	940
TOTALS		66	3092	34627	–	–	–	18455	–	35	27	2198

(continued)

TABLE 5-3

SUMMARY OF VOLATILE ORGANIC ANALYSES FOR FIRST PHASE FROM SOIL BORING SAMPLES

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

PARAMETER (μg/kg)	CRQL (μg/kg)	TB-117 (0-2 ft. bgs)	TB-117 DUP (0-2 ft. bgs)	TB-118* (2-4 ft. bgs)	TB-118 (4-6 ft. bgs)	TB-122* (0-2 ft. bgs)	TB-122* (2-4 ft. bgs)	TB-123* (0-2 ft. bgs)	TB-123 (6-8 ft. bgs)	TB-124* (2-5 ft. bgs)	TB-124 (10-11 ft. bgs)	TB-125* (4-7 ft. bgs)
2-Butanone	10	–	–	R	–	R	R	R	–	R	R	R
Trichloroethene	5	–	–	1000	–	2000	–	16000	7	1500	85	2700
Benzene	5	–	–	–	–	–	–	–	–	–	–	–
4-Methyl-2-Pentanone	10	–	–	–	–	–	–	–	–	–	250	–
Tetrachlorethene	5	8	–	3400	–	4300	3300	22000	–	12000	31	8600
1,1,2,2-Tetrachloroethane	5	–	–	–	–	–	–	720	–	–	–	–
Toluene	5	–	–	–	–	–	1200	7100	–	4400	110	5900
Chlorobenzene	5	–	–	–	–	–	–	–	–	–	–	–
Ethylbenzene	5	–	–	1700	–	–	2700	2300	–	2100	–	4200
Total Xylenes	5	–	–	9200	–	1700	16000	67000 D	–	14000	95	25000
TOTALS		8	–	15300	–	8000	23200	115120	7	34000	571	46400

TABLE 5–4

SUMMARY OF VOLATILE ORGANIC DATA FOR SECOND PHASE SOIL BORING SAMPLES

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

PARAMETER (µg/kg)	CRQL (µg/kg)	SB–201 (4–6 ft. bgs)	SB–202 (4–6 ft. bgs)	SB–203 (2–4 ft. bgs)	SB–204 (4–6 ft. bgs)	SB–205 (2–4 ft. bgs)	SB–205 DUP (2–4 ft. bgs)	SB–206 (4–6 ft. bgs)	SB–207 (4–6 ft. bgs)
Acetone	10	25	–	–	–	–	–	–	–
Benzene	5	–	–	–	–	–	–	74 J	–
Ethylbenzene	5	–	–	–	10	–	42 J	150 J	89
4–Methyl–2–Pentanone	10	–	–	–	–	–	–	69 J	–
Methylene Chloride	5	–	–	–	–	–	7 J	10 J	–
Trichloroethene	5	–	–	–	–	22	78 J	630 D	180
Tetrachloroethene	5	–	–	–	9	170	1200 DEJ	1600 DEJ	1600 DEJ
Toluene	5	–	–	–	–	–	170 J	1100 D	200
Total Xylenes	5	–	–	–	79	–	210 J	230 D	3200 DEJ

Notes:

CRQL = Contract Required Quantitation Limit

D = Indicates that sample concentration was obtained by dilution to bring result within calibration range.

ft. bgs = feet below ground surface.

E = Indicates that the analyte concentration exceeded the calibration range of the GC/MS and that a re–analysis of a diluted sample is required.

J = Estimated concentration because results are either below the Contract Required Quantitation Limit or quality control criteria were not met.

µg/kg = micrograms per kilogram

TABLE 5-5

SUMMARY OF SEMIVOLATILE ORGANIC DATA FOR FIRST PHASE SOIL BORING SAMPLES

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

PARAMETER (µg/kg)	CRQL (µg/kg)	TB-1A (0-4 ft. bgs)	TB-101* (0-2 ft. bgs)	TB-101 (4-8 ft. bgs)	TB-102* (0-2 ft. bgs)	TB-102 (6-8 ft. bgs)	TB-102 (8-10 ft. bgs)	TB-103 (0-6 ft. bgs)	TB-104 (11-15 ft. bgs)	TB-105 (8-10 ft. bgs)	TB-106 (2-4 ft. bgs)	TB-106 (12-14 ft. bgs)
1,2-Dichlorobenzene	330	–	R	–	–	–	–	–	–	–	3200 J	–
Isophorone	330	–	R	–	R	–	–	–	–	–	4500 J	–
Naphthalene	330	–	3200 J	–	6900 J	–	–	–	–	–	110000 J	–
2-Methylnaphthalene	330	–	11000 J	–	13000 J	–	–	–	–	–	210000 J	–
Acenaphthene	330	–	–	–	–	–	–	–	–	–	6100 J	–
Dibenzofuran	330	–	–	–	–	–	–	–	–	–	4900 J	–
Diethylphthalate	330	–	R	–	R	–	–	–	–	–	R	–
Fluorene	330	–	1500 J	–	–	–	–	–	–	–	8900 J	–
Phenanthrene	330	–	2600 J	–	2000 J	–	–	–	–	–	11000 J	–
Anthracene	330	–	–	–	–	–	–	–	–	–	2500 J	–
Di-n-octylphthalate	330	–	R	–	R	–	–	–	–	–	R	–
TOTALS		–	18300	–	21900	–	–	–	–	–	361100	–

(continued)

TABLE 5-3

SUMMARY OF VOLATILE ORGANIC ANALYSES FOR FIRST PHASE FROM SOIL BORING SAMPLES

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

PARAMETER (μg/kg)	CRQL (μg/kg)	TB-126 (7-9 ft. bgs)	TB-127* (4-6 ft. bgs)	TB-127 (5-10 ft. bgs)	TB-129* (0-2 ft. bgs)	TB-129* DUP (0-2 ft. bgs)	TB-130 (4-6 ft. bgs)	TB-131* (2-4 ft. bgs.)	TB-131* (6-8 ft. bgs)	TB-133* (2-3 ft. bgs)	TB-133 (5-7 ft. bgs)	TB-134 (2-4 ft. bgs)
2-Butanone	10	-	R	R	R	R	R	R	R	R	R	R
Trichloroethene	5	200	2000	46	9600	8800	3300 D	11000	-	2600	360	-
Benzene	5	-	-	-	-	-	40 J	1200	-	-	-	-
4-Methyl-2-Pentanone	10	-	-	-	-	-	64 J	-	-	-	-	-
Tetrachlorethene	5	770	21000	620	39000	27000	9100 D	99000 D	3800	10000	830	-
1,1,2,2-Tetrachloroethane	5	-	-	-	-	-	39 J	-	-	-	-	-
Toluene	5	120	8200	210	-	1600	5900 D	30000 D	1200	6400	670	-
Chlorobenzene	5	-	-	-	-	-	25 J	-	-	-	-	-
Ethylbenzene	5	97	4700	140	-	1200	3200 D	9800	1200	3400	340	-
Total Xylenes	5	570	24000	850	11000	9200	20000 D	59000 D	7100	22000	1800	-
TOTALS		1757	59900	1866	59600	47800	41668	210000	13300	44400	4000	-

NOTES:

- \- = Not detected
- * = Medium Level Analysis was conducted.
- CRQL = Contract Required Quantitation Level
- D = Sample concentration was obtained by dilution to bring result within calibration range.
- E = Analyte concentration exceeded the calibration range of the GC/MS and re-analysis of a diluted sample is required.
- J = Estimated concentration because results are either below the CRQL or quality control criteria were not met.
- R = Rejected value due to non-compliant quality control criteria.
- μg/kg = micrograms per kilogram
- ft. bgs = Feet below ground surface

(continued)

TABLE 5–5

SUMMARY OF SEMIVOLATILE ORGANIC DATA FOR FIRST PHASE SOIL BORING SAMPLES

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

PARAMETER (µg/kg)	CRQL (µg/kg)	TB–107 (8–10 ft. bgs)	TB–108 (6–8 ft. bgs)	TB–109 (6–8 ft. bgs)	TB–110 (10–12 ft. bgs)	TB–111 (0–2 ft. bgs)	TB–111 DUP (0–2 ft. bgs)	TB–113 (2–6 ft. bgs)	TB–114 (0–2 ft. bgs)	TB–115 (0–2 ft. bgs)	TB–115 DUP (0–2 ft. bgs)	TB–116 (4–6 ft. bgs)
1,2–Dichlorobenzene	330	–	–	–	–	–	–	–	–	–	–	R
Isophorone	330	–	–	–	–	–	–	–	–	–	–	R
Naphthalene	330	–	–	–	–	–	–	–	–	–	–	–
2–Methylnaphthalene	330	–	–	–	–	–	–	1600	–	–	–	–
Acenaphthene	330	–	–	–	–	–	–	–	–	–	–	R
Dibenzofuran	330	–	–	–	–	–	–	–	–	–	–	R
Diethylphthalate	330	–	–	–	–	–	–	–	–	–	–	R
Fluorene	330	–	–	–	–	–	–	–	–	–	–	R
Phenanthrene	330	–	–	–	–	–	–	–	–	–	–	–
Anthracene	330	–	–	–	–	–	–	–	–	–	–	R
Di–n–octylphthalate	330	–	–	–	–	–	–	–	–	–	–	R
TOTALS		–	–	–	–	–	–	1600	–	–	–	–

(continued)

TABLE 5-5

SUMMARY OF SEMIVOLATILE ORGANIC DATA FOR FIRST PHASE SOIL BORING SAMPLES

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

PARAMETER (μg/kg)	CRQL (μg/kg)	TB–117 (0–2 ft. bgs)	TB–117 DUP (0–2 ft. bgs)	TB–118* (2–4 ft. bgs)	TB–118 (4–6 ft. bgs)	TB–122* (0–2 ft. bgs)	TB–122* (2–4 ft. bgs)	TB–123* (0–2 ft. bgs)	TB–123 (6–8 ft. bgs)	TB–124* (2–5 ft. bgs)	TB–124 (10–11 ft. bgs)	TB–125* (4–7 ft. bgs)
1,2–Dichlorobenzene	330	–	–	–	–	R	–	1300 J	–	–	–	–
Isophorone	330	–	–	–	–	R	–	R	–	–	–	–
Naphthalene	330	–	–	–	–	–	4800	8600 J	–	1900	–	1400
2–Methylnaphthalene	330	–	–	3500 J	–	–	8900	16000 J	–	2900	–	2200
Acenaphthene	330	–	–	–	–	R	–	–	–	–	–	–
Dibenzofuran	330	–	–	–	–	R	–	R	–	–	–	–
Diethylphthalate	330	–	–	2300 J	–	R	–	R	–	–	–	–
Fluorene	330	–	–	–	–	R	–	–	–	–	–	–
Phenanthrene	330	–	–	–	–	R	–	1100 J	–	–	–	–
Anthracene	330	–	–	–	–	R	–	–	–	–	–	–
Di–n–octylphthalate	330	–	–	–	28000 J	R	–	R	–	–	–	–
TOTALS		–	–	5800	28000	–	13700	27000	–	4800	–	3600

(continued)

TABLE 5–5

SUMMARY OF SEMIVOLATILE ORGANIC DATA FOR FIRST PHASE SOIL BORING SAMPLES
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

PARAMETER (µg/kg)	CRQL (µg/kg)	TB–126 (7–9 ft. bgs)	TB–127* (4–6 ft. bgs)	TB–127 (5–10 ft. bgs)	TB–129* (0–2 ft. bgs)	TB–129* DUP (0–2 ft. bgs)	TB–130 (4–6 ft. bgs)	TB–131* (2–4 ft. bgs)	TB–131* (6–8 ft. bgs)	TB–133* (2–3 ft. bgs)	TB–133 (5–7 ft. bgs)	TB–134 (2–4 ft. bgs)
1,2–Dichlorobenzene	330	–	–	–	R	R	–	–	–	–	–	–
Isophorone	330	–	–	–	–	R	–	–	–	–	–	–
Naphthalene	330	–	2200 J	–	–	–	1200	11000	–	3100 J	–	–
2–Methylnaphthalene	330	–	–	–	3600 J	1400 J	1800	18000	3400	4800 J	–	–
Acenaphthene	330	–	–	–	–	R	–	–	–	–	–	–
Dibenzofuran	330	–	–	–	–	R	–	–	–	–	–	–
Diethylphthalate	330	–	–	–	R	R	–	–	–	–	–	–
Fluorene	330	–	–	–	–	–	–	–	–	–	–	–
Phenanthrene	330	–	–	–	–	–	–	–	–	–	–	–
Anthracene	330	–	–	–	R	R	–	–	–	–	–	–
Di–n–octylphthalate	330	–	–	–	R	R	–	–	–	–	–	–
TOTALS		–	2200	–	3600	1400	3000	29000	3400	7900	–	–

Notes:

CRQL = Contract Required Quantitation Limit

µg/kg = micrograms per kilogram

ft. bgs = feet below ground surface

J = Estimated concentration because results are either below the contract required detection limit or quality control criteria were not met.

R = Data are unusable because quality control criteria were not met.

– = Not detected.

* = Medium level analysis was conducted.

TABLE 5–6

SUMMARY OF SEMIVOLATILE ORGANIC DATA FROM SECOND PHASE SOIL BORING SAMPLES

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

ANALYTE (μg/kg)	CRQL (μg/kg)	SB–201 (4–6 ft. bgs)	SB–202 (0–2 ft. bgs)	SB–203 (2–4 ft. bgs)	SB–204 (4–6 ft. bgs)	SB–205 (2–4 ft. bgs)	SB–205 DUP (2–4 ft. bgs)	SB–206 (0–2 ft. bgs)	SB–207 (2–4 ft. bgs)
Naphthalene	330	–	–	–	–	9200	4800	–	5000
2–Methylnaphthalene	330	–	–	–	–	13000	8900	–	6600
N–Nitrosodiphenylamine	330	–	–	–	–	–	–	–	540 J
Phenanthrene	330	–	–	–	–	1700	–	–	1000 J
bis(2–Ethylhexyl)phthalate	330	–	–	–	1300 B	2900 B	–	–	–

Notes:

B = Indicates that analyte was detected in both the sample and the associated laboratory method blank.

CRQL = Contract Required Quantitation Limit

ft. bgs = feet below ground surface

J = Indicates an estimated concentration because results are either below the contract required quantitation level or quality control criteria were not met.

μg/kg = micrograms per kilogram

TABLE 5-7

SUMMARY OF TPH FIELD SCREENING DATA FOR FIRST PHASE SOIL BORINGS

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

SAMPLE LOCATION	DEPTH (ft. bgs)	TPH[1] CONCENTRATION (ppm)
TB-101	S-1 (0-2)	420
	S-2 (2-4)	-
	S-4 (4-6)	-
	S-5 (6-8)	-
	S-6 (8-10)	-
	S-7 (10-12)	-
	S-8 (12-14)	-
	S-9 (14-16)	-
TB-1A	S-1 (0-2)	-
	S-2 (2-4)	-
TB-102	S-1 (0-2)	-
	S-1 (0-2)	14000
	S-2 (2-4)	820
	S-3 (4-6)	140
	S-4 (6-8)	-
	S-5 (8-10)	-
TB-103	S-1 (0-2)	550
	S-2 (2-4)	-
	S-3 (4-6)	-
	S-4 (8-10)	-
	S-5 (10-12)	-
	S-6 (12-14)	-
	S-7 (14-16)	-
TB-104	S-1 (0-2)	420
	S-2 (2-4)	180
	S-3 (4.6-6.6)	120
	S-4 (6.6-8.6)	190
	S-5 (8.6-8.9)	-
	S-6 (10.9-11.4)	-
	S-7 (12.9-13.6)	-
	S-8 (14.9-15.2)	-
TB-105	S-1 (0-2)	940
	S-2 (2-4)	3200
	S-3 (4-6)	-
	S-4 (6-8)	190
	S-5 (8-10)	-
	S-6 (10-12)	-
	S-7 (12-14)	-
	S-8 (14-16)	180

(continued)

TABLE 5–7

SUMMARY OF TPH FIELD SCREENING DATA FOR FIRST PHASE SOIL BORINGS

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

SAMPLE LOCATION	DEPTH (ft. bgs)	TPH[1] CONCENTRATION (ppm)
TB–106	S–1 (0–2)	–
	S–2 (2–4)	71000
	S–3 (4–6)	3900
	S–4 (6–8)	200
	S–5 (8–10)	1200
	S–6 (10–12)	1400
	S–7 (12–14)	–
	S–8 (14–16)	–
TB–107	S–1 (0–2)	1900
	S–2 (2–4)	170
	S–3 (4–6)	240
	S–4 (6–8)	120
	S–5 (8–10)	–
	S–6 (10–12)	–
	S–7 (12–14)	110
	S–8 (14–16)	–
TB–108	S–1 (0–2)	–
	S–2 (2–4)	1300
	S–3 (4–6)	–
	S–4 (6–8)	–
	S–5 (8–10)	–
	S–6 (10–12)	–
	S–7 (12–14)	–
	S–8 (14–16)	–
TB–109	S–1 (0–2)	160
	S–2 (2–4)	–
	S–3 (4–6)	–
	S–4 (6–8)	–
	S–5 (8–10)	–
	S–6 (10–12)	–
	S–7 (12–14)	–
TB–110	S–1 (0–2)	2000
	S–3 (4–6)	5800
	S–4 (6–8)	6200
	S–5 (8–10)	540
	S–6 (10–12)	720
	S–7 (12–14)	–
	S–8 (14–16)	–

(continued)

TABLE 5–7

SUMMARY OF TPH FIELD SCREENING DATA FOR FIRST PHASE SOIL BORINGS

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

SAMPLE LOCATION	DEPTH (ft. bgs)	TPH[1] CONCENTRATION (ppm)
TB–111	S–1 (0–2)	450
	S–2 (2–4)	–
	S–3 (4–6)	–
	S–4 (6–8)	–
	S–5 (8–10)	–
	S–6 (10–12)	–
	S–7 (12–14)	–
	S–8 (14–16)	–
TB–112	S–1 (0–2)	5700
	S–2 (2–4)	240
	S–3 (4–6)	120
TB–113	S–1 (0–2)	–
	S–2 (2–4)	–
	S–3 (4–6)	–
	S–4 (7–9)	–
	S–5 (9–11)	–
	S–6 (11–13)	–
	S–7 (13–15)	–
TB–114	S–1 (0–2)	–
	S–2 (2–4)	–
	S–3 (4–6)	–
	S–4 (6–8)	–
	S–5 (8–10)	–
	S–6 (10–12)	–
	S–7 (12–14)	–
	S–8 (14–16)	–
TB–115	S–1 (0–2)	–
	S–2 (2–4)	–
	S–3 (4–6)	–
	S–4 (6–8)	–
	S–5 (8–10)	–
TB–116	S–1 (0–2)	–
	S–2 (2–4)	–
	S–3 (4–6)	4800
	S–4 (6–8)	–
	S–5 (8–10)	–
	S–6 (10–12)	–
	S–7 (12–14)	120
	S–8 (14–16)	–

(continued)

TABLE 5–7

SUMMARY OF TPH FIELD SCREENING DATA FOR FIRST PHASE SOIL BORINGS

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

SAMPLE LOCATION	DEPTH (ft. bgs)	TPH[1] CONCENTRATION (ppm)
TB–117	S–1 (0–2)	–
	S–2 (2–4)	–
	S–3 (4–6)	–
	S–4 (6–8)	–
	S–5 (8–10)	–
	S–6 (10–12)	–
	S–7 (12–14)	–
	S–8 (14–16)	–
TB–118	S–1 (0–2)	15000
	S–2 (2–4)	2200
	S–3 (4–6)	–
	S–4 (6–8)	–
	S–5 (8–10)	–
	S–6 (10–12)	–
	S–7 (12–14)	–
TB–122	S–1 (0–2)	21000
	S–2 (2–3.5)	10000
	S–3 (3.5–5)	–
	S–4 (4–6)	–
	S–6 (8–10)	–
TB–123	S–1 (0–2)	20000
	S–2 (2–4)	10000
	S–4 (6–8)	–
	S–5 (8–10)	–
	S–6 (10–12)	–
TB–124	S–1 (0–2)	550
	S–2 (2–3.5)	9200
	S–3 (3.5–5)	4800
	S–4 (5–6.5)	4100
	S–5 (6.5–8)	780
	S–7 (9.5–11)	140
	S–8 (11–12.5)	–
TB–125	S–1 (0–2)	13000
	S–2 (2–3.5)	11000
	S–3 (3.5–5)	13000
	S–4 (5–6.5)	–
	S–6 (9–11.5)	–
	S–7 (11.5–13)	–

(continued)

TABLE 5–7

SUMMARY OF TPH FIELD SCREENING DATA FOR FIRST PHASE SOIL BORINGS

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

SAMPLE LOCATION	DEPTH (ft. bgs)	TPH[1] CONCENTRATION (ppm)
TB–126	S–1 (0–2)	17000
	S–2 (2–3.5)	11000
	S–3 (3.5–5)	560
	S–4 (5–6.5)	–
	S–5 (6.5–8)	–
	S–6 (8–9.5)	–
	S–7 (9.5–11)	–
	S–10 (14–16)	–
TB–127	S–1 (0–2)	25000
	S–2 (2–3.5)	5700
	S–3 (3.5–5)	5000
	S–4 (5–6.5)	6500
	S–7 (9.5–10.4)	–
	S–8 (10.5–10.7)	–
	S–9 (12.8–13.6)	430
	S–10 (14–14.8)	–
TB–129	S–1 (0–2)	35000
	S–2 (2–3.5)	4800
	S–3 (3.5–5)	240
	S–4 (5–6.5)	590
	S–5 (6.5–8)	150
	S–6 (8–9.5)	1200
	S–7 (9.5–10.5)	–
	S–8 (11–12.5)	–
	S–10 (14–16)	–
TB–130	S–1 (0–2)	17000
	S–2 (2–3.5)	28000
	S–3 (3.5–5)	300
	S–7 (9.5–11)	460
	S–8 (11–12.5)	290
	S–9 (12.5–14)	–
	S–10 (14–15.3)	–
TB–131	S–1 (0–2)	14000
	S–2 (2–3.5)	12000
	S–3 (3.5–5)	14000
	S–4 (5–6.5)	3800
	S–5 (6.5–8)	490
	S–6 (8–9.5)	170
	S–7 (9.5–11)	–
	S–8 (11–12.5)	–
	S–9 (12.5–15)	–

(continued)

TABLE 5–7

SUMMARY OF TPH FIELD SCREENING DATA FOR FIRST PHASE SOIL BORINGS

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

SAMPLE LOCATION	DEPTH (ft. bgs)	TPH[1] CONCENTRATION (ppm)
TB–132	S–1 (0–2)	14000
	S–3 (3.5–5)	1500
TB–133	S–1 (0–2)	–
	S–2 (2–3.5)	9600
	S–3 (4–5.5)	2100
	S–4 (5.7–6)	1100
	S–5 (7–8.5)	150
	S–6 (8.7–9)	850
	S–7 (9.5–11)	–
	S–8 (11–13.5)	–
	S–9 (13.5–15)	–
TB–134	S–1 (0–2)	1900
	S–2 (2–3.5)	–
	S–3 (3.5–5)	–
	S–4 (5–6.5)	–
	S–6 (8–9.5)	–
	S–7 (9.5–11)	–
	S–8 (11–12.5)	–
	S–9 (12.5–14)	–

Notes:

1 = Method Detection Limit is 100 ppm

– = Not detected

ft. bgs = feet below ground surface

ppm = parts per million

TPH = total petroleum hydrocarbons

TABLE 5-8

SUMMARY OF PCB FIELD SCREENING DATA FOR FIRST PHASE SOIL BORINGS

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

SAMPLE LOCATION	DEPTH (ft. bgs)	PCB[1] CONCENTRATION (ppm)
TB-101	S-1 (0-2)	0.5
	S-2 (2-4)	1.3
	S-4 (4-6)	-
	S-5 (6-8)	-
	S-6 (8-10)	-
	S-7 (10-12)	-
	S-8 (12-14)	-
	S-9 (14-16)	-
TB-1A	S-1 (0-2)	-
	S-2 (2-4)	-
TB-102	S-1 (0-2)	-
	S-1 (0-2)	18
	S-2 (2-4)	1
	S-3 (4-6)	-
	S-4 (6-8)	-
	S-5 (8-10)	-
TB-103	S-1 (0-2)	25
	S-2 (2-4)	2
	S-3 (4-6)	-
	S-4 (8-10)	-
	S-5 (10-12)	-
	S-6 (12-14)	-
	S-7 (14-16)	-
TB-104	S-1 (0-2)	1.5
	S-2 (2-4)	-
	S-3 (4.6-6.6)	-
	S-4 (6.6-8.6)	-
	S-5 (8.6-8.9)	-
	S-6 (10.9-11.4)	-
	S-7 (12.9-13.6)	-
	S-8 (14.9-15.2)	-
TB-105	S-1 (0-2)	34
	S-2 (2-4)	1.5
	S-3 (4-6)	0.7
	S-4 (6-8)	0.7
	S-5 (8-10)	-
	S-6 (10-12)	-
	S-7 (12-14)	-
	S-8 (14-16)	-

(continued)

TABLE 5-8

SUMMARY OF PCB FIELD SCREENING DATA FOR FIRST PHASE SOIL BORINGS

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

SAMPLE LOCATION	DEPTH (ft. bgs)	PCB[1] CONCENTRATION (ppm)
TB-106	S-1 (0-2)	18
	S-2 (2-4)	16
	S-3 (4-6)	60
	S-4 (6-8)	-
	S-5 (8-10)	1
	S-6 (10-12)	5.5
	S-7 (12-14)	-
	S-8 (14-16)	-
TB-107	S-1 (0-2)	46
	S-2 (2-4)	-
	S-3 (4-6)	-
	S-4 (6-8)	1
	S-5 (8-10)	-
	S-6 (10-12)	-
	S-7 (12-14)	-
	S-8 (14-16)	-
TB-108	S-1 (0-2)	4
	S-2 (2-4)	7.5
	S-3 (4-6)	11
	S-4 (6-8)	-
	S-5 (8-10)	-
	S-6 (10-12)	-
	S-7 (12-14)	-
	S-8 (14-16)	-
TB-109	S-1 (0-2)	23
	S-2 (2-4)	9
	S-3 (4-6)	3
	S-4 (6-8)	0.8
	S-5 (8-10)	-
	S-6 (10-12)	-
	S-7 (12-14)	-
TB-110	S-1 (0-2)	32
	S-3 (4-6)	5.5
	S-4 (6-8)	6
	S-5 (8-10)	-
	S-6 (10-12)	-
	S-7 (12-14)	-
	S-8 (14-16)	-

(continued)

TABLE 5-8

SUMMARY OF PCB FIELD SCREENING DATA FOR FIRST PHASE SOIL BORINGS

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

SAMPLE LOCATION	DEPTH (ft. bgs)	PCB[1] CONCENTRATION (ppm)
TB-111	S-1 (0-2)	-
	S-2 (2-4)	-
	S-3 (4-6)	-
	S-4 (6-8)	-
	S-5 (8-10)	-
	S-6 (10-12)	-
	S-7 (12-14)	-
	S-8 (14-16)	-
TB-112	S-1 (0-2)	24
	S-2 (2-4)	5
	S-3 (4-6)	-
TB-113	S-1 (0-2)	2.7
	S-2 (2-4)	2.9
	S-3 (4-6)	-
	S-4 (7-9)	-
	S-5 (9-11)	-
	S-6 (11-13)	-
	S-7 (13-15)	-
TB-114	S-1 (0-2)	-
	S-2 (2-4)	-
	S-3 (4-6)	-
	S-4 (6-8)	-
	S-5 (8-10)	-
	S-6 (10-12)	-
	S-7 (12-14)	-
	S-8 (14-16)	-
TB-115	S-1 (0-2)	-
	S-2 (2-4)	-
	S-3 (4-6)	-
	S-4 (6-8)	-
	S-5 (8-10)	-
TB-116	S-1 (0-2)	17
	S-2 (2-4)	6
	S-3 (4-6)	3.7
	S-4 (6-8)	-
	S-5 (8-10)	-
	S-6 (10-12)	-
	S-7 (12-14)	-
	S-8 (14-16)	-

(continued)

TABLE 5-8

SUMMARY OF PCB FIELD SCREENING DATA FOR FIRST PHASE SOIL BORINGS

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

SAMPLE LOCATION	DEPTH (ft. bgs)	PCB[1] CONCENTRATION (ppm)
TB-117	S-1 (0-2)	-
	S-2 (2-4)	-
	S-3 (4-6)	-
	S-4 (6-8)	-
	S-5 (8-10)	-
	S-6 (10-12)	-
	S-7 (12-14)	-
	S-8 (14-16)	-
TB-118	S-1 (0-2)	7.5
	S-2 (2-4)	5.0
	S-3 (4-6)	-
	S-4 (6-8)	-
	S-5 (8-10)	-
	S-6 (10-12)	-
	S-7 (12-14)	-
TB-122	S-1 (0-2)	12
	S-2 (2-3.5)	-
	S-3 (3.5-5)	-
	S-4 (4-6)	-
	S-6 (8-10)	-
TB-123	S-1 (0-2)	19
	S-2 (2-4)	6
	S-4 (6-8)	-
	S-5 (8-10)	-
	S-6 (10-12)	-
TB-124	S-1 (0-2)	3.5
	S-2 (2-3.5)	9
	S-3 (3.5-5)	-
	S-4 (5-6.5)	4
	S-5 (6.5-8)	3
	S-7 (9.5-11)	2
	S-8 (11-12.5)	-
TB-125	S-1 (0-2)	7
	S-2 (2-3.5)	8
	S-3 (3.5-5)	5.5
	S-4 (5-6.5)	-
	S-6 (9-11.5)	-
	S-7 (11.5-13)	-

(continued)

TABLE 5–8

SUMMARY OF PCB FIELD SCREENING DATA FOR FIRST PHASE SOIL BORINGS

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

SAMPLE LOCATION	DEPTH (ft. bgs)	PCB[1] CONCENTRATION (ppm)
TB–126	S–1 (0–2)	10
	S–2 (2–3.5)	7.5
	S–3 (3.5–5)	–
	S–4 (5–6.5)	–
	S–5 (6.5–8)	–
	S–6 (8–9.5)	–
	S–7 (9.5–11)	–
	S–10 (14–16)	–
TB–127	S–1 (0–2)	11
	S–2 (2–3.5)	4
	S–3 (3.5–5)	1.6
	S–4 (5–6.5)	–
	S–7 (9.5–10.4)	–
	S–8 (10.5–10.7)	–
	S–9 (12.8–13.6)	–
	S–10 (14–14.8)	–
TB–129	S–1 (0–2)	10
	S–2 (2–3.5)	3
	S–3 (3.5–5)	–
	S–4 (5–6.5)	–
	S–5 (6.5–8)	–
	S–6 (8–9.5)	–
	S–7 (9.5–10.5)	–
	S–8 (11–12.5)	–
	S–10 (14–16)	–
TB–130	S–1 (0–2)	10
	S–2 (2–3.5)	7.5
	S–3 (3.5–5)	–
	S–7 (9.5–11)	–
	S–8 (11–12.5)	–
	S–9 (12.5–14)	–
	S–10 (14–15.3)	–
TB–131	S–1 (0–2)	12
	S–2 (2–3.5)	11
	S–3 (3.5–5)	–
	S–4 (5–6.5)	3
	S–5 (6.5–8)	–
	S–6 (8–9.5)	–
	S–7 (9.5–11)	–
	S–8 (11–12.5)	–
	S–9 (12.5–15)	–

(continued)

TABLE 5-8

SUMMARY OF PCB FIELD SCREENING DATA FOR FIRST PHASE SOIL BORINGS

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

SAMPLE LOCATION	DEPTH (ft. bgs)	PCB[1] CONCENTRATION (ppm)
TB-132	S-1 (0-2)	1.1
	S-3 (3.5-5)	-
TB-133	S-1 (0-2)	5.0
	S-2 (2-3.5)	3.5
	S-3 (4-5.5)	2.5
	S-4 (5.7-6)	-
	S-5 (7-8.5)	-
	S-6 (8.7-9)	-
	S-7 (9.5-11)	-
	S-8 (11-13.5)	-
	S-9 (13.5-15)	-
TB-134	S-1 (0-2)	-
	S-2 (2-3.5)	-
	S-3 (3.5-5)	-
	S-4 (5-6.5)	-
	S-6 (8-9.5)	-
	S-7 (9.5-11)	-
	S-8 (11-12.5)	-
	S-9 (12.5-14)	-

Notes:

1	= Method Detection Limit is 0.5 ppm
-	= Not detected
ft. bgs	= feet below ground surface
PCB	= polychlorinated biphenyls
ppm	= parts per million

TABLE 5-9
SUMMARY OF PESTICIDE/PCB DATA FOR FIRST PHASE SOIL BORING SAMPLES
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

SAMPLE LOCATION	PARAMETER (μg/kg) AROCLOR-1016	AROCLOR-1254	SAMPLE LOCATION	PARAMETER (μg/kg) AROCLOR-1016	AROCLOR-1254
CRQL	80	160	CRQL	160	80
TB-1A (0-4 ft. bgs)	-	-	TB-117 (0-2 ft. bgs)	-	-
TB-101* (0-2 ft. bgs)	-	-	TB-117 DUP (0-2 ft. bgs)	-	-
TB-101 (4-8 ft. bgs)	-	-	TB-118* (2-4 ft. bgs)	3500J	2400J
TB-102* (0-2 ft. bgs)	-	-	TB-118 (4-6 ft. bgs)	1200J	R
TB-102 (6-8 ft. bgs)	-	-	TB-122* (0-2 ft. bgs)	3200J	R
TB-102 (8-10 ft. bgs)	NA	NA	TB-122* (2-4 ft. bgs)	-	-
TB-103* (0-6 ft. bgs)	-	-	TB-123* (0-2 ft. bgs)	2000J	R
TB-104 (11-15 ft. bgs)	-	-	TB-123 (6-8 ft. bgs)	R	R
TB-105 (8-10 ft. bgs)	-	-	TB-124* (2-5 ft. bgs)	-	-
TB-106* (2-4 ft. bgs)	-	-	TB-124 (10-11 ft. bgs)	-	-
TB-106 (12-14 ft. bgs)	-	-	TB-125 (4-7 ft. bgs)	-	-
TB-107 (8-10 ft. bgs)	-	-	TB-126 (7-9 ft. bgs)	-	-
TB-108 (6-8 ft. bgs)	-	-	TB-127* (4-6 ft. bgs)	-	-
TB-109 (6-8 ft. bgs)	-	-	TB-127 (5-10 ft. bgs)	-	-
TB-110 (10-12 ft. bgs)	-	-	TB-129* (0-2 ft. bgs)	-	-
TB-111 (0-2 ft. bgs)	-	-	TB-129* DUP (0-2 ft. bgs)	-	-
TB-111 DUP (0-2 ft. bgs)	-	-	TB-130 (4-6 ft. bgs)	-	-
TB-113 (2-6 ft. bgs)	-	-	TB-131* (2-4 ft. bgs)	-	-
TB-114 (0-2 ft. bgs)	-	-	TB-131* (6-8 ft. bgs)	-	-
TB-115 (0-2 ft. bgs)	-	-	TB-133* (2-3 ft. bgs)	-	-
TB-115 DUP (0-2 ft. bgs)	-	-	TB-133 (5-7 ft. bgs)	-	-
TB-116 (4-6 ft. bgs)	-	-	TB-134 (2-4 ft. bgs)	-	-

Notes:
- = Not detected
* = medium level analysis was conducted
CRQL = Contract Required Quantitation Limit
DUP = duplicate sample
ft. bgs = feet below ground surface
J = Estimated concentration because results are either below the contract required detection limit or quality control criteria were not met
μg/kg = micrograms per kilogram

TABLE 5-10

SUMMARY OF PESTICIDE/PCB DATA FOR SECOND PHASE SOIL BORING SAMPLES

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

SAMPLE LOCATION	PARAMETER (μg/kg)	
	AROCLOR-1248	AROCLOR-1260
MDL	80	160
SB-201 (0-2 ft. bgs)	2800	1800
SB-201 (6-8 ft. bgs)	-	-
SB-202 (4-6 ft. bgs)	-	-
SB-203 (0-2 ft. bgs)	-	1000
SB-204 (0-2 ft. bgs)	9700	5500
SB-205 (2-4 ft. bgs)	3300	1700
SB-206 (4-6 ft. bgs)	2500	1600
SB-207 (0-2 ft. bgs)	6900	5700
SB 207 DUP (0-2 ft. bgs)	4300	3000

Notes:

DUP = duplicate sample was collected

ft. bgs. = feet below ground surface

MDL = method detection limit

μg/kg = micrograms per kilograms

TABLE 5–11

SUMMARY OF INORGANIC DATA FOR FIRST PHASE PIEZOMETER SOIL SAMPLES

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

PARAMETER (mg/kg)	CRQL (mg/kg)	PZ–1 (20–22 ft. bgs)	PZ–3 (30–32 ft. bgs)	PZ–4 (10–12 ft. bgs)	PZ–5 (5–7 ft. bgs)	PZ–6 (10–12 ft. bgs)	PZ–7 (25–27 ft. bgs)	PZ–8 (3–5 ft. bgs)
Aluminum	40	3110 J	3300 J	3500 J	3110 J	1870 J	2400 J	21200 J
Arsenic	2	–	–	2.9 J	2.8 J	2.5 J	–	19.9 J
Barium	40	–	–	65.8	–	108	–	507
Calcium	1000	32800 J	12200 J	45600 J	41600 J	48600 J	17600 J	40300 J
Chromium	2	4.7	4.1	5.1	5.1	4.8	3.7	41
Cobalt	10	–	–	–	–	–	–	14.3
Iron	20	59000 J	5290 J	6040 J	5920 J	5020 J	4860 J	38400 J
Magnesium	1000	5010	3280	6080	7330	4860	4100	21700
Manganese	3	158 J	97.8 J	239 J	203 J	265 J	98 J	608
Nickel	8	–	–	–	–	–	–	32.5
Potassium	1000	–	–	–	–	–	–	6960
Vanadium	10	–	10.9 J	10.8 J	–	–	–	58.5 J

Notes:

– = Not Detected

CRQL = Contract Required Quantitation Limit

ft. bgs = feet below ground surface

J = Estimated concentration because quality control criteria were not met.

mg/kg = milligrams per kilogram

(continued)

TABLE 5–12

SUMMARY OF INORGANIC DATA FOR FIRST PHASE TEST BORING SAMPLES

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

PARAMETER (mg/kg)	CRQL (mg/kg)	TB–126 (7–9 ft. bgs)	TB–127* (4–6 ft. bgs)	TB–127 (5–10 ft. bgs)	TB–129* (0–2 ft. bgs)	TB–129* DUP (0–2 ft. bgs)	TB–130 (4–6 ft. bgs)	TB–131* (2–4 ft. bgs)	TB–131* (6–8 ft. bgs)	TB–133* (2–3 ft. bgs)	TB–133 (5–7 ft. bgs)	TB–134 (2–4 ft. bgs)
Aluminum	40	21700	1740	1030	1680	1130	2000	2670	2010	2000	1520	2920
Antimony	12	–	–	–	–	–	–	–	–	–	–	–
Arsenic	2	4.1 J	–	0.94 J	4.4 J	2.8 J	–	5.6 J	3.1 J	–	–	2.6 J
Barium	40	240 J	57 J	–	9050 J	9200 J	54 J	140 J	172 J	68 J	43 J	72 J
Beryllium	1	–	–	–	–	–	–	–	–	–	–	–
Cadmium	1	–	–	–	16	14	–	–	–	–	–	–
Calcium	1000	31300 J	30700 J	26700 J	36100 J	8740 J	39700 J	26700 J	23400 J	44800 J	39000 J	28900 J
Chromium	2	23 J	3.1 J	–	53 J	36 J	2.9 J	4.1	3.5	3.1 J	2.7 J	3.7 J
Cobalt	10	–	–	–	–	–	–	–	–	5.3	–	–
Copper	5	–	–	–	270 J	210 J	–	–	–	–	–	–
Iron	20	19700	5070	3440	6410	5000	5040	5890	4930	4570	4530	5560
Lead	1	23 J	37 J	–	57900 J	58500 J	25 J	326 J	26.7 J	49 J	16 J	39 J
Magnesium	1000	22100 J	14700 J	9800 J	12500 J	4030 J	27700 J	11100	4570	25900 J	17600 J	19900 J
Manganese	3	480 J	230 J	110 J	240 J	130 J	280 J	254	341	270 J	270 J	230 J
Mercury	0.1	–	–	–	0.6	0.2	–	–	–	–	0.12	–
Nickel	8	25	10	–	21	17	12	17.5	16.8	11	12	12
Potassium	1000	4860	–	–	–	–	–	–	–	–	–	–
Silver	2	–	–	–	–	–	–	–	–	–	–	–
Vanadium	10	26	–	–	–	–	–	–	–	–	–	–
Zinc	4	–	–	–	60800 J	72900 J	–	–	–	–	–	–
Cyanide	1	–	–	–	–	–	–	–	–	–	–	–

Notes:

CRQL = Contract Required Quantitation Limit

mg/kg = milligrams per kilogram

ft. bgs = feet below ground surface

J = estimated concentration because results are either below the contract required detection limit or quality control criteria were not met.

– = Not detected

* = Medium level analysis was conducted.

(continued)

TABLE 5–12

SUMMARY OF INORGANIC DATA FOR FIRST PHASE TEST BORING SAMPLES

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

PARAMETER (mg/kg)	CRQL (mg/kg)	TB–117 (0–2 ft. bgs)	TB–117 DUP (0–2 ft. bgs)	TB–118* (2–4 ft. bgs)	TB–118 (4–6 ft. bgs)	TB–122* (0–2 ft. bgs)	TB–122* (2–4 ft. bgs)	TB–123* (0–2 ft. bgs)	TB–123 (6–8 ft. bgs)	TB–124* (2–5 ft. bgs)	TB–124 (10–11 ft. bgs)	TB–125* (4–7 ft. bgs)
Aluminum	40	27600	19600	2240	3230	2700	25800	3430	19000	39400	1860	2770
Antimony	12	–	–	–	–	–	–	–	–	–	–	–
Arsenic	2	20.3 J	12.5 J	2.6 J	4.2 J	6 J	24.5 J	6.7 J	26.5 J	–	–	2.6 J
Barium	40	536 J	356 J	–	–	11900 J	488 J	2520 J	276 J	390 J	180 J	130 J
Beryllium	1	1.6	0.99	–	–	–	1.6	–	–	–	0.52	–
Cadmium	1	–	–	–	–	18 J	–	–	–	–	–	–
Calcium	1000	23500 J	37100 J	37500 J	42000 J	12400 J	23500 J	39700 J	27400 J	29100 J	31200 J	47200 J
Chromium	2	47.6	36	4	4.7	52.6	44.2	17.6	37.7	35 J	3.3 J	5.4 J
Cobalt	10	24.8	13.6	–	–	–	19.6	–	–	14	–	–
Copper	5	–	–	–	–	235 J	–	–	–	–	–	–
Iron	20	43800	26700	4960	6650	7610	42600	6700	30700	56000	4720	3940
Lead	1	90.2 J	98 J	31.5 J	24.9 J	75900 J	52.2 J	10900 J	127 J	130 J	–	170 J
Magnesium	1000	19600	26900	18900	25100	3430	17300	22100	21600	20500 J	9400 J	32100 J
Manganese	3	954	751	319	392	398	1060	541	624	520 J	280 J	360 J
Mercury	0.1	–	–	–	–	0.38	–	–	–	0.31	–	–
Nickel	8	65.4	53.3	14.7	19.6	30	62	31.2	46.4	38	10	15
Potassium	1000	7860	6610	–	–	–	8240	–	6000	6400	–	–
Silver	2	–	–	–	–	–	–	–	–	–	–	–
Vanadium	10	64	54.6	–	–	–	60.4	–	51.3	44	–	–
Zinc	4	–	–	–	–	67400 J	–	12600 J	–	–	–	–
Cyanide	1	–	–	–	–	–	–	–	–	–	–	–

TABLE 5-13

SUMMARY OF TOC DATA FOR SECOND PHASE SOIL BORING SAMPLES

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

SAMPLE LOCATION (ft. bgs)	CONCENTRATION (mg/kg)
SB-201 (0-2)	78300
SB-201 (6-8)	32600
SB-202 (4-6)	20600
SB-203 (0-2)	19450
SB-204 (0-2)	95900
SB-204 (DUP) (0-2)	835000J
SB-205 (2-4)	54200
SB-206 (4-6)	48400
SB-207 (0-2)	139000
SB-208 (0-2)	98250
SB-209 (0-2)	147000
SB-210 (0-2)	57500

Notes:

ft. bgs = feet below ground surface

J = Estimated concentration because results are either below the contract required quantitation limit or quality control criteria were not met.

mg/kg = milligrams per kilogram

TABLE 5–14
SUMMARY OF VOLATILE ORGANIC DATA FOR FIRST PHASE GROUNDWATER SAMPLES
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

SAMPLE LOCATION	PARAMETER (µg/L)				
	ACETONE	2–BUTANONE	TRICHLOROETHENE	BENZENE	TETRACHLOROETHENE
CRQL	10	10	5	5	5
MW–101A	–	R	–	–	–
MW–101B	–	36 J	–	–	–
MW–102A	–	–	–	–	–
MW–102B	–	–	–	–	–
MW–102B DUP	–	–	–	–	–
MW–103	–	R	–	–	–
MW–103 DUP	–	R	–	–	–
MW–104A	–	R	–	–	–
MW–104B	–	–	93	12	42
MW–105A	–	R	–	–	–
MW–105B	–	–	–	–	–
MW–106	32	–	–	–	–
MW–107A	–	4000 JD	–	–	–
MW–107B	–	–	–	–	–

Notes:

– = Not detected
CRQL = Contract Required Quantitation Limit
D = Sample concentration was obtained by dilution to bring result within calibration range.
J = Estimated value due to non–compliant quality control criteria.
R = Rejected value due to non–compliant quality control criteria.
µg/L = micrograms per liter

TABLE 5–15

SUMMARY OF VOLATILE ORGANIC DATA FOR SECOND PHASE GROUNDWATER SAMPLES

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

SAMPLE LOCATION	PARAMETER (μg/L)		
	ACETONE	TRICHLOROETHENE	TETRACHLOROETHENE
CRQL	10	5	5
MW–101A	–	–	–
MW–101B	–	–	–
MW–102A	10B	–	–
MW–102B	–	–	–
MW–103	–	–	–
MW–104A	–	–	–
MW–104B	–	34	14
MW–105A	–	–	–
MW–105B	24B	–	–
MW–106	–	–	–
MW–107A	–	–	–
MW–107B	–	–	–
MW–201	–	–	–
MW–202	–	–	–
MW–203	11B	–	–
MW–203 (DUP)	–	–	–
MW–204	–	–	–

Notes:

– = Not detected

B = Analyte was detected in both the sample and the associated laboratory method blank.

CRQL = Contract Required Quantitation Limit

μg/L = micrograms per liter

TABLE 5-16

SUMMARY OF SEMIVOLATILE ORGANIC DATA FOR SECOND PHASE GROUNDWATER SAMPLES

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

SAMPLE LOCATION	PARAMETER (μg/L) bis(2-Ethylhexyl)phthalate
MDL	10
MW-201	10
MW-202	–
MW-203	–
MW-203 (DUP)	–

Notes:

DUP = duplicate sample was collected

MDL = method detection limit

μg/L = micrograms per liter

TABLE 5–17

SUMMARY OF INORGANIC DATA FOR FIRST PHASE GROUNDWATER SAMPLES

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

PARAMETER (µg/L)	CRQL (µg/L)	MW–101A	MW–101B	MW–102A	MW–102B	MW–102B DUP	MW–103	MW–103 DUP	MW–104A	MW–104B	MW–105A	MW–105B	MW–106	MW–107A	MW–107B
Aluminum	200	–	–	–	–	–	–	–	–	–	–	–	1100	–	–
Barium	200	–	–	–	–	–	–	–	–	–	–	–	–	–	520
Beryllium	5	–	–	–	–	–	–	–	5	–	–	–	–	5	–
Calcium	5000	43000	43600	17500	39100	39800	46100	50100	50600	49100	48600	54900	29100	27000	33200
Chromium	10	–	–	–	–	–	–	–	10	–	–	–	–	–	–
Cobalt	50	–	–	–	–	–	–	70	–	–	–	–	–	–	50
Iron	100	–	–	–	–	–	–	–	1490 J	–	2120 J	–	720 J	–	730 J
Magnesium	5000	17700	21000	5570	10500	10200	18000	20300	20800	27400	20700	24700	9640	23900	15100
Manganese	15	71	33	–	92	103	408	447	1210	62	47	253	44	46	190
Potassium	5000	–	–	34000 J	–	–	–	–	–	–	–	–	5980 J	6400 J	–
Sodium	5000	14000	7000	27000	–	–	5000	5000	53000	15000	9000	12000	14000	18000	73000
Zinc	20	–	–	–	–	65 J	–	–	–	7390 J	–	–	–	–	–

Notes:

CRQL = Contract Required Quantitation Limit

J = Indicates an estimated concentration because quality control criteria were not met.

µg/L = micrograms per liter

TABLE 5–18

SUMMARY OF INORGANIC DATA FOR SECOND PHASE GROUNDWATER SAMPLES

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

PARAMETER (μg/L)	CRQL (μg/L)	MW–101A	MW–101B	MW–102A	MW–102B	MW–103	MW–104A	MW–104B	MW–105A	MW–105B	MW–106	MW–107A
Aluminum	200	8780	15400	–	586	985	10000 E*	347 E*	–	45300	8810 E*	65900 E*
Arsenic	10	–	–	–	–	–	–	–	–	–	–	19.7 N
Barium	200	–	283	–	–	–	–	261	–	986	–	894
Calcium	5000	77500	109000	30000	49600	79000	85600	68800	47500	274000	91000	253000
Chromium	10	43	53	–	–	–	49.1*	10.4*	–	77.8	34.6*	146*
Copper	25	29.9	77.8	–	–	–	–	–	–	73.3	–	392
Iron	100	12700	22200	338	775	1730	17200	2590	1060	73700	14400	101000
Lead	3	13	17.8	–	–	–	11.9 S	–	–	41.6 S	8.4	47.1
Magnesium	5000	31100	46700	13300	21200	30200	44800	26400	22200	101000	24000	106000
Manganese	15	275	884	18.7	28.9	84.2	347	1320	27.2	1620	439	2590
Mercury	0.2	–	–	–	–	–	–	–	–	–	–	0.56
Nickel	40	45.6	45.6	–	–	–	–	–	–	87.9	–	321
Potassium	5000	–	–	–	–	–	5830	–	–	12000	–	25100
Silver	10	–	–	–	–	–	–	–	–	–	–	–
Sodium	5000	8600	8290	–	–	–	15000	47600	6650	11000	9020	19700
Vanadium	50	–	–	–	–	–	–	–	–	87.7	–	102
Zinc	20	853	62.1	–	49.1	–	24200*	–	41.4	355	42.3*	2830*

(continued)

TABLE 5–18

SUMMARY OF INORGANIC DATA FOR SECOND PHASE GROUNDWATER SAMPLES

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

PARAMETER (μg/L)	CRQL (μg/L)	MW–107B	MW–201	MW–202	MW–203	MW–203 DUP	MW–204
Aluminum	200	2460 E*	–	–	1710	800	25700 E*
Arsenic	10	–	–	–	–	–	–
Barium	200	506	–	–	–	–	518
Calcium	5000	38900	53500	88500	73900	68500	89400
Chromium	10	9.1	–	–	43.6	38.9	67.1*
Copper	25	–	–	–	29.9	28.4	58.6
Iron	100	4480	143	191	2990	1760	32000
Lead	3	3.1	–	–	–	–	12.5
Magnesium	5000	19000	23200	43700	29500	27400	44100
Manganese	15	225	341	370	101	61.3	887
Mercury	0.2	–	–	–	–	–	–
Nickel	40	–	–	–	–	–	124
Potassium	5000	–	–	–	–	–	10500
Silver	10	–	29.9	–	–	–	–
Sodium	5000	81000	–	14100	–	–	43600
Vanadium	50	–	–	–	–	–	58.8
Zinc	20	–	–	23.2	22.7	–	110*

Notes:

* = Duplicate analysis was not within control limits.

CRQL = Contract Required Quantitation Limit

E = The reported concentration is estimated because of the presence of an interference.

S = The reported concentration was determined by the method of standard additions.

μg/L = micrograms per liter

N = Spike sample recovery not within criteria

TABLE 5–19

SUMMARY OF VOLATILE ORGANIC DATA FOR FIRST PHASE SURFACE WATER SAMPLES

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

SAMPLE LOCATION	PARAMETER (μg/L)		
	CARBON DISULFIDE	2–BUTANONE	1,1,1–TRICHLOROETHANE
CRQL	5	10	5
SW–1	–	R	–
SW–2	–	R	–
SW–3	–	–	–
SW–4	–	–	–
SW–5	–	–	–
SW–6	–	–	–
SW–7	–	–	–
SW–8	–	–	–
SW–9	–	–	–
SW–10	–	–	–
SW–11	–	–	–
SW–12	26	–	–
SW–13	–	–	–
SW–14	–	–	–
SW–14 (DUP)	–	R	–
SW–15	–	R	–
SW–15 (DUP)	–	R	–
SW–16	–	R	5

Notes:

– = Not detected

CRQL = Contract Required Quantitation Limit

DUP = Duplicate sample was collected.

R = Data are unusable because quality control criteria were not met.

μg/L = micrograms per liter

TABLE 5–20

SUMMARY OF SEMIVOLATILE ORGANIC DATA FOR FIRST PHASE SURFACE WATER SAMPLES

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

SAMPLE LOCATION	PARAMETER (µg/L)	
	BENZOIC ACID	BIS(2–ETHYLHEXYL)PHTHALATE
CRQL	50	10
SW–1	R	–
SW–2	R	–
SW–3	R	–
SW–4	R	180
SW–5	R	–
SW–6	–	–
SW–7	–	–
SW–8	–	–
SW–9	–	–
SW–10	–	–
SW–11	–	–
SW–12	–	–
SW–13	–	–
SW–14	–	–
SW–14 (DUP)	–	–
SW–15	–	–
SW–15 (DUP)	–	1500 D
SW–16	–	–

Notes:

– = Not detected

CRQL = Contract Required Quantitation Limit

D = Sample concentration was obtained by dilution to bring result within calibration range

DUP = Duplicate sample was collected

R = Data are unusuable because quality control criteria were not met

µg/L = micrograms per liter

TABLE 5–21

SUMMARY OF PCB DATA FOR FIRST PHASE SURFACE WATER SAMPLES

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

LOCATION	PARAMETER (μg/L) AROCLOR–1254
CRQL	1
SW–1	NR
SW–2	–
SW–3	3.6 J
SW–4	NR
SW–5	NR
SW–6	NR
SW–7	NR
SW–8	NR
SW–9	NR
SW–10	NR
SW–11	NR
SW–12	NR
SW–13	NR
SW–14	NR
SW–14 DUP	NR
SW–15	NR
SW–15 DUP	NR
SW–16	NR

Notes:

– = Not detected

DUP = Duplicate sample

J = Indicates an estimated concentration because results are either below the contract required detection level or quality control criteria were not met.

NR = Not requested

μg/L = micrograms per liter

TABLE 5–22

SUMMARY OF INORGANIC DATA FOR FIRST PHASE SURFACE WATER SAMPLES

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

PARAMETER (µg/L)	CRQL (µg/L)	SAMPLE LOCATION SW–1	SW–2	SW–3	SW–4	SW–5	SW–6	SW–7	SW–8	SW–9	SW–10	SW–11
Aluminum	200	–	–	–	–	3340	7100	–	–	–	–	–
Barium	200	–	1420	1550	980J	9510J	1320J	950J	–	–	–	–
Beryllium	5	5	6	5	–	–	6	5	5	–	6	6
Calcium	5000	14600	20900	26900	41500	32400	102000	25300	18900	16100	25600	23400
Cobalt	50	–	–	60	60	–	–	–	–	–	–	–
Copper	25	–	–	–	–	253J	–	–	–	–	–	–
Iron	100	–	–	–	11300J	3590J	13600J	1650J	–	–	–	1720J
Lead	5	–	99.6	1730	1070	15600	2120	1320	22.4	8.1	24.5	260
Magnesium	5000	5950	5210	5740	12300	5540	16200	7110	8310	6940	10600	7540
Manganese	15	41	83	124	6200J	294J	689J	659J	67J	45J	95J	178J
Silver	10	–	–	–	–	–	–	13	–	–	–	–
Sodium	5000	8000	9000	8000	–	8000	18000	10000	14000	14000	5000	11000
Zinc	20	–	72J	246J	321	769	359	230	–	–	–	122

(continued)

TABLE 5–22

SUMMARY OF INORGANIC DATA FOR FIRST PHASE SURFACE WATER SAMPLES

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

PARAMETER (μg/L)	CRQL (μg/L)	SAMPLE LOCATION						
		SW–12	SW–13	SW–14	SW–14 DUP	SW–15	SW–15 DUP	SW–16
Aluminum	200	4810	–	–	–	–	–	–
Barium	200	630J	–	–	–	–	–	–
Beryllium	5	5	5	–	–	5	–	–
Calcium	5000	48200	21800	12200	14600	14400	14800	15100
Cobalt	50	–	–	–	–	–	–	–
Copper	25	–	–	–	–	–	–	–
Iron	100	7300J	–	–	–	1110J	1800J	–
Lead	5	740	14	–	–	–	–	–
Magnesium	5000	10000	9160	–	–	–	5390	5160
Manganese	15	350J	20J	21J	–	180J	252J	17J
Silver	10	–	–	–	–	–	–	–
Sodium	5000	9000	–	–	6000	–	6000	6000
Zinc	20	174	–	–	–	–	–	–

Notes:

– = Not detected

CRQL = Contract Required Quantitation Limit

DUP = Duplicate sample

J = Estimated concentration because quality control criteria were not met.

μg/L = micrograms per liter

TABLE 5–23

SUMMARY OF VOLATILE ORGANIC DATA FOR FIRST PHASE SEDIMENT SAMPLES

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

PARAMETER (μg/kg)	CRQL (μg/kg)	SD–1	SD–2*	SD–3*	SD–4	SD–5	SD–6	SD–7	SD–8	SD–9	SD–10	SD–11
Methylene Chloride	5	–	–	–	–	–	260 J	–	–	–	–	–
Acetone	10	970 J	–	–	310 J	2900 EJ	1800 EJ	–	1200 J	–	–	–
2–Butanone	10	–	R	R	R	R	R	–	R	–	R	R
Trichloroethene	5	–	–	16000 J	–	–	–	–	–	–	–	–
Tetrachloroethene	5	–	980 J	18000 J	33 J	93 J	–	–	–	–	–	–
Toluene	5	–	–	–	–	49 J	–	–	–	–	–	–
Ethylbenzene	5	–	–	11000 J	–	–	–	–	–	–	–	–
Total Xylenes	5	–	–	28000 J	–	–	–	–	–	–	–	–

(continued)

TABLE 5–23

SUMMARY OF VOLATILE ORGANIC DATA FOR FIRST PHASE SEDIMENT SAMPLES

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

PARAMETER (μg/kg)	CRQL (μg/kg)	SD–12	SD–13	SD–14	SD–14 DUP	SD–15	SD–15 DUP	SD–16
Methylene Chloride	5	–	–	–	–	–	–	–
Acetone	10	–	–	–	–	–	–	–
2–Butanone	10	R	R	R	R	R	R	R
Trichloroethene	5	–	–	–	–	–	–	–
Tetrachloroethene	5	–	–	–	–	–	–	–
Toluene	5	–	–	–	–	–	–	–
Ethylbenzene	5	–	–	–	–	–	–	–
Total Xylenes	5	–	–	–	–	–	–	–

Notes:

* = Sediment sample collected from the edge of the lagoon.

– = Not Detected

CRQL = Contract Required Quantitation Limit

DUP = Duplicate sample

E = Analyte concentration exceeded the calibration range of the GC/MS and that a re–analysis of a diluted sample is required.

J = Estimated concentration because quality control criteria were not met.

R = Data is unusable because quality control criteria were not met.

μg/kg = micrograms per kilogram

TABLE 5-24

SUMMARY OF SEMIVOLATILE ORGANIC DATA FOR FIRST PHASE SEDIMENT SAMPLES

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

SAMPLE LOCATION	PARAMETER (µg/kg)	
	BENZOIC ACID	DI-N-BUTYLPHTHALATE
CRQL	1600	330
SD-1	R	–
SD-2*	–	–
SD-3*	–	–
SD-4	–	–
SD-5	–	–
SD-6	–	–
SD-7	–	–
SD-8	–	–
SD-9	–	–
SD-10	–	–
SD-11	–	–
SD-12	–	–
SD-13	–	–
SD-14	–	6000
SD-14 DUP	–	4000 J
SD-15	–	–
SD-15 DUP	–	–
SD-16	–	–

Notes:

* = Sediment samples collected from the edge of the lagoon.

– = Not detected

CRQL = Contract Required Quantitation Limit

DUP = Duplicate sample

J = Estimated concentration because results are either below the contract required quantitative limit or quality control criteria were not met.

µg/kg = micrograms per kilogram

TABLE 5–25

SUMMARY OF PESTICIDE/PCB DATA FOR FIRST PHASE SEDIMENT SAMPLES

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

SAMPLE LOCATION	PARAMETER (µg/kg)		
	HEPTACHLOR	AROCLOR–1242	AROCLOR–1260
CRQL	8	80	160
SD–1	–	–	–
SD–2*	–	1500	1100
SD–3*	–	9000	5300
SD–4	–	12000	14000
SD–5	–	8900	6500
SD–6	–	–	–
SD–7	–	–	–
SD–8	210	–	7300
SD–9	–	–	–
SD–10	–	–	–
SD–11	–	–	–
SD–12	–	–	–
SD–13	–	–	–
SD–14	–	–	–
SD–14 DUP	–	–	–
SD–15	–	–	–
SD–15 DUP	–	–	–
SD–16	–	–	–

Notes:

* = Sediment samples collected from edge of the lagoon.

– = Not detected

DUP = Duplicate sample

CRQL = Contract Required Quantitation Limit

µg/kg = micrograms per kilogram

TABLE 5-26

SUMMARY OF PESTICIDE/PCB DATA FOR SECOND PHASE SEDIMENT SAMPLES

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

SAMPLE LOCATION	PARAMETER (μg/kg)	
	AROCLOR-1242	AROCLOR-1260
MDL	80	160
SD-206 (6 in. bgs)	7000	10000
SD-207 (12 in. bgs)	820	740
SD-208 (6 in. bgs)	–	7300
SD-209 (12 in. bgs)	–	3600
SD-210 (6 in. bgs)	–	–
SD-211 (12 in. bgs)	–	–
SD-212 (0 in. bgs)	–	5900
SD-213 (0 in. bgs)	–	–
SD-214 (0 in. bgs)	–	–
SD-215 (0 in. bgs)	–	620
SD-216 (0 in. bgs)	–	–
SD-217 (0 in. bgs)	–	–
SD-218 (0 in. bgs)	–	–
SD-219 (0 in. bgs)	–	–
SD-220 (0 in. bgs)	–	–
SD-221 (0 in. bgs)	–	–
SD-222 (0 in. bgs)	–	–
SD-223 (0 in. bgs)	–	–
SD-223 DUP (0 in. bgs)	–	–
SD-224 (0 in. bgs)	–	–

Notes:

– = Not detected

in. bgs = inches below ground surface

MDL = method detection limit

μg/kg = micrograms per kilogram

TABLE 5–27

SUMMARY OF INORGANIC DATA FOR FIRST PHASE SEDIMENT SAMPLES

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

PARAMETER (mg/kg)	CRQL (mg/kg)	SD–1	SD–2*	SD–3*	SD–4	SD–5	SD–6	SD–7	SD–8	SD–9	SD–10	SD–11
Aluminum	40	3240	1810	955	966	403	1820	–	816	4520	783	–
Arsenic	2	–	3.6	–	–	–	–	–	–	–	–	–
Barium	40	–	2310	10900	4390	3280	–	419	1310	188	5290	–
Calcium	1000	2320 J	3500 J	4450 J	10600 J	5010 J	25000 J	10700 J	27800 J	9290 J	22500 J	21500 J
Chromium	2	–	15.8	52.7	20.5	–	–	–	–	–	–	–
Copper	5	–	85.8 J	308 J	118 J	70.2 J	587 J	–	–	–	167 J	–
Cyanide	1	–	–	3.6	–	–	–	–	–	–	–	–
Iron	20	3180	3070	3980	2500	984	2510	1560	2020	1980 J	2930	3240
Lead	1	31.2 J	1060 J	76200 J	10900 J	5640 J	337 J	504 J	1940 J	97.9 J	8570 J	274 J
Magnesium	1000	–	1870	–	–	–	–	–	–	–	–	–
Manganese	3	67.1 J	86.2 J	112 J	317 J	34.8 J	64.4 J	164 J	114 J	32 J	304 J	107 J
Sodium	1000	–	–	2790	–	–	–	–	–	–	–	–
Zinc	4	42	1040	6990	563	165	47.9	152	289	28	376	142

(continued)

TABLE 5–27

SUMMARY OF INORGANIC DATA FOR FIRST PHASE SEDIMENT SAMPLES

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

PARAMETER (mg/kg)	CRQL (mg/kg)	SD–12	SD–13	SD–14	SD–14 DUP	SD–15	SD–15 DUP	SD–16
Aluminum	40	2850	874	4020	3280 J	3760	2500	3460
Arsenic	2	–	–	–	3.2	7.4	8.5	–
Barium	40	411	1300	74.3	–	200	170	–
Calcium	1000	28700 J	22500 J	3450 J	2440	7740 J	7310 J	10500 J
Chromium	2	–	–	–	–	–	–	–
Copper	5	–	–	–	–	–	–	–
Cyanide	1	–	–	–	–	–	–	14.3
Iron	20	4340	1910	14900	20500	33300	28500	3620
Lead	1	571 J	2040 J	26.5 J	15 J	80.1 J	55.8 J	102 J
Magnesium	1000	–	–	–	–	–	–	–
Manganese	3	131 J	92.9 J	601 J	868	866 J	784 J	93.5 J
Sodium	1000	–	–	–	–	–	–	–
Zinc	4	83.7	432	46.6	39.9 J	70	56.9	43.2

Notes:
* = Sediment samples collected from the edge of the lagoon.
CRQL = Contract Required Quantitation Limit
DUP = Duplicate sample
J = Indicates an estimated concentration because quality control criteria were not met.
mg/kg = milligrams per kilogram

TABLE 5–28

SUMMARY OF INORGANIC DATA FOR SECOND PHASE SEDIMENT SAMPLES

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

PARAMETER (mg/kg)	CRQL (mg/kg)	SD–201 (0 in. bgs)	SD–202 (0 in. bgs)	SD–203 (0 in. bgs)	SD–206 (6 in. bgs)	SD–207 (12 in. bgs)	SD–208 (6 in. bgs)	SD–209 (12 in. bgs)	SD–210 (6 in. bgs)	SD–211 (12 in. bgs)	SD–215 (0 in. bgs)	SD–216 (0 in. bgs)
Aluminum	40	9880	17900	6230	6590	2340	1140	4850	1970	1690	7810	4010
Antimony	12	–	–	–	–	–	–	–	–	–	–	–
Barium	40	136	278	122	3180	141	954	780	552	–	231	332
Calcium	1000	6150	22300	5840	23900	1310	20300	35200	20300	–	9700	29300
Chromium	2	10	15	9	21.2	2.5	–	–	–	–	6.8	–
Iron	20	7730	7620	6920	4780	4180	1740	2660	2430	2140	4000	4910
Lead	0.6	18.3 S	30.2	16.5	6400*	92.1*	1470*	550*	477*	6.9	149*	396*
Magnesium	1000	–	–	–	–	–	–	–	–	–	–	–
Manganese	3	148	296	150	328	36.7	95.9	183	79.9	24.3	49.1	110
Mercury	0.1	–	–	–	0.85	0.14	0.76	1.2	1.9	0.37	–	–
Vanadium	10	–	–	–	–	–	–	–	–	–	–	–
Zinc	4	39.4	72.6	32.3	479	10.8	406	111	123	7.8	42.9	122

(continued)

TABLE 5–28

SUMMARY OF INORGANIC DATA FOR SECOND PHASE SEDIMENT SAMPLES

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

PARAMETER (mg/kg)	CRQL (mg/kg)	SD–217 (0 in. bgs)	SD–218 (0 in. bgs)	SD–219 (0 in. bgs)	SD–220 (0 in. bgs)	SD–220 DUP (0 in. bgs)	SD–221 (0 in. bgs)	SD–222 (0 in. bgs)	SD–223 (0 in. bgs)	SD–224 (0 in. bgs)
Aluminum	40	552	804	5810	9740	9730	11500	10400	12400	10700
Antimony	12	–	–	–	21.6	–	–	–	–	–
Barium	40	187	90.7	71.9	105	94.3	168	149	311	285
Calcium	1000	5970	5670	4040	5180	4150	11200	8810	20300	19000
Chromium	2	–	–	8.4	14.1	13.5	11.2	12.3	13.7	12.7
Iron	20	800	1440	9390	14000	14400	10000	13900	10100	9430
Lead	0.6	416*	119*	14.6 S	21.3	32.7*	21	18.4	40.4	29
Magnesium	1000	–	–	–	1750	1730	2830	2280	3960	3820
Manganese	3	31.8	35.1	336	273	267	108	661	286	373
Mercury	0.1	–	1.3	1.0	0.85	–	1.3	1.1	1.0	–
Vanadium	10	–	–	–	24.1	24.2	22	23.3	–	–
Zinc	4	48.3	57.5	19.4	31.2	29.6	31.6	27.4	54.5	36.9

Notes:

- * = Duplicate analysis not within control limit
- – = Not detected
- CRQL = Contract Required Quantitation Limit
- in. bgs = inches below ground surface
- mg/kg = milligrams per kilogram
- S = Reported concentration was determined by the method of standard additions.

TABLE 5-29

SUMMARY OF LEAD DATA FOR SECOND PHASE SEDIMENT SAMPLES

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

SAMPLE LOCATION[1]	CONCENTRATION (mg/kg)	SAMPLE LOCATION[1]	CONCENTRATION (mg/kg)
SD-225	2,280	SD-243	1,100
SD-226	356	SD-244	200
SD-227	1,120	SD-245	283
SD-228	657	SD-246	13.20
SD-229	57.4 S	SD-247	11.5
SD-230	85.2	SD-248	37.5
SD-231	17	SD-249	70.9
SD-232	508	SD-250	33.4
SD-233	469	SD-251	7.7
SD-233 (DUP)	204	SD-252	20.1 S
SD-234	535	SD-253	25.4
SD-235	1,020	SD-254	18.5 S
SD-236	118	SD-255	24.6 S
SD-237	992	SD-255 (DUP)	30
SD-238	283	SD-256	31 S
SD-239	90.6	SD-257	7.5
SD-240	1,430	SD-258	250
SD-241	439	SD-259	63.9
SD-242	332		

Notes:

[1] = All sediment samples were collected from ground surface.

DUP = duplicate

mg/kg = milligrams per kilogram

S = The reported concentration was determined by the method of standard additions.

TABLE 5–30

SUMMARY OF LEAD DATA FOR THIRD PHASE SEDIMENT SAMPLES

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

SAMPLE LOCATION	PARAMETER (mg/kg) LEAD
CRQL	10
SD-301	170
SD-302	36
SD-303	40
SD-303D	26
SD-304	38
SD-305	120
SD-306	43
SD-307	26
SD-308	95
SD-309	69
SD-310	85
SD-311	25
SD-312	14

Notes:

CRQL = Contract Required Quantitation Limit
D = Duplicate Sample
mg/kg = milligrams per kilogram

TABLE 5-31

SUMMARY OF TCLP DATA FOR SECOND PHASE SEDIMENT SAMPLES

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

SAMPLE LOCATION	PARAMETER ($\mu g/L$)	
	BARIUM	LEAD
SD-204	903	756
SD-205	752	293
SD-205 DUP	828	188

Notes:

DUP = Duplicate sample

TCLP = Toxicity Characteristic Leaching Procedure

$\mu g/L$ = micrograms per liter

TABLE 5-32

SUMMARY OF TOC DATA FOR FIRST PHASE SEDIMENT SAMPLES

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

SAMPLE LOCATION	TOC ($\mu g/g$)
SD-1	760
SD-2	11000
SD-3	366000
SD-5	3800
SD-8	2400
SD-11	760

Notes:

TOC = total organic carbon

$\mu g/g$ = micrograms per gram

TABLE 5–33

SUMMARY OF TOC DATA FOR SECOND PHASE SEDIMENT SAMPLES

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

SAMPLE LOCATION (Depth in. bgs)	CONCENTRATION (mg/kg)	SAMPLE LOCATION (Depth in. bgs)	CONCENTRATION (mg/kg)
SD–206 (6)	6030000 J	SD–215 (0)	242000
SD–207 (12)	18500	SD–216 (0)	624000
SD–208 (6)	462000	SD–217 (0)	76100
SD–209 (12)	220000	SD–218 (0)	48500
SD–209 (DUP) (12)	162000	SD–219 (0)	34800
SD–210 (6)	370000	SD–220 (0)	52200
SD–211 (12)	108000	SD–221 (0)	165000
SD–212 (0)	102000	SD–222 (0)	72300
SD–213 (0)	716000	SD–223 (0)	106000
SD–214 (0)	212000	SD–224 (0)	315000

Notes:

DUP = duplicate

in. bgs = inches below ground surface

J = Indicates an estimated concentration because quality control criteria were not met.

mg/kg = milligrams per kilogram

TABLE 5-34
PLANT SPECIES OBSERVED IN UPLAND AND WETLAND AREAS
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

Scientific Name	Common Name	Wetland Indicator Status*	Relative Abundance	Habitat
Abies balsamea	Balsam fir	FACW	Common	wetlands
Acer rubrum	Red maple	FAC	Dominant	wetlands
Acer saccharum	Sugar maple	FACU-	Occasional	floodplain forest
Acer saccharinum	Silver maple	FACW	Common	wetlands
Achillea millefolium	Yarrow	FACU	Occasional	upland field
Alnus rugosa	Speckled alder	FACW+	Occasional	wetlands
Aralia nudicaulis	Bristly sarsaparilla	FACU	Common	near lagoon/upland forest
Arisaema triphyllum	Jack-in-the-pulpit	FACW-	Occasional	wetlands
Asclepias incarnata	Swamp milkweed	OBL	Occasional	wetlands
Asclepias syriaca	Common milkweed	UPL	Occasional	old field
Asplenium sp.	Spleenwort	FACU	Occasional	near lagoon
Betula alleghaniansis	Yellow birch	FAC	Occasional	wetland
Betula populifolia	Gray birch	FAC	Common	upland, wetland edge, occassionally in wetland, and at edge of lagoon
Calamagrostis canadensis	Common bluejoint	FACW+		wet meadow
Carex stricta	Tussock sedge	OBL	Common	wetlands
Carex vulpinoidea	Fox sedge	OBL	Common	wetlands
Carpinus caroliniana	Ironwood	FAC	Occasional	wetland edge
Carya ovata	Shagbark hickory	FACU-	Common	wetland hummocks
Cephalanthus occidentalis	Buttonbush	OBL	Common	wetlands
Coptis trifolia	Goldthread	FACW	Common	wetlands
Cornus amomum	Silky dogwood	FACW	Occasional	near lagoon
Cornus canadensis	Bunchberry	FAC-	Occasional	upland forest
Cornus stolonifera	Red-osier dogwood	FACW+	Common	wetland
Daucus carota	Queen anne's lace	UPL	Common	old field
Eleocharis sp.	Black rush	OBL	Common	wetlands
Equisetum sp.	Horsetail	FACW	Common	wetlands
Erythronium americanum	Trout Lily	NC	Common	upland forest
Eupatorium perfoliatum	Boneset	FACW+	Common	wetlands/lagoon
Eupatorium purpureus	Joe Pye weed	FAC	Occasional	wetlands
Fagus grandifolia	Beech	FACU	Occasional	upland forest
Fragaria virginiana	Wild strawberry	FACU	Common	upland forest
Fraxinus nigra	Black ash	FACW	Common	wetland tree
Fraxinus pennsylvanica	Green ash	FACW	Occasional	wetland tree
Gallium sp.	Bedstraw	FACU-OBL	Occasional	wetlands
Hamamelis virginiana	Witchhazel	FAC-	Common	upland forest
Hypericum gentianoides	St. Johnswort	UPL	Occasional	roadside
Ilex verticillata	Winterberry	FACW+	Common	wetlands
Impatiens capensis	Jewelweed	FACW	Common	wetlands
Iris versicolor	Blue flag	OBL	Common	wetlands
Juncus sp.	Rushes	FACU-OBL	Common	wetlands
Juniperus virginiana	Red cedar	FACU	Common	upland forest
Larix laricina	Tamarack	FACW	Common	wetland, edge of lagoon
Lemna minor	Duckweed	OBL	Common	wetland
Lonicera sp.	Honeysuckle	FACU-FACW	Occasional	wetland edge
Lysmachia quadrifolia	Loosestrife	FACW+	Occasional	wetlands
Maianthemum canadense	Wild Lily of the Valley	FAC-	Common	upland forest
Mitchella repens	Partridgeberry	FACU	Common	upland forest
Nemopanthus mucronatus	Catberry	OBL	Occasional	wetlands
Onoclea sensibilis	Sensitive fern	FACW	Common	sometimes dominant herb in wetland
Osmunda cinnamomea	Cinnamon fern	FACW	Common	wetland edge

TABLE 5–34
PLANT SPECIES OBSERVED IN UPLAND AND WETLAND AREAS
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

Scientific Name	Common Name	Wetland Indicator Status*	Relative Abundance	Habitat
Osmunda claytonia	Interupted fern	FAC	Common	near lagoon, wetlands
Osmunda regalis	Royal fern	OBL	Common	wetlands
Pinus strobus	White pine	FACU	Common	upland forest
Plantago major	Plantain	FACU	Occasional	old field
Polystichum acrostichoides	Christmas fern	FACU–	Occasional	wetland, upland
Populus balsamifera	Balsam poplar	FACW	Common	wetland edges
Populus grandidentata	Bigtooth aspen	FACU–	Common	sometimes dominant in wetland
Populus tremula	Trembling aspen	FACU	Occasional	upland forest
Prunus serotina	Black cherry	FACU	Occasional	upland forest
Pteridium aquilinum	Bracken fern	FACU	Common	upland forest
Quercus bicolor	Swamp white oak	FACW+	Common	wetlands
Toxicodendron radicans	Poison ivy	FAC	Occasional	wetland hummocks
Ranunculus flabellaris	Swamp buttercup	OBL	Occasional	wetlands
Rhamnus alnifolia	Buckthorn	OBL	Occasional	wetlands
Rhus typhina	Staghorn sumac	FACU	Occasional	upland forest
Rubus hispidus	Bristly blackberry	FACW	Occasional	wetland
Rubus sp.	Brambles	FACU–FACW	Occasional	wetland
Rumex verticillatus	Swamp dock	OBL	Occasional	wetlands
Salix discolor	Pussy willow	FACW	Common	wetland tree
Sambucus canadensis	Elderberry	FACW–	Common	wetlands
Scirpus cyperinus	Woolly sedge	FACW+	Occasional	wetland
Sisyrinchium sp.	Blue–eyed grass	FACU–FACW	Occasional	roadside
Smilacina racemosa	False solomon's seal	FACU–	Occasional	upland forest
Solanum dulcamara	Nightshade	FAC–	Occasional	wetlands
Solidago sp.	Goldenrod	FACU–FACW	Occasional	upland forest
Sphagnum spp.	Sphagnum moss		Common	wetlands
Spiraea latifolia	Meadow–sweet	FAC+	Occasional	wetland
Spiraea tomentosa	Steeplebush	FACW	Occasional	wetland
Tilia americana	Basswood	FACU	Common	lagoon edge/upland forest
Thelypteris nove–boracensis	New York fern	FAC	Common	upland edge
Thelypteris simulata	Massachusetts fern	FACW	Occasional	wetlands
Thuja occidentalis	Northern white cedar	FACW	Common	wetlands, sometimes dominant wetland tree
Trientalis borealis	Starflower	FAC	Common	upland
Trillium erectum	Red trillium	FACU–	Occasional	upland forest
Trillium grandiflorum	White trillium	NC	Common	upland forest
Typha latifolia	Common cattail	OBL	Occasional	wetlands
Ulmus americana	American elm	FACW–	Common	wetlands
Vaccinium corymbosum	Highbush blueberry	FACW–	Occasional	near lagoon
Viburnum cassinoides	Witherod	FACW	Occasional	wetlands
Viburnum recognitum	Northern arrowwood	FACW–	Common	wetlands
Vitis sp.	Wild grape	FACU–FACW	Occasional	near lagoon

* – From National List of Plant Species Found in Wetlands: Reed (1988)
OBL (Obligate) – Occurs almost always in wetlands (>99% estimated probablity)
FACW (Facultative wetland) – Usually found in wetlands (67% to 99% estimated probability)
FAC (Facultative) – Equally likely in wetlands or uplands(34% to 66% estimated probability)
FACU (Facultative upland) – Usually occurs in non–wetlands (1% to 33% estimated probability)
NC – Not Considered
NA – No Agreement

TABLE 5-35
AQUATIC AND TERRESTRIAL VERTEBRATES OBSERVED AND EXPECTED AT NLODS
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

COMMON NAME	FAMILY	SCIENTIFIC NAME
REPTILES AND AMPHIBIANS		
Eastern painted turtle	Emydidae	*Chrysemys picta*
Eastern garter snake	Colubridae	*Thamnophis sirtalis**
Northern leopard frog	Ranidae	*Rana pipiens*
Green frog	Ranidae	*Rana clamitans**
Wood frog	Ranidae	*Rana sylvatica**
BIRDS		
Sharp-shinned hawk	Accipitridae	*Accipiter striatus*
Mallard	Anatidae	*Anas platyrhynchos**
American black duck	Anatidae	*Anas rubripes**
Hooded merganser	Anatidae	*Lophodytes cucullatus**
American wigeon	Anatidae	*Anas americana**
Gadwall	Anatidae	*Anas strepera**
Blue-Winged teal	Anatidae	*Anas discors*
Wood duck	Anatidae	*Aix sponsa*
Great blue heron	Ardeidae	*Ardea herodias**
Mourning dove	Columbidae	*Zenaida macroura*
Blue jay	Corvidae	*Cyanocitta cristata*
Swamp sparrow	Emberizidae	*Melospiza georgiana*
Yellow warbler	Emberizidae	*Dendroica petechia*
Chestnut-sided warbler	Emberizidae	*Dendroica pensylvanica*
Scarlet tanager	Emberizidae	*Piranga olivacea**
White-throated sparrow	Emberizidae	*Zonotrichia albicollis**
Sparrow hawk	Falconidae	*Falco sparverius*
Red-winged blackbird	Icteridae	*Agelaius phoeniceus**
Northern oriole	Icteridae	*Icterus galbula**
Gray catbird	Mimidae	*Dumatella carolinensis**
American robin	Muscicapidae	*Turdus migratorius*
Black-capped chicadee	Paridae	*Parus atricapillus**
Blackburnian warbler	Parulidae	*Dendroica fusca**
Common yellowthroat	Parulidae	*Geothylpis trichas**
Black-and-white warbler	Parulidae	*Mniotilta varia**
American redstart	Parulidae	*Setophaga ruticilla**
Yellow-shafted flicker	Picidae	*Colaptes auratus**
Downy woodpecker	Picidae	*Picoides pubescens**
Pileated woodpecker	Picidae	*Dryocopur pileatus**
American woodcock	Scolopacidae	*Scolopax minor**
White-breasted nuthatch	Sittidae	*Sitta carolinensis*
Ruffed grouse	Tetraonidae	*Bonasa umbellus**
Winter wren	Troglodytidae	*Troglodytes troglodytes*
Veery	Turdidae	*Catharus fuscesens**
American robin	Turdidae	*Turdus migratorius**
Great crested flycatcher	Tyrannidae	*Myiarchus crinitus*
Eastern phoebe	Tyrannidae	*Sayornis phoebe*
Eastern wood-pewee	Tyrannidae	*Contopus virene**
Creat crested flycatcher	Tyrannidae	*Myiarchus crinitus**
Eastern kingbird	Tyrannidae	*Tyrannus tyrannus**
Red-eyed veiro	Vireonidae	*Verio olivaceus**
FISH		
Red-bellied dace		*Phoxinus eois*
Creek chubsucker	Catostomidae	*Erimyzon sp.*
Golden shiner	Cyprinidae	*Notemigonas chrysoleucas*
Killifish	Cyprinodontidae	*Fundulus sp.*
Three-spined stickleback	Gasterosteidae	*Gasterosteus aculeatus*
Five-spined stickleback	Gasterosteidae	
Central mudminnow	Umbridae	*Umbra limi*
MAMMALS		
White-tailed deer	Cervivae	*Odocoileus virginianus*
White-footed mouse	Cricetidae	*Peromyscus leucopus*
Beaver	Castoridae	*Castor canadensis**
Muskrat	Cricetidae	*Ondatra zibethicus**
Eastern cottontail	Leporidae	*Sylvilagus floridanus*
Mink	Mustelidae	*Mustela vison**
Eastern chipmunk	Sciuridae	*Tamias striatus*
Woodland jumping mouse	Zapodidae	*Napaeozapus insignis*

Notes:
* Personal Communication, James Farquhar, III – Senior Wildlife Technician, New York State Department of Environmental Conservation. All other species or evidence of their presence (e.g., tracks, scat) observed at the site May 1989.

TABLE 5-36

CONCENTRATIONS OF SELECTED CHEMICALS IN BIOLOGICAL TISSUE SAMPLES

NORTH LAWRENCE OIL DUMP SITE

REMEDIAL INVESTIGATION

SAMPLE LOCATION	PCBs (mg/kg)	Cadmium (mg/kg)	Chromium (mg/kg)	Lead (mg/kg)	Zinc (mg/kg)	
BI-1 (mice/lagoon)	0.47	—	—	62.7	190.4	J
BI-2 (tadpoles/lagoon)	9.8	—	—	3263.2	791.6	J
BI-3 (fish/wetland outlet)	—	—	—	—	312.6	J
BI-4 (turtle/lagoon)	4.65	—	—	6.3	210.3	J
BI-5 (tadpoles/wetland outlet)	—	—	—	—	227.2	J
BI-6 (earthworms/lagoon)	9.3	71.8	60.1	30756.8	17567.6	J
BI-7 (cattails/lagoon center)	2.2	—	—	4722.9	871.7	J
BI-8 (cattails/lagoon south)	—	—	—	2106.7	389.3	J
BI-9 (tadpoles/lagoon)	4.4	—	—	1491.2	530.4	J
BI-10 (cattails/wetland near SD-4)	2.4	—	—	998.5	177.9	J
BI-11 (cattails/wetland near SD-7)	—	—	—	314.2	169.5	J
BI-12 (cattails/wetland outlet)	—	—	—	23.8	203.7	J
BI-13 (frogs/lagoon)	—	—	21.2	17.6	89.4	J

Notes:

— = Not detected

mg/kg = milligrams per kilogram

PCBs = polychlorinated biphenyls

J = indicates an estimated concentration because quality control criteria were not met

STOP HERE

STOP HERE

stop here

APPENDIX A

FIRST PHASE FIELD DATA

APPENDIX A-1

FIRST PHASE SOIL BORING LOGS

BORING NO. TB-1

SOIL BORING LOG

PAGE 1 OF 2

PROJECT NO. 5809-02

DRILLING CONTRACTOR AA & D

DESCRIBED BY Cianchette/ Arnold

RIG NO. 1

CHECKED BY

DRILLER Lee Penrod

DATE STARTED 3-10-89

DATE FINISHED 3-10-89

GROUND ELEV.

BIT SIZE 3.25"

CASING SIZE 3.25"

DEPTH TO WATER (DATE) NA

CORE SIZE NA

INCLINATION NA

DEPTH: SOIL 16'

ROCK NA

TOTAL 16'

SAMPLE NO.	DEPTH FT.	NO. BLOWS PER 6 IN.	REC. IN.	P.I. ppm	DESCRIPTION
S-1	0-2	17-18-20-22 N 738 Dense	0.5' / 2.0'	1.0	Silty-sand, brown-black fine and fine gravel, moist, strong oily odor.
S-2	2-4	26-21-14-18 N 735 Dense	0' / 2.0'	—	Gravel and boulders Analytical sample S-1 includes splitspoon samples S-1 through S-3.
S-3	2.5-4	7-12-12-12 N 724 Medium Dense	0.8' / 2.0'	0.5	0.5' Sand, brown, fine to coarse and medium to coarse gravel, wet, strong oily odor. 0.3' clay, gray with oil stains, moist, strong oily odor.
S-4	4-6	6-13-22-26 N 735 Dense	0.6' / 2.0'	0.5	Clay, gray-brown, moist.
S-5	6-8	90-41-27-23 N 768 Very Dense	1.0' / 2.0'	0.3	0.3' Sand, brown, fine to coarse, wet. 0.2' sand, brown, coarse, wet. 0.5' silty-sand, gray, fine, wet. Analytical sample S-2 contains splitspoons S-4 and S-5.

BORING NO. TB-1A

SOIL BORING LOG

PAGE 1 OF 1

PROJECT NO. 5809-02

DRILLING CONTRACTOR AA&D

DESCRIBED BY Cianchette / Arnold

RIG NO. 1

CHECKED BY

DRILLER Rocky Baye

DATE STARTED 3-21-89

DATE FINISHED 3-21-89

GROUND ELEV.

BIT SIZE

CASING SIZE 2.25" Augers

DEPTH TO WATER (DATE) —

CORE SIZE —

INCLINATION NA

DEPTH: SOIL 4'

ROCK

TOTAL 4'

SAMPLE NO.	DEPTH FT.	NO. BLOWS PER 6 IN.	REC. ~~IN.~~	P.I. ppm	DESCRIPTION
S-1	0-2'	4-7-24-28 N > 31 Dense	0.6' / 2.0'	5	Sand, gray-brown, fine some broken rock fragments, saturated, strong oily odor.
S-2	2-4'	5-27-27-26 N > 54 Very Dense	0.8' / 2.0'	0.2'	Sand, gray, fine to medium, trace silt, trace gravel, saturated, strong oily odor.

BORING NO. TB-2

SOIL BORING LOG

PAGE 2 OF 2

PROJECT NO. 5809-02

DRILLING CONTRACTOR AA&D

DESCRIBED BY Cianchette / Arnold

RIG NO. 1

CHECKED BY

DRILLER Rocky Baye

DATE STARTED 3-12-89

DATE FINISHED 3-12-89

GROUND ELEV.

BIT SIZE NA

CASING SIZE 2.5" Casing

DEPTH TO WATER (DATE) NA

CORE SIZE NA

INCLINATION NA

DEPTH: SOIL 10'

ROCK NA

TOTAL 10'

SAMPLE NO.	DEPTH FT.	NO. BLOWS PER 6 IN.	REC. IN.	P.I. ppm	DESCRIPTION
S-4	6-8	12-20-33-30 N > 53 Very Dense	0.8' / 2.0'	1.0	Sand, gray, fine and gravel, saturated, trace oily odor. Collected at 1152; S-4.
S-5	8-10	20-90(5") Very Dense	0.5' / 0.9'	0.3	Sand, gray, fine to coarse and gravel, saturated, slight oily odor. Collected at 1208; 6C
S-6	10-	Boulder	0 / 0	NA	No sample collected; encountered quartzite boulder and wrecked small rock core bit.
					Bottom of Exploration 10'

BORING NO. TB-3

SOIL BORING LOG

PROJECT NO. 5809-02

DRILLING CONTRACTOR AA & D

DESCRIBED BY Cianchette / Arnold

RIG NO. 1

CHECKED BY

DRILLER Rocky Baye

DATE STARTED 3-11-89

DATE FINISHED 3-12-89

GROUND ELEV.

BIT SIZE NA

CASING SIZE 3.25" Casing

DEPTH TO WATER (DATE) NA

CORE SIZE NA

INCLINATION NA

DEPTH: SOIL 16'

ROCK NA

TOTAL 16'

SAMPLE NO.	DEPTH FT.	NO. BLOWS PER 6 IN.	REC. IN.	P.I. ppm	DESCRIPTION
S-4	8-10	24·32·44·38 N>76 Very Dense	0.2 / 2.0	0.5	Till, sand, gray, fine, some gravel, wet, slight oily odor. No analytical sample collected, not enough recovery. Collected at 1645.
S-5	10-12	25·36·46·59 N>82 Very Dense	1.8' / 2.0'	2.0	Till, sand, gray, fine, some gravel, wet, oily odor. Analytical sample S-5 collected at 1700.
S-6	12-14	31·54·62·90 N>116 Very Dense	1.8' / 2.0'	0.7	Till, sand, fine, gray, few gravel, wet, oily odor. Analytical sample S-6 collected at 1730.
S-7	14-16 BOE 16'	30·48·91 (5")	1.5' / 1.5'	0.5	Till, sand, gray, fine, few gravel, wet, oily odor. Analytical sample S-7 collected at 1745.

BORING NO. TB-4

SOIL BORING LOG

PAGE 2 OF 2

PROJECT NO. 5809-02

DRILLING CONTRACTOR AA & D

DESCRIBED BY Cianchette / Arnold

RIG NO. 1

CHECKED BY

DRILLER Rocky Baye

DATE STARTED 3-11-89

DATE FINISHED 3-11-89

GROUND ELEV.

BIT SIZE NA

CASING SIZE 2.25" Casing

DEPTH TO WATER (DATE) NA

CORE SIZE NA

INCLINATION NA

DEPTH: SOIL 16'

ROCK NA

TOTAL 16'

SAMPLE NO.	DEPTH FT.	NO. BLOWS PER 6 IN.	REC. IN.	P.I. ppm	DESCRIPTION
S-5	8.6-8.9	100(3") Very Dense	0.2' / 0.2'	0	Till, sand, gray, fine, some gravel, saturated, oily odor. Analytical sample S-5 was not collected. Boulder
S-6	10.9-11.4	100(4.5") Very Dense	0.3' / 0.3'	0.1	Till, sand, gray, fine, some medium gravel, moist, trace oily odor.
S-7	12.9-13.6	85-100(3") Very Dense	0.3' / 0.7'	0.2	Till, sand, gray, fine, some medium gravel, moist, trace oily odor.
S-8	14.9-15.2	78-90(1.5")	0.1' / 0.1'	0.1	Till, sand, gray, fine, little small gravel, moist, faint oily odor. Analytical sample S-6 contains Splitspoon samples S-6, S-7 and S-8.

SOIL BORING LOG

PROJECT NO. 5809-02

DRILLING CONTRACTOR AA & D

DESCRIBED BY Cianchette / Arnold

RIG NO. 1

CHECKED BY

DRILLER Rocky Baye

DATE STARTED 3-13-89

DATE FINISHED 3-13-89

GROUND ELEV. BIT SIZE NA CASING SIZE 3.25" HSA

DEPTH TO WATER (DATE) NA CORE SIZE NA INCLINATION NA

DEPTH: SOIL 16' ROCK NA TOTAL 16'

SAMPLE NO.	DEPTH FT.	NO. BLOWS PER 6 IN.	REC. IN.	P.I. ppm	DESCRIPTION
S-4	6-8	41·59·65 55 N >124 Very Dense	1.2' / 2.0'	25	0.2' sand, brown, fine, trace gravel, saturated, strong oily odor. 1.0' sand, gray, fine, some gravel, stained black in spots, moist, oily odor. Analytical sample S-4 was collected at 1425.
S-5	8-10	23·51·62 26 N >113 Very Dense	1.6' / 2.0'	4	Till, 0.4' sand, gray, fine to coarse, and gravel, saturated, trace oily odor. 1.2' sand, gray, fine to coarse, some medium gravel, trace silt, moist, slight oily odor. Analytical sample S-5 was collected at 1437.
S-6	10-12	11·23·43 49 N > 66 Very Dense	1.6' / 2.0'	8	Till 0.3', sand, gray-brown, fine to medium, some medium gravel, saturated, oily odor. 1.3' Sand, gray-brown, some little to medium gravel, moist, oily odor. Analytical sample S-6 collected at 1450.

BORING NO. TB-6

SOIL BORING LOG

PAGE 1 OF 3

PROJECT NO. 5809-02

DRILLING CONTRACTOR AA&D

DESCRIBED BY Cianchetto / Arnold

RIG NO. 1

CHECKED BY

DRILLER Rocky Baye

DATE STARTED 3-12-89

DATE FINISHED 3-12-89

GROUND ELEV.

BIT SIZE NA

CASING SIZE 3.25" HSA

DEPTH TO WATER (DATE) NA

CORE SIZE NA

INCLINATION NA

DEPTH: SOIL 16'

ROCK NA

TOTAL 16'

SAMPLE NO.	DEPTH FT.	NO. BLOWS PER 6 IN.	REC. IN.	P.I. ppm	DESCRIPTION
S-1	0-2	5·14·15·12 N>29 Medium Dense	1.0'/2.0'	42	Sludge, black, gooey. Analytical sample S-1 was collected at 1500.
S-2	2-4	6·6·3·3 N>9 Loose	1.0'/2.0'	400	0.7' sludge, black, gooey. 0.3' silty-sand, brown, fine, saturated, strong oily odor. Analytical sample S-2 was collected at 1510.
S-3	4-6	6·16·18·20 N>34 Dense	1.0'/2.0'	86	Silty-sand, brown, fine, some medium to large gravel, saturated, oily odor. Analytical sample S-3 collected at 1550.
S-4	6-8	8·17·42·55 N>59 Very Dense	0.8'/2.0'	42	Till, sand, brown, fine to coarse and small to medium gravel, saturated. Analytical sample S-4 collected at 1610.

BORING NO. TB-6

SOIL BORING LOG

PAGE 3 OF 3

PROJECT NO. 5809-02

DRILLING CONTRACTOR AA&D

DESCRIBED BY Cianchette / Arnold

RIG NO. 1

CHECKED BY

DRILLER Rocky Baye

DATE STARTED 3-12-89

DATE FINISHED 3-12-89

GROUND ELEV.

BIT SIZE NA

CASING SIZE 3.25" HSA

DEPTH TO WATER (DATE) NA

CORE SIZE NA

INCLINATION NA

DEPTH: SOIL 16'

ROCK NA

TOTAL 16'

SAMPLE NO.	DEPTH FT.	NO. BLOWS PER 6 IN.	REC. IN.	P.I. ppm	DESCRIPTION
S-8	14-16	14-28-46-90(4") Very Dense	1.5' / 1.8'	44	Till, sand, gray, fine, few small gravel, wet, faint oily odor. Analytical sample S-8 collected at 1654.

BORING NO. TB-7

SOIL BORING LOG

PAGE 2 OF 3

DRILLING CONTRACTOR AA&D

RIG NO. 1

DRILLER Rocky Baye

PROJECT NO. 5809-02

DESCRIBED BY Cianchette / Arnold

CHECKED BY

DATE STARTED 3-13-89

DATE FINISHED 3-14-89

GROUND ELEV. BIT SIZE NA CASING SIZE 3.25" HSA

DEPTH TO WATER (DATE) NA CORE SIZE NA INCLINATION NA

DEPTH: SOIL 14' ROCK NA TOTAL 14'

SAMPLE NO.	DEPTH FT.	NO. BLOWS PER 6 IN.	REC. IN.	P.I. ppm	DESCRIPTION
S-4	6-8	5·3·16·15 N>19 Medium Dense	1.8'/2.0'	17	1.4' Silty-clay, gray, trace medium gravel, moist, slight oily odor. 0.4' Sand, brown, fine, trace medium gravel, moist, slight oily odor. Analytical sample S-4 was collected at 1718.
S-5	8-10	4·28·73·28 N>101 Very Dense	1.0'/2.0'	14	Till, 0.7', sand, gray, fine, trace small to medium gravel, saturated, slight oily odor. 0.3' rock fragments from boulder. Analytical sample S-5 collected at 1732.

BORING NO. TB-8

SOIL BORING LOG

PAGE 1 OF 3

PROJECT NO. 5809-02

DRILLING CONTRACTOR AA&D

DESCRIBED BY Cianchette / Kipp

RIG NO. 1

CHECKED BY

DRILLER John Pietruch

DATE STARTED 3-22-89

DATE FINISHED 3-22-89

GROUND ELEV. BIT SIZE NA CASING SIZE 3.25" HSA

DEPTH TO WATER (DATE) NA CORE SIZE NA INCLINATION NA

DEPTH: SOIL 16' ROCK NA TOTAL 16'

SAMPLE NO.	DEPTH FT.	NO. BLOWS PER 6 IN.	REC. IN.	P.I. ppm	DESCRIPTION
					3" of ice directly on ground surface.
S-1	0-2	8·1·2·6 N>3 Very Loose	1.2' / 2.0'	2	0.9' Sludge, black, frozen, oily odor. 0.3' sand, brown, fine to medium, little silt, trace small gravel, saturated, oily odor. Analytical sample S-1 collected at 1530.
S-2	2-4	12·16·16·26 N>32 Medium Dense	1.3' / 2.0'	1.5	0.4' Sand, brown, fine to medium, and medium gravel, saturated, oily odor. 0.2' broken rock fragments, oily odor. 0.7' sand, brown, medium to coarse, some medium gravel, saturated, oily odor. Analytical sample S-2 collected at 1540.
S-3	4-6	8·10·15·20 N>25 Medium Dense	1.4' / 2.0'	3	0.5' Sand, brown, fine to coarse, and medium gravel, saturated, oily odor. Analytical sample S-3 collected at 1600.

E.C. JORDAN CO.

BORING NO. TB-8

SOIL BORING LOG

PROJECT NO. 5809-02

DRILLING CONTRACTOR AA & D

DESCRIBED BY Cianchette / Kipp

RIG NO. 1

CHECKED BY

DRILLER John Pietruch

DATE STARTED 3-22-89

DATE FINISHED 3-22-89

GROUND ELEV.

BIT SIZE NA

CASING SIZE 3.25" HSA

DEPTH TO WATER (DATE) NA

CORE SIZE NA

INCLINATION NA

DEPTH: SOIL 16'

ROCK NA

TOTAL 16'

SAMPLE NO.	DEPTH FT.	NO. BLOWS PER 6 IN.	REC. IN.	P.I. ppm	DESCRIPTION
S-7	12-14	14-21-31-33 N.>52 Very Dense	1.2' / 2.0'	0.1	Till, sand, gray, fine, some medium to large gravel, saturated. Analytical sample S-7 collected at 1705.
S-8	14-16	63-34-40-56 N>74 Very Dense	1.4' / 2.0'	0	Till, 0.5' Sand, gray, fine, saturated. 0.2' weathered rock fragments. 0.7' Sand, gray, fine, trace small gravel, saturated. Analytical sample S-8 collected at 1725.

BORING NO. TB-9

SOIL BORING LOG

PROJECT NO. 5809-02

DRILLING CONTRACTOR AA&D

DESCRIBED BY Cianchette / Kipp

RIG NO. 1

CHECKED BY

DRILLER John Pietruch

DATE STARTED 3-21-89

DATE FINISHED 3-22-89

GROUND ELEV.

BIT SIZE NA

CASING SIZE 3.25" HSA

DEPTH TO WATER (DATE) NA

CORE SIZE NA

INCLINATION NA

DEPTH: SOIL 14'

ROCK NA

TOTAL 14'

SAMPLE NO.	DEPTH FT.	NO. BLOWS PER 6 IN.	REC. IN.	P.I. ppm	DESCRIPTION
S-5	8-10	13·14·14·16 N>28 Medium Dense	1.3'/2.0'	2	Till, 0.1' Sand, gray, fine to medium saturated, faint oily odor. 0.3' Sand, red-brown, fine to medium, some medium gravel, saturated, faint oily odor. 0.9' Sand, tan-brown, little small gravel, saturated, faint oily odor. Analytical sample collected at 1205.
S-6	10-12	12·18·26·29 N>44 Dense	1.3'/2.0'	0.1	Till, 0.3' sand, brown, fine to medium, little medium gravel, saturated. 1.0' Sand, brown, fine, some medium gravel, moist. Analytical sample S-6 collected at 1220.
S-7	12-14	26·32·41·64 N>73 Very Dense	1.5'/2.0'	1.0	Till, 0.5' Sand, gray, fine, some medium gravel, wet. 0.3' Broken rock fragments from cobble. 0.7' Sand, gray, fine to medium, little small gravel, trace silt, moist. Analytical sample S-7 collected at 1240.
S-8	14	50(0)			Boulder

BORING NO. TB-10

SOIL BORING LOG

PAGE 2 OF 2

PROJECT NO. 5809-02

DRILLING CONTRACTOR AA&D

DESCRIBED BY Cianchette / Arnold

RIG NO. 1

CHECKED BY

DRILLER Rocky Baye

DATE STARTED 3-14-89

DATE FINISHED 3-14-89

GROUND ELEV.

BIT SIZE NA

CASING SIZE 3.25" HSA

DEPTH TO WATER (DATE) NA

CORE SIZE NA

INCLINATION NA

DEPTH: SOIL 16'

ROCK NA

TOTAL 16'

SAMPLE NO.	DEPTH FT.	NO. BLOWS PER 6 IN.	REC. IN.	P.I. ppm	DESCRIPTION
S-5	8-10	11·25·42·38 Very Dense	1.5 / 2.0	17	Till, 0.9' Sand, gray, fine to medium, and medium gravel, wet, faint oily odor. 0.6' sand, gray, fine, some medium gravel, moist, faint oily odor. Analytical sample S-5 collected at 1125.
S-6	10-12	68·28·28·10 Very Dense	1.3' / 2.0'	3	Till, 0.4' sand, gray, fine to medium, some medium gravel, wet. 0.3' sand, gray, fine, little medium gravel, trace silt, moist. 0.6' sand, gray, fine to medium, some medium gravel, wet. Analytical sample S-6 collected at 1137.
S-7	12-14	22-90(4") Very Dense	0.8' / 0.8'	1	Till, sand, gray, fine to medium, some medium to large gravel, saturated. Analytical sample S-7 collected at 1149.
S-8	14-16	37-55-56-63 Very Dense	1.8' / 2.0'	1	Till, 0.5' sand, gray, fine to coarse, and medium gravel, saturated. 0.4' Sand, gray, fine, some medium gravel, trace silt, moist. 0.9' sand, gray, fine, some medium gravel, saturated.

Analytical sample S-8 collected at 1200.

BORING NO. TB-11

SOIL BORING LOG

PAGE 2 OF 2

PROJECT NO. 5809-02

DRILLING CONTRACTOR AA&D

DESCRIBED BY Cianchette / Kipp

RIG NO. 1

CHECKED BY

DRILLER John Pietruch

DATE STARTED 3-23-89

DATE FINISHED 3-23-89

GROUND ELEV.

BIT SIZE NA

CASING SIZE 3.25" HSA

DEPTH TO WATER (DATE) NA

CORE SIZE NA

INCLINATION NA

DEPTH: SOIL 16'

ROCK NA

TOTAL 16'

SAMPLE NO.	DEPTH FT.	NO. BLOWS PER 6 IN.	REC. IN.	P.I. ppm	DESCRIPTION
S-6	10-12	24-47-41-72 Very Dense	1.5' / 2.0'	0	Till, 1.1' Sand, tannish-brown, fine to medium, trace medium gravel, saturated. 0.1' Sand, rust-brown, coarse, saturated. 0.3' Sand, tannish-brown, fine and medium gravel, saturated. Analytical sample S-6 taken at 1510.
S-7	12-14	30-35-79-90(4") Very Dense	1.7' / 2.0'	0	Till, 0.8' Sand, brown, medium, some small gravel, saturated. 0.2' Broken, weathered cobble. 0.7' Sand, brown, medium grading to silty-sand, fine, trace to little small to medium gravel, moist. Analytical sample S-7 taken at 1540.
S-8	14-16	25-34-38-63 Very Dense	2.0 / 2.0	0	Till, 1.1' Sand, tannish-brown, fine, trace small gravel, moist. 0.9' Sand, gray, fine, trace small gravel, moist. Analytical sample S-8 taken at 1600.

BORING NO. TB-13

SOIL BORING LOG

PAGE 1 OF 2

PROJECT NO. 5809-02

DRILLING CONTRACTOR AA&D

DESCRIBED BY Cianchette/Kipp

RIG NO. 1

CHECKED BY

DRILLER John Pietruch

DATE STARTED 3-23-89

DATE FINISHED 3-23-89

GROUND ELEV. BIT SIZE NA CASING SIZE 3.25" HSA

DEPTH TO WATER (DATE) NA CORE SIZE NA INCLINATION NA

DEPTH: SOIL 13.7' ROCK NA TOTAL 13.7'

SAMPLE NO.	DEPTH FT.	NO. BLOWS PER 6 IN.	REC. IN.	P.I. ppm	DESCRIPTION
S-1	0-2	15-1-1-10 N>2 Soft to loose	1.9' / 2.0'	2	1.5' Sludge, black, frozen, oily odor. 0.2' Sludge, black, gooey, strong oily odor. 0.2' Silty-sand, fine, some medium gravel, dry. Analytical sample S-1 was taken at 0945.
S-2	2-4	10-13-15-12 N>28 Medium Dense	0.6' / 2.0'	5	0.2' organics, black, to dark brown, peat, moist, oily odor. 0.4' sand, brown, fine to medium, dry to barely moist, oily odor. Analytical sample S-2 is composed of split-spoons S-2 and S-3, taken at 0950.
S-3	4-6	5-9-11-16 N>20 Medium Dense	1.8' / 2.0'	10	0.6' Sand, brown, fine, some silt, little small to medium gravel, moist, oily odor. Till, 1.2' sand, gray, fine, little silt, some medium gravel, moist, oily odor.
S-4	7-9	WOH-2-1-9 N>3 Very Loose	1.8' / 2.0'	0.2'	Till, Sand, brown, fine, some medium gravel, saturated, oily odor. Analytical sample S-4 taken at 1030.

SOIL BORING LOG

PROJECT NO. 5809-02

DRILLING CONTRACTOR AA&D

DESCRIBED BY Cianchette

RIG NO. 1

CHECKED BY

DRILLER John Pietruch

DATE STARTED 4-12-89

DATE FINISHED 4-12-89

GROUND ELEV. BIT SIZE NA CASING SIZE 4.25" HSA

DEPTH TO WATER (DATE) NA CORE SIZE NA INCLINATION NA

DEPTH: SOIL 15.1' ROCK NA TOTAL 15.1'

SAMPLE NO.	DEPTH FT.	NO. BLOWS PER 6 IN.	REC. IN.	P.I. ppm	DESCRIPTION
S-1	0-2	3-2-4-4 N>6 Loose	1.0' / 2.0'	—	0.3' Sludge, black, gooey and organics, sticks, roots and leaves. 0.7' Sand, light brown, fine to medium, some medium gravel, trace silt, saturated, strong oily odor. Analytical sample S-1 taken at 1010.
S-2	2-4	14-20-24-44 N>44 Dense	1.0' / 2.0'	—	Sand, light brown, fine to medium, some small to large gravel, trace silt, moist to wet, slight oily odor. Analytical sample S-2 taken at 1030.
S-3	4-6	17-25(3") medium dense to Dense	0.4' / 0.8'	—	Sand, light brown, fine to medium, some medium to large gravel, moist, faint oily odor. Analytical sample was not collected but a GC sample was.

BORING NO. TB-14

SOIL BORING LOG

PAGE 3 OF 3

PROJECT NO. 5809-02

DRILLING CONTRACTOR AA&D

DESCRIBED BY Cianchette

RIG NO. 1

CHECKED BY

DRILLER John Pietruch

DATE STARTED 4-12-89

DATE FINISHED 4-12-89

GROUND ELEV.

BIT SIZE NA

CASING SIZE 4.25" HSA

DEPTH TO WATER (DATE) NA

CORE SIZE NA

INCLINATION NA

DEPTH: SOIL 15.1'

ROCK NA

TOTAL 15.1'

SAMPLE NO.	DEPTH FT.	NO. BLOWS PER 6 IN.	REC. IN.	P.I. ppm	DESCRIPTION
S-7	12-14	17-27-25-50(1") N>52 Very Dense	1.0' / 1.6'	—	Till, sand, light brown, fine to coarse, some small to medium gravel, saturated. Analytical sample S-7 taken at 1200.
S-8	14-16	17-35-50(1") N>85 Very Dense	0.9' / 1.1'	—	Till, sand, light brown, fine to medium, some small to large gravel, saturated. Analytical sample S-8 taken at 1220.

BORING NO. TB-16

SOIL BORING LOG

PROJECT NO. 5809-02

DRILLING CONTRACTOR AA&D

DESCRIBED BY Cianchette

RIG NO. 1

CHECKED BY

DRILLER John Pietruch

DATE STARTED 3-24-89

DATE FINISHED 3-24-89

GROUND ELEV.

BIT SIZE NA

CASING SIZE 2.25" HSA

DEPTH TO WATER (DATE) NA

CORE SIZE NA

INCLINATION NA

DEPTH: SOIL 15.9'

ROCK NA

TOTAL 15.9'

SAMPLE NO.	DEPTH FT.	NO. BLOWS PER 6 IN.	REC. IN.	P.I. ppm	DESCRIPTION
S-1	0-2	3-6-6-7 N>12 Medium Dense	1.6' / 2.0'	0.3	0.9' Sludge, black, frozen, oily odor. 0.5' Silty-sand, brown, fine, moist, oily odor. 0.1' Broken rock fragments, cobble. 0.1' Sand, brown, coarse, some medium gravel, saturated, oily odor. Analytical sample S-1 taken at 1230.
S-2	2-4	10-12-14-16 N>26 Medium Dense	1.5' / 2.0'	0.2	Sand, light brown, fine to medium, little small gravel, saturated, oily odor. Analytical sample S-2 taken at 1235.
S-3	4-6	11-12-11-15 N>23 Medium Dense	1.4' / 2.0'	1.2	0.8' Sand, brown, fine to medium, some small gravel, saturated, oily odor. 0.6' Sand, orange-brown, fine to medium, little medium gravel, saturated, oily odor. Analytical sample S-3 taken at 1247.

BORING NO. TB-16

SOIL BORING LOG

PROJECT NO. 5809-02

DRILLING CONTRACTOR AA&D

DESCRIBED BY Cianchette

RIG NO. 1

CHECKED BY

DRILLER John Pietruch

DATE STARTED 3-24-89

DATE FINISHED 3-24-89

GROUND ELEV.

BIT SIZE NA

CASING SIZE 2.25" HSA

DEPTH TO WATER (DATE) NA

CORE SIZE NA

INCLINATION NA

DEPTH: SOIL 15.9'

ROCK NA

TOTAL 15.9'

SAMPLE NO.	DEPTH FT.	NO. BLOWS PER 6 IN.	REC. IN.	P.I. ppm	DESCRIPTION
S-7	12-14	46-35-95(6") N>95 Very Dense	1.2' / 1.6'	0.2	Till, 0.4', sand, gray, fine, little small gravel, saturated. 0.8' sand, brown, fine to medium and medium gravel, saturated. Analytical sample S-7 taken at 1350.
S-8	14-16	67-62-90(5") N>152 Very Dense	1.5' / 1.5'	0	Till, 0.6', sand, brown, fine to medium, some medium gravel, saturated. 0.9', sand, brown, fine, some medium gravel, trace silt, moist. Analytical sample S-8 taken at 1407.

BORING NO. TB-17

SOIL BORING LOG

PAGE 2 OF 3

PROJECT NO. 5809-02

DRILLING CONTRACTOR AA&D

DESCRIBED BY Cianchette

RIG NO. 1

CHECKED BY

DRILLER John Pietruch

DATE STARTED 4-12-89

DATE FINISHED 4-13-89

GROUND ELEV. BIT SIZE NA CASING SIZE 4.25" HSA

DEPTH TO WATER (DATE) NA CORE SIZE NA INCLINATION NA

DEPTH: SOIL 15.5' ROCK NA TOTAL 15.5'

SAMPLE NO.	DEPTH FT.	NO. BLOWS PER 6 IN.	REC. IN.	P.I. ppm	DESCRIPTION
S-4	6-8	14-20 (1.5") N>20 Medium Dense	0.2' / 0.6'	—	Silty-sand, brown, and large gravel, saturated, strong oily odor. No analytical sample was taken, GC sample was taken only.
S-5	8-10	28-50 (4.5") Very Dense	0.5' / 0.9'	—	Till, sand, light brown, fine to medium, little medium gravel, trace silt, moist, slight oily odor. Only GC sample was taken.
S-6	10-12	15-28-50(4") N>78 Very Dense	0.8' / 1.3'	—	Till, sand, light brown, fine to medium, little medium gravel, saturated, slight oily odor. Analytical sample S-6 is composed of splitspoon samples S-6 and S-7 collected at 0820.

BORING NO. TB-18

SOIL BORING LOG

PROJECT NO. 5809-02

DRILLING CONTRACTOR AA&D

DESCRIBED BY Cianchette

RIG NO. 1

CHECKED BY

DRILLER John Pietruch

DATE STARTED 4-13-89

DATE FINISHED 4-13-89

GROUND ELEV.

BIT SIZE NA

CASING SIZE 4.25" HSA

DEPTH TO WATER (DATE) NA

CORE SIZE NA

INCLINATION NA

DEPTH: SOIL 12.5'

ROCK NA

TOTAL 12.5'

SAMPLE NO.	DEPTH FT.	NO. BLOWS PER 6 IN.	REC. IN.	P.I. ppm	DESCRIPTION
S-1	0-2	7-7-10-15 N 717 Medium Dense	1.2' / 2.0'	—	0.2' sludge, black, gooey, oily odor. 0.8' Sand, orange-brown to chocolate brown, fine to medium, some medium to large gravel, moist, strong oily odor. 0.2', silty-sand, olive-brown, fine, trace medium gravel, moist, strong oily odor. Analytical sample S-1 was collected at 0930.
S-2	2-4	9-14-19-25 N 733 Dense	1.5' / 2.0'	—	Sand, olive-brown, fine to medium, some small to large gravel, trace silt, moist, strong oily odor. Analytical sample S-2 taken at 0940.
S-3	4-6	14-12-24-19 N 736 Dense	1.0' / 2.0'	—	Silty-sand, olive-brown, fine, some large gravel, moist, strong oily odor. Analytical sample S-3 taken at 0950.

BORING NO. TB-22

SOIL BORING LOG

PAGE 1 OF 2

PROJECT NO. 5809-02

DRILLING CONTRACTOR AA&D

DESCRIBED BY Cianchette

RIG NO. 1

CHECKED BY

DRILLER Rocky Baye

DATE STARTED 4-11-89

DATE FINISHED 4-12-89

GROUND ELEV. BIT SIZE NA CASING SIZE 3" Wireline → 4.25" HSA

DEPTH TO WATER (DATE) NA CORE SIZE NA INCLINATION NA

DEPTH: SOIL 8.8' ROCK NA TOTAL 8.8'

SAMPLE NO.	DEPTH FT.	NO. BLOWS PER 6 IN.	REC. IN.	P.I. ppm	DESCRIPTION
S-1	0-2	15-10-11-8 N 721 Medium Dense	1.0' / 2.0'	—	0.2' sludge, black, gooey, strong oily odor. 0.8' Sand, brown, fine to medium, trace small gravel, moist to dry, strong oily odor. Analytical sample S-1 taken at 1710.
S-2	2-3.5	6-6-11 N 717 Medium Dense	0.7' / 1.5'	—	0.3' Sand, reddish-brown, medium, some medium gravel, saturated, stained w/ black streaks of oil, strong odor. 0.4' Silty-clay, little small gravel, dry to moist, strong oily odor. Analytical sample S-2 taken at 1720.
S-3	3.5-5	26 (3") Medium Dense to Dense	0.1' / 0.2'	—	Sand, gray, fine to medium, some small to medium gravel, saturated, oily odor. No analytical sample taken, only GC sample collected.

BORING NO. TB-23

SOIL BORING LOG

PAGE 1 OF 2

PROJECT NO. 5809-02

DRILLING CONTRACTOR AA&D

DESCRIBED BY Cianchette

RIG NO. 2

CHECKED BY

DRILLER John Pietruch

DATE STARTED 4-13-89

DATE FINISHED 4-13-89

GROUND ELEV. BIT SIZE NA CASING SIZE 4.25" HSA

DEPTH TO WATER (DATE) NA CORE SIZE NA INCLINATION NA

DEPTH: SOIL 10.6' ROCK NA TOTAL 10.6'

SAMPLE NO.	DEPTH FT.	NO. BLOWS PER 6 IN.	REC. IN.	P.I. ppm	DESCRIPTION
S-1	0-2	8-9-9-12 N>18 Medium Dense	1.0' / 2.0'	—	0.4' Sludge, black, gooey, strong oily odor. 0.2' Sand, orange-brown, fine, stained with black oil streaks, saturated. 0.4' Sand, brown, medium, and medium gravel, saturated, strong oily odor. Analytical sample S-1 taken at 1205.
S-2	2-4	19-8-7-10 N>15 Medium Dense	0.3' / 2.0'	—	Sand, brown, medium, some medium gravel, saturated, strong oily odor. only took 6C sample.
S-3	4-6	—	—	—	Boulder - No sample
S-4	6-8	7-22-12-15 N>34 Dense	1.0' / 2.0'	—	silty-clay, brown, dry to moist, faint oily odor. Analytical sample taken at 1250.

BORING NO. TB-24

SOIL BORING LOG

PROJECT NO. 5809-02

DRILLING CONTRACTOR AA&D

DESCRIBED BY Cianchette / Arnold

RIG NO. 1

CHECKED BY

DRILLER Rocky Baye

DATE STARTED 4-2-89

DATE FINISHED 4-2-89

GROUND ELEV. BIT SIZE 3" CASING SIZE 3" Wireline

DEPTH TO WATER (DATE) NA CORE SIZE NA INCLINATION NA

DEPTH: SOIL 14' ROCK NA TOTAL 14'

SAMPLE NO.	DEPTH FT.	NO. BLOWS PER 6 IN.	REC. IN.	P.I. ppm	DESCRIPTION
S-1	0-2	1-3-11-11 N>14 Medium Dense	1.0' / 2.0'	3.1	0.7' Sludge, black, gooey, strong oily odor. 0.3' Sand, brown, fine to medium, little small to large gravel, wet, oily odor. Analytical sample S-1 taken at 1142.
S-2	2-3.5'	10-26(5") Medium Dense	0.8' / 0.8'	11.5	Sand, brown, medium to coarse, and small to medium gravel, trace silt, saturated, strong oily odor. Analytical sample S-2 is composed of splitspoon samples S-2 and S-3, taken at 1152.
S-3	3.5-5	9-16-36 N>52 Very Dense	1.1' / 1.5'	131	Clay, brown, trace medium gravel, dry to moist, very crumbly, very strong oily odor.

BORING NO. TB-24

SOIL BORING LOG

PAGE 3 OF 3

PROJECT NO. 5809-02

DRILLING CONTRACTOR AA&D

DESCRIBED BY Cianchette / Arnold

RIG NO. 1

CHECKED BY

DRILLER Rocky Baye

DATE STARTED 4-2-89

DATE FINISHED 4-2-89

GROUND ELEV.

BIT SIZE 3"

CASING SIZE 3" Wireline

DEPTH TO WATER (DATE) NA

CORE SIZE NA

INCLINATION NA

DEPTH: SOIL 14'

ROCK NA

TOTAL 14'

SAMPLE NO.	DEPTH FT.	NO. BLOWS PER 6 IN.	REC. IN.	P.I. ppm	DESCRIPTION
S-8	11-12.5	51-80-70(2") Very Dense	1.0 / 1.1	0.3	Till, sand, gray, fine, little small gravel, trace silt, wet to moist, faint odor.
S-9	12.5-14	—	—	—	Boulder - No sample

BORING NO. TB-25

SOIL BORING LOG

PAGE 2 OF 2

PROJECT NO. 5809-02

DRILLING CONTRACTOR AA&D

DESCRIBED BY Cianchette/Arnold

RIG NO. 2

CHECKED BY

DRILLER Rocky Baye

DATE STARTED 4-3-89

DATE FINISHED 4-4-89

GROUND ELEV.

BIT SIZE 3"

CASING SIZE 3" Wireline

DEPTH TO WATER (DATE) NA

CORE SIZE NA

INCLINATION NA

DEPTH: SOIL 12.5'

ROCK NA

TOTAL 12.5'

SAMPLE NO.	DEPTH FT.	NO. BLOWS PER 6 IN.	REC. IN.	P.I. ppm	DESCRIPTION
S-4	5-6.5	15-31-33 N>64 Very Dense	0.4' / 1.5'	—	Sand, brown, fine to medium, some small gravel, wet, strong oily odor.
S-5	6.5-8	—	—	—	Boulder - No sample obtained.
S-6	9-11.5	57-50 (2") Very Dense	0.5' / 0.7'	—	Till, sand, gray, fine to coarse, some medium gravel, saturated, strong oily odor. Analytical sample S-6 contains split-spoon samples S-6 and S-7, taken at 1517.
S-7	11.5-13	45-60(3")	0.7' / 0.9'	—	Till, sand, gray, fine to coarse, some small to large gravel, saturated, faint oily odor.

BORING NO. TB-26

SOIL BORING LOG

PAGE 2 OF 3

PROJECT NO. 5809-02

DRILLING CONTRACTOR AA&D

DESCRIBED BY Cianchette/Arnold

RIG NO. 2

CHECKED BY

DRILLER Rocky Baye

DATE STARTED 4-4-89

DATE FINISHED 4-4-89

GROUND ELEV. BIT SIZE 3" CASING SIZE 3" Wireline

DEPTH TO WATER (DATE) NA CORE SIZE NA INCLINATION NA

DEPTH: SOIL 14.1 ROCK NA TOTAL 14.1'

SAMPLE NO.	DEPTH FT.	NO. BLOWS PER 6 IN.	REC. IN.	P.I. ppm	DESCRIPTION
S-4	5-6.5	8-17-34 N>51 Very Dense	1.5'/1.5'	—	1' silty-clay, brown, trace medium gravel, moist, trace oily odor. 0.5' silty-clay, gray, moist, trace oily odor.
S-5	6.5-8	6-7-11 N>18 Medium Dense	1.1'/1.5'	—	0.5' sand, brown, fine to medium, little medium gravel, saturated, strong oily odor. 0.6' silty-clay, brown, trace medium gravel, moist to wet, oily odor. Analytical sample S-5 taken at 1210
S-6	8-9.5	4-6-14 N>20	0.8'/1.5'	—	Sand, brown, medium, little large gravel, saturated, very strong oily odor. Analytical sample S-6 includes split-spoon samples S-6 and S-7, taken at 1220.

SOIL BORING LOG

PROJECT NO. 5809-02

DRILLING CONTRACTOR AA&D

DESCRIBED BY Cianchette/Arnold

RIG NO. 2

CHECKED BY

DRILLER Rocky Baye

DATE STARTED 4-1-89

DATE FINISHED 4-1-89

GROUND ELEV.

BIT SIZE 3"

CASING SIZE 3" Wireline

DEPTH TO WATER (DATE) NA

CORE SIZE

INCLINATION NA

DEPTH: SOIL 14'

ROCK NA

TOTAL 14'

SAMPLE NO.	DEPTH FT.	NO. BLOWS PER 6 IN.	REC. IN.	P.I. ppm	DESCRIPTION
S-1	0-2	WOH-WOH-9-9 N79 Loose	1.1 / 2.0	—	0.6' Sludge, black, gooey, strong oily odor. 0.3' sand, brown, fine to coarse, some medium gravel, saturated, strong oily odor. 0.2' sand, brown, fine, saturated, strong oily odor. Analytical sample S-1 contains splitspoon samples S-1 and S-2, taken at 1515.
S-2	2-3.5	14-30-50 N>80 Very Dense	1.0' / 1.5'	—	Sand, brown, fine, little small gravel, wet, strong oily odor.
S-3	3.5-5	56-69-72(4") N>141 Very Dense	1.3' / 1.3'	—	0.6' Sand, olive-brown, fine, little small to medium gravel, wet, strong oily odor. 0.7' Silty-sand, brown, fine, little medium gravel, dry to moist, strong oily odor. Analytical sample S-3 taken at 1540.

BORING NO. TB27

SOIL BORING LOG

PROJECT NO. 5809-02

DRILLING CONTRACTOR AA&D

DESCRIBED BY Cianchette/Arnold

RIG NO. 2

CHECKED BY

DRILLER Rocky Baye

DATE STARTED 4-1-89

DATE FINISHED 4-1-89

GROUND ELEV. BIT SIZE 3" CASING SIZE 3" Wireline

DEPTH TO WATER (DATE) NA CORE SIZE NA INCLINATION NA

DEPTH: SOIL 14 ROCK NA TOTAL 14

SAMPLE NO.	DEPTH FT.	NO. BLOWS PER 6 IN.	REC. IN.	P.I. ppm	DESCRIPTION
S-9	12.8-13.6	73-73(3") N773 Very Dense	0.7'/0.8'	—	Till, sand, gray, fine, some small to large gravel, trace silt, dry to moist, faint oily odor. Analytical sample S-9 contains split-spoon samples S-9 and S-10, taken at 1712.
S-10	14-14.8	80-70(4") N770 Very Dense	0.5'/0.8'	—	Till, sand, gray, fine and medium gravel, moist, no odor.

BORING NO. TB-29

SOIL BORING LOG

PAGE 2 OF 3

PROJECT NO. 5809-02

DRILLING CONTRACTOR AA & D

DESCRIBED BY Cianchette / Arnold

RIG NO. 2

CHECKED BY

DRILLER Rocky Baye

DATE STARTED 4-5-89

DATE FINISHED 4-5-89

GROUND ELEV. BIT SIZE 3" CASING SIZE 3" Wire line

DEPTH TO WATER (DATE) NA CORE SIZE NA INCLINATION NA

DEPTH: SOIL 14.6' ROCK NA TOTAL 14.6'

SAMPLE NO.	DEPTH FT.	NO. BLOWS PER 6 IN.	REC. IN.	P.I. ppm	DESCRIPTION
S-5	6.5-8	60-47-87 N7134 Very Dense	1.0' / 1.5'	—	0.2' Sand, brown, medium, and medium to large gravel, saturated, strong oily odor. 0.4' broken boulder/cobble fragments. 0.4' sand, gray, fine, trace medium gravel, moist, strong oily odor. Analytical sample taken at 0910.
S-6	8-9.5	64-17(1") medium Dense to Dense	0.5' / 0.6'	—	0.3' Sand, brown, fine, some small gravel, trace silt, saturated, oily odor. 0.2' Silty-sand, brown, moist, oily odor. Analytical sample S-6 includes splitspoon samples S-6 and S-7, taken at 0917.
S-7	9.5-10.5	68-100(6") Very Dense	0.5' / 1.0'	—	Till, sand, gray, fine, some small gravel, trace silt, moist, oily odor.

BORING NO. TB-30

SOIL BORING LOG

PAGE 1 OF 3

PROJECT NO. 5809-02

DRILLING CONTRACTOR AA&D

DESCRIBED BY Cianchette/Arnold

RIG NO. 2

CHECKED BY

DRILLER Rocky Baye

DATE STARTED 4-1-89

DATE FINISHED 4-1-89

GROUND ELEV. BIT SIZE 3" CASING SIZE 3" Wireline

DEPTH TO WATER (DATE) NA CORE SIZE NA INCLINATION NA

DEPTH: SOIL 15.25' ROCK NA TOTAL 15.25'

SAMPLE NO.	DEPTH FT.	NO. BLOWS PER 6 IN.	REC. IN.	P.I. ppm	DESCRIPTION
S-1	0-2	WOH-2-4-18 N>6 Loose	1.6' / 2.0'	—	0.7' sludge, black, gooey, oily odor. 0.9' Sand, brown, fine, trace large gravel, moist, strong oily odor. Analytical sample S-1 taken at 1044.
S-2	2-3.5'	15-32-37 N>69 very Dense	1.1' / 1.5'	—	0.3' Sand, brown, fine, moist, strong oily odor. 0.7' Silty-sand, brown, little small gravel, moist, strong oily odor. 0.1' sand, olive-brown, some gravel, trace silt, wet, strong oily odor. Analytical sample S-2 taken at 1100.
S-3	3.5-5	45-61-78(5") N>139 very Dense	1.0' / 1.4'	—	Sand, olive-brown, fine, little medium gravel, wet, strong oily odor. Analytical sample S-3 taken at 1122.

BORING NO. TB-30

SOIL BORING LOG

PAGE 3 OF 3

PROJECT NO. 5809-02

DRILLING CONTRACTOR AA & D

DESCRIBED BY Cianchette / Arnold

RIG NO. 2

CHECKED BY

DRILLER Rocky Baye

DATE STARTED 4-1-89

DATE FINISHED 4-1-89

GROUND ELEV.

BIT SIZE 3"

CASING SIZE 3" Wireline

DEPTH TO WATER (DATE) NA

CORE SIZE NA

INCLINATION NA

DEPTH: SOIL 15.25'

ROCK NA

TOTAL 15.25'

SAMPLE NO.	DEPTH FT.	NO. BLOWS PER 6 IN.	REC. IN.	P.I. ppm	DESCRIPTION
S-10	14-15.25'	22-61-49(3") Very Dense	0.7' / 1.2'	—	Till, sand, gray, fine, little small gravel, saturated, faint oily odor. Only took GC sample.

BORING NO. TB-31

SOIL BORING LOG

PROJECT NO. 5809-02

DRILLING CONTRACTOR AA&D

DESCRIBED BY Cianchetto

RIG NO. 2

CHECKED BY

DRILLER Rocky Baye

DATE STARTED 4-11-89

DATE FINISHED 4-11-89

GROUND ELEV.

BIT SIZE 3"

CASING SIZE 3" Wireline

DEPTH TO WATER (DATE) NA

CORE SIZE NA

INCLINATION NA

DEPTH: SOIL

ROCK NA

TOTAL

SAMPLE NO.	DEPTH FT.	NO. BLOWS PER 6 IN.	REC. IN.	P.I. ppm	DESCRIPTION
S-4	5-6.5	17-29-35 N764 Very Dense	1.0' / 1.5'		Sand, brown, fine, some silt, trace small gravel, wet, strong oily odor. Analytical sample S-4 taken at 1106.
S-5	6.5-8	11-44-45 N789 Very Dense	0.8' / 1.5'		Sand, brown, fine, little silt, trace small gravel, wet to saturated, faint oily odor. Analytical sample S-5 collected at 1120.
S-6	8-9.5	31-53-50 N7103 Very Dense	1.0' / 1.5'		Till Sand, gray, fine, little medium to coarse gravel, wet to moist, oily odor. Analytical sample S-6 taken at 1128.
S-7	9.5-11	41-40-43 N783 Very Dense	0.9' / 1.5'		Till Sand, gray, fine to medium, little medium gravel, saturated, oily odor. Analytical sample S-7 taken at 1145.

BORING NO. TB-32

SOIL BORING LOG

PAGE 1 OF 1

PROJECT NO. 5809-02

DRILLING CONTRACTOR AA&D

DESCRIBED BY Cianchette/Arnold

RIG NO. 2

CHECKED BY

DRILLER Rocky Baye

DATE STARTED 4-5-89

DATE FINISHED 4-11-89

GROUND ELEV.

BIT SIZE 3"

CASING SIZE 3" Wireline

DEPTH TO WATER (DATE) NA

CORE SIZE NA

INCLINATION NA

DEPTH: SOIL 7'

ROCK NA

TOTAL 7'

SAMPLE NO.	DEPTH FT.	NO. BLOWS PER 6 IN.	REC. IN.	P.I. ppm	DESCRIPTION
S-1	0-2	5-8-24-21(3") N>45 Dense	1.0' / 1.8'	10	0.4' sludge, black, gooey, oily odor. 0.6' Silty-sand, brown, and medium gravel, saturated, strong oily odor. Analytical sample S-1 taken at 1205.
S-2	2-3.5	—	—	—	Boulder - no sample.
S-3	3.5-5	30(3") Very Dense	0.1' / 0.2'	0	Sand, brown, fine and medium to large gravel, saturated, strong oily odor. Only took GC sample.
S-4	5-6.5	—	—	—	Boulder - no sample.
S-5	6.5-8	—	—	—	Boulder - no sample; stopped at 7'.

BORING NO. TB-33

SOIL BORING LOG

PROJECT NO. 5809-02

DRILLING CONTRACTOR AA&D

DESCRIBED BY Gianchetto / Arnold

RIG NO. 2

CHECKED BY

DRILLER Rocky Baye

DATE STARTED -

DATE FINISHED 3-31-89

GROUND ELEV.

BIT SIZE 3"

CASING SIZE 3" Wireline

DEPTH TO WATER (DATE) NA

CORE SIZE NA

INCLINATION NA

DEPTH: SOIL 14.1'

ROCK NA

TOTAL 14.1'

SAMPLE NO.	DEPTH FT.	NO. BLOWS PER 6 IN.	REC. IN.	P.I. ppm	DESCRIPTION
S-5	7-8.5	59(4") Very Dense	0.3' / 0.3'		Till, sand, brown, fine, some medium gravel, saturated, oily odor. Only GC sample collected.
S-6	8.7-9	78(4") Very Dense	0.3' / 0.3'		Till, sand, brown, fine, some medium gravel, saturated, oily odor.
S-7	9.5-11	100(4") very Dense	0.3' / 0.3'		Till, sand, gray, fine, some small gravel, trace large gravel, wet, distinct oily odor. Only GC sample collected.
S-8	11-13.5	90(5") Very Dense	0.4' / 0.4'		Till, sand, gray, fine, some small gravel, trace large gravel, wet, strong oily odor. GC sample taken.
S-9	13.5-15	90-49(3") Very Dense	0.6' / 0.8'		Till, sand, gray, fine, some medium gravel, wet, strong oily odor. GC sample taken.

BORING NO. TB-34

SOIL BORING LOG

PAGE 2 OF 2

PROJECT NO. 5809-02

DRILLING CONTRACTOR AA&D

DESCRIBED BY Cianchette/ Arnold

RIG NO. 2

CHECKED BY

DRILLER Rocky Baye

DATE STARTED 3-31-89

DATE FINISHED 3-31-89

GROUND ELEV.

BIT SIZE 3"

CASING SIZE 3" Wireline

DEPTH TO WATER (DATE) NA

CORE SIZE NA

INCLINATION NA

DEPTH: SOIL 14.6'

ROCK NA

TOTAL 14.6'

SAMPLE NO.	DEPTH FT.	NO. BLOWS PER 6 IN.	REC. IN.	P.I. ppm	DESCRIPTION
S-6	8-9.5	74-54(3") very Dense	0.8' / 0.8'		Till, sand, tan-brown, fine, some small gravel, trace large gravel, wet. Analytical sample S-6 taken at 1031.
S-7	9.5-11	59-84-72(3") N>156 very Dense	1.0' / 1.2'		Till, sand, tan-brown, fine, some small to large gravel, wet. Analytical sample taken at 1038.
S-8	11-12.5	45-47-58 N>105 very Dense	0.9' / 1.5'		Till, sand, tan-brown, fine, little small gravel, trace silt, wet. Analytical sample taken at 1116.
S-9	12.5-14	72-66(3") N>66 Very Dense	0.6' / 0.8		Till, sand, tan-brown, fine, little medium gravel, wet. Only took GC sample. Drilled to 14.6' to try for one more sample; encountered only boulders.

APPENDIX A-2

FIRST PHASE PIEZOMETER BORING LOGS

BORING NO. PZ-2

CLIENT NORTH LAWRENCE OIL DUMP SITE	PROJECT NO. 5809-02
CONTRACTOR AMERICAN AUGER AND DITCHING, INC.	DATE STARTED 3-13-89 COMPLTD. 3-13-89
METHOD Wireline / CASING SIZE 4"	HNU 11.7/10.2 / PROTECTION LEVEL MOD. D
GROUND EL / SOIL DRILLED 15	ROCK DRILLED 0' / BELOW GROUND
LOGGED BY L. Healey / CHECKED BY Ganchetto	DATE 5-1-89 / Page 1 of 1

DEPTH (FT)	HNU AMB. AIR	SAMP NO. & TYPE NO.	SAMPLE	CLP	GC	OTHER Grain Size	FEET RECOVERY	SOIL/ROCK DESCRIPTION	SOIL CLASS OR ROCK FRACTURES	BLOWS/6-IN	WELL DATA	EL. (FT)
0	0	S-1	✓				2.0/2.0	0.8' organic loam, dark brown, roots, woodstump, frozen. 1.2' Silty-sand, orange-brown, fine, some fine to coarse gravel, moist.	Pt / SM	12 30 21 10 Very Dense		0 concrete; 3 seal 4
5	0.1	S-2	✓			X	1.2/1.8	Sand, yellow-brown, fine to medium, some fine gravel, trace silt, wet.	SM	31 44 44 100(4") Very Dense		5 silica sand
10	0	S-3	✓		✓	X	2.0/2.0	Sand, yellow-brown, fine, some silt, little to trace fine to medium gravel, saturated.	SM	8 7 7 11 Medium Dense		10
15								Boulder B.O.E. at 15 feet				15
20												20
25												25
30												30
35												35
40												40

*: U= THIN WALL S= SPLIT SPOON R= ROCK

E.C. JORDAN CO.

BORING NO. PZ-4

CLIENT NORTH LAWRENCE OIL DUMP SITE	PROJECT NO. 5809-02

CONTRACTOR AMERICAN AUGER AND DITCHING, INC.		DATE STARTED 3-15-89	COMPLTD. 3-15-89
METHOD Wireline	CASING SIZE 4"	HNU 11.7/10.2	PROTECTION LEVEL MOD. D
GROUND EL	SOIL DRILLED 16.4'	ROCK DRILLED 0'	BELOW GROUND
LOGGED BY L. Healey	CHECKED BY Cianchetto	DATE 5-1-89	Page 1 of 1

DEPTH (FT)	HNU AMB. AIR	SAMP NO. & TYPE NO.	SAMPLE	CLP	GC	OTHER	FEET RECOVERY	SOIL/ROCK DESCRIPTION	SOIL CLASS OR ROCK FRACTURES	BLOWS/6-IN	WELL DATA	EL. (FT)
0		S-1	✓				2.0/2.0	1.5' organics, roots, dark brown topsoil, orange-brown sandy loam, frozen. 0.5' sand, orange-brown, fine, little silt, f-m gravel, moist	pt / Sm	15 31 31 25 Very Dense	concrete 0–3; seal 3–4	0
5		S-2	✓				1.2/1.3	silty-sand, yellow-brown, little fine gravel, trace medium gravel, saturated.	Sm	13 21 50(3") Very Dense	silica sand	5
10		S-3	✓	✓	✓		1.0/1.5	Till, silty-sand, gray-brown, fine, some fine to coarse gravel, moist.	Sm	13 45 50 Very Dense		10
15		S-4	✓				1.0/1.4	Till, sand, yellow-brown, fine and fine to coarse gravel, little silt, dry to moist.	Sm	35 85 100(4") Very Dense		15
								B.O.E. at 16.4 feet				
20												

*: U= THIN WALL S= SPLIT SPOON R= ROCK

E.C. JORDAN CO.

BORING NO. PZ-6

CLIENT NORTH LAWRENCE OIL DUMP SITE	PROJECT NO. 5809-02

CONTRACTOR AMERICAN AUGER AND DITCHING, INC.		DATE STARTED 3-14-89	COMPLTD. 3-14-89
METHOD Wireline	CASING SIZE 4"	HNU 11.7/10.2	PROTECTION LEVEL MOD. D
GROUND EL	SOIL DRILLED 17'	ROCK DRILLED 0'	BELOW GROUND
LOGGED BY L. Healey	CHECKED BY Ganchetto	DATE 5-2-89	Page 1of 1

DEPTH (FT)	HNU AMB. AIR	SAMP NO. & TYPE NO.	SAMPLE	CLP	GC	OTHER	FEET RECOVERY	SOIL/ROCK DESCRIPTION	SOIL CLASS OR ROCK FRACTURES	BLOWS/6-IN	WELL DATA	EL. (FT)
0	1	S-1	✓				2.0/2.0	1.5' Sandy loam, dark brown, roots, wood, frozen, contains orange mottles. 0.5' Sand, yellow-brown, fine to coarse, moist.	Pt SW	17 11 4 7 Medium Dense	Concrete 0–3; Seal 3–4	0
								S-2 no Recovery Boulder				
5	0	S-3	✓				0.5/2.0	Sand, light brown, fine to medium, trace fine gravel, saturated.	SW	6 8 4 4 Medium Dense	Silica sand	5
10	0	S-4	✓	✓			1.4/2.0	Sand, light brown, fine, some silt, some medium to coarse gravel, saturated	SM	23 20 28 22 Dense		10
15	0	S-5	✓				2.0/2.0	Till, sand, gray, fine, trace fine to medium gravel, saturated. Silty-sand, gray, fine, trace fine gravel, moist to dry.	SM	28 40 48 75 Very Dense		15
20								B.O.E. at 17 feet				20

* U= THIN WALL S= SPLIT SPOON R= ROCK

E.C. JORDAN CO.

BORING NO. PZ-8

CLIENT NORTH LAWRENCE OIL DUMP SITE			PROJECT NO. 5809-02
CONTRACTOR AMERICAN AUGER AND DITCHING, INC.		DATE STARTED 3-14-89	COMPLTD. 3-15-89
METHOD Spun Casing	CASING SIZE 2.5"	HNU 11.7/10.2	PROTECTION LEVEL MOD. D
GROUND EL	SOIL DRILLED 15'	ROCK DRILLED 0'	BELOW GROUND
LOGGED BY Ganchetti/Arnold	CHECKED BY	DATE	Page 1 of 1

DEPTH (FT)	HNU AMB. AIR	SAMP NO. & TYPE NO.	SAMPLE	CLP	GC	OTHER	FEET RECOVERY	SOIL/ROCK DESCRIPTION	SOIL CLASS OR ROCK FRACTURES	BLOWS/6-IN	WELL DATA	EL. (FT)
0	0.1	S-1	✓				1.5 / 2.0	1.3' organics, peat, brown to black, some roots, wood, moist. 0.2' sand, brown, fine and medium gravel moist.	Pt SM	7 3 4 7 Loose		0 concrete
	3	S-2	✓	✓			0.9 / 2.0	0.2' sand, brown, coarse and medium gravel, saturated. 0.7' clay, gray, moist to dry.	GP CL	12 10 9 22 Medium Dense		2.9' seal 3.9'
5								Boulder				5 silica sand
	4	S-3	✓				2.0 / 2.0	0.9' sand, gray, medium to coarse, saturated. 0.4' sand, gray, coarse some medium gravel, saturated. 0.7' sand, gray, fine, some medium gravel, saturated.	SM	10 19 26 19 Dense		
10												10
	0	S-4	✓				1.5 / 2.0	Till, sand, gray, fine to medium, some medium gravel, saturated.	SM	33 41 71 68 Very Dense		
15								B.O.E. at 15 feet				15

* U= THIN WALL S= SPLIT SPOON R= ROCK

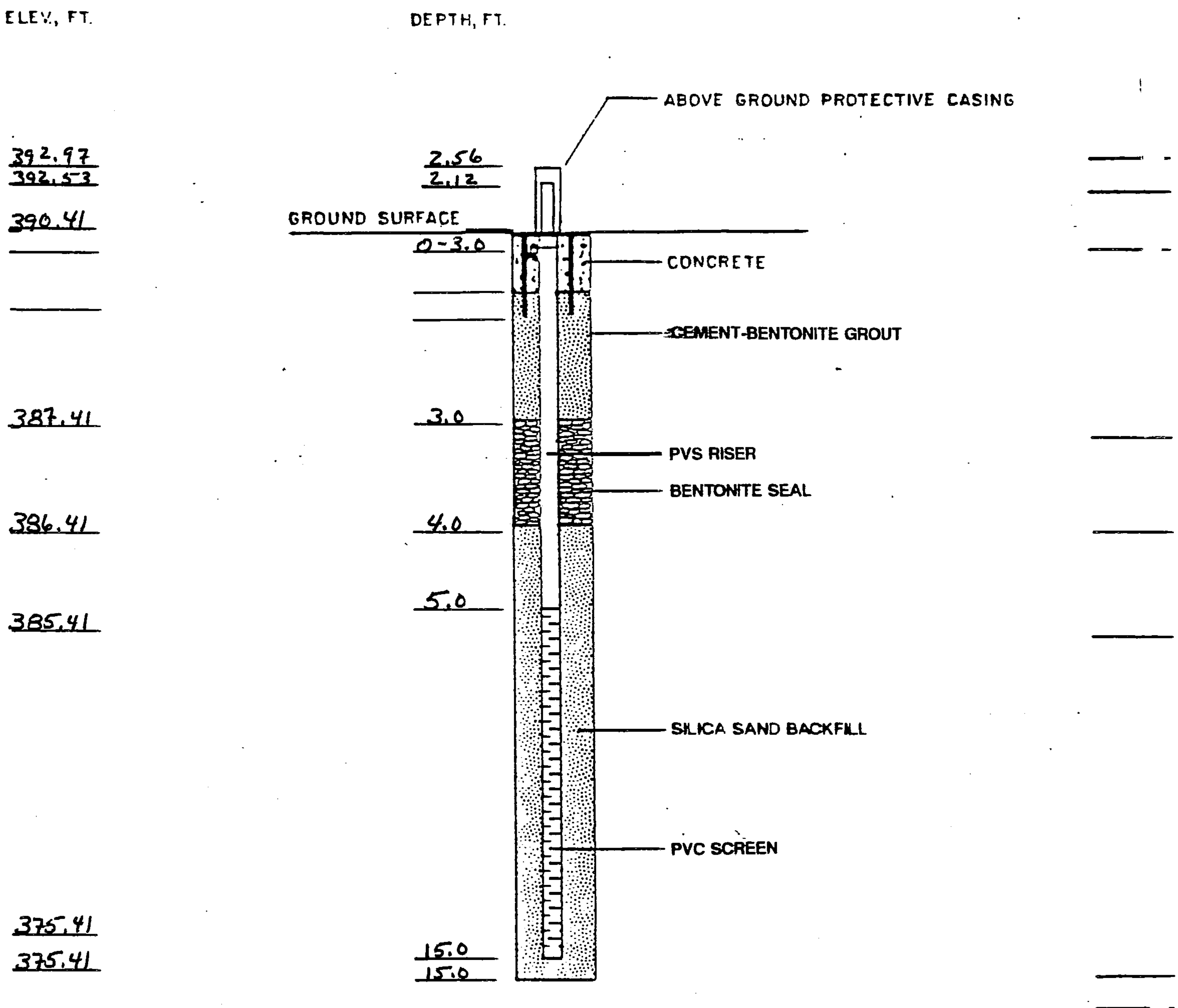
E.C. JORDAN CO.

APPENDIX A-3

FIRST PHASE PIEZOMETER INSTALLATION DIAGRAMS

PIEZOMETER AND MONITORING WELL INSTALLATION DIAGRAM

PROJECT NO. 5809-02	PROJECT NAME NLODS	WELL NO. PZ-2
INSTALLED BY AA&D	DATE INSTALLED 3-13-89	BORING DIAMETER 3 7/8 INCH
WELL DIAMETER 3/4 INCH	WELL MATERIAL PVC	BACKFILL MATERIAL SILICA SAND



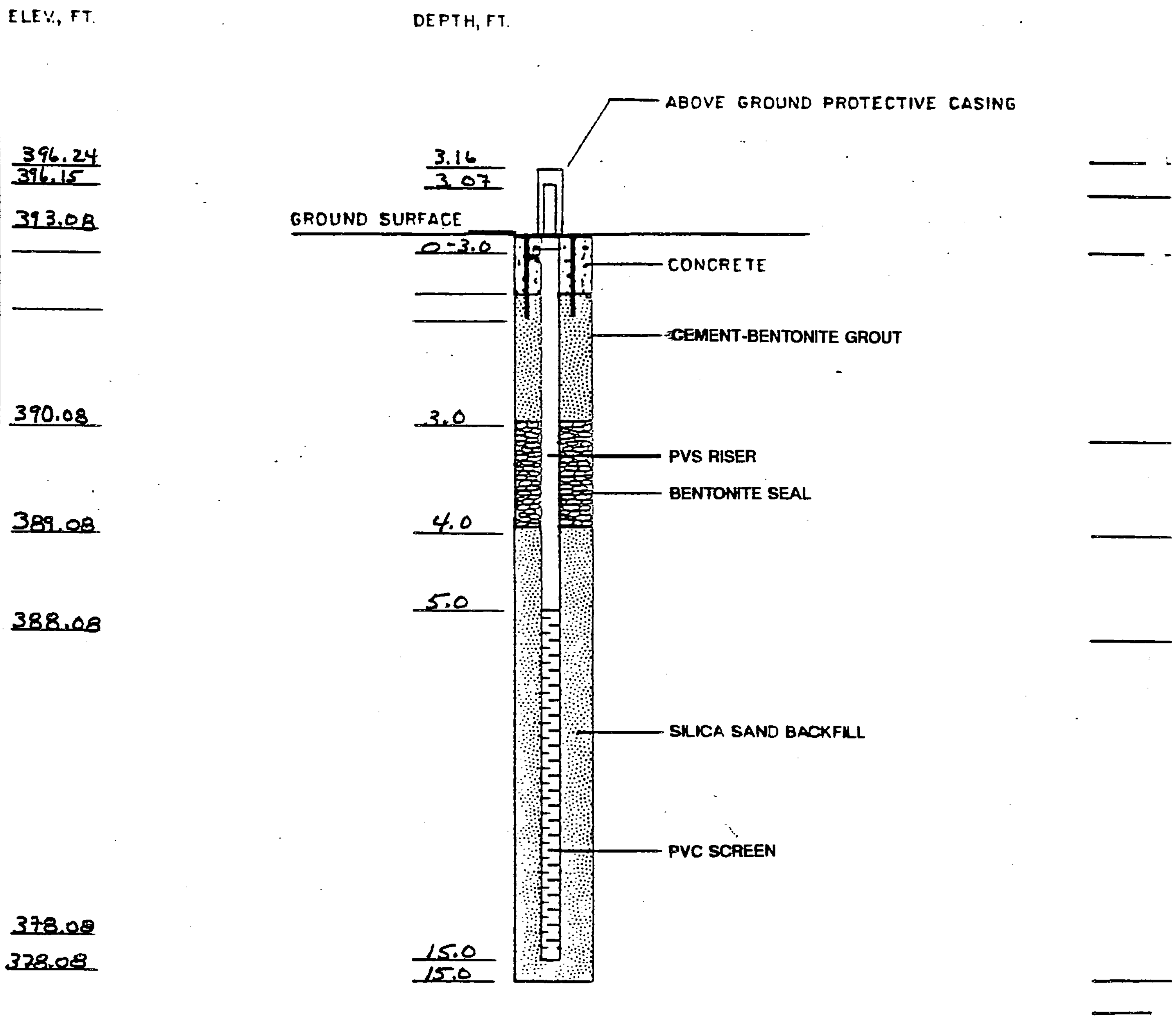
PIEZOMETER DETAIL

E.C.JORDAN CO.

4087-00

PIEZOMETER AND MONITORING WELL INSTALLATION DIAGRAM

PROJECT NO. 5809-02	PROJECT NAME NLODS	WELL NO. PZ-4
INSTALLED BY AA&D	DATE INSTALLED 3-15-89	BORING DIAMETER 4 INCH
WELL DIAMETER 3/4 INCH	WELL MATERIAL PVC	BACKFILL MATERIAL SILICA SAND



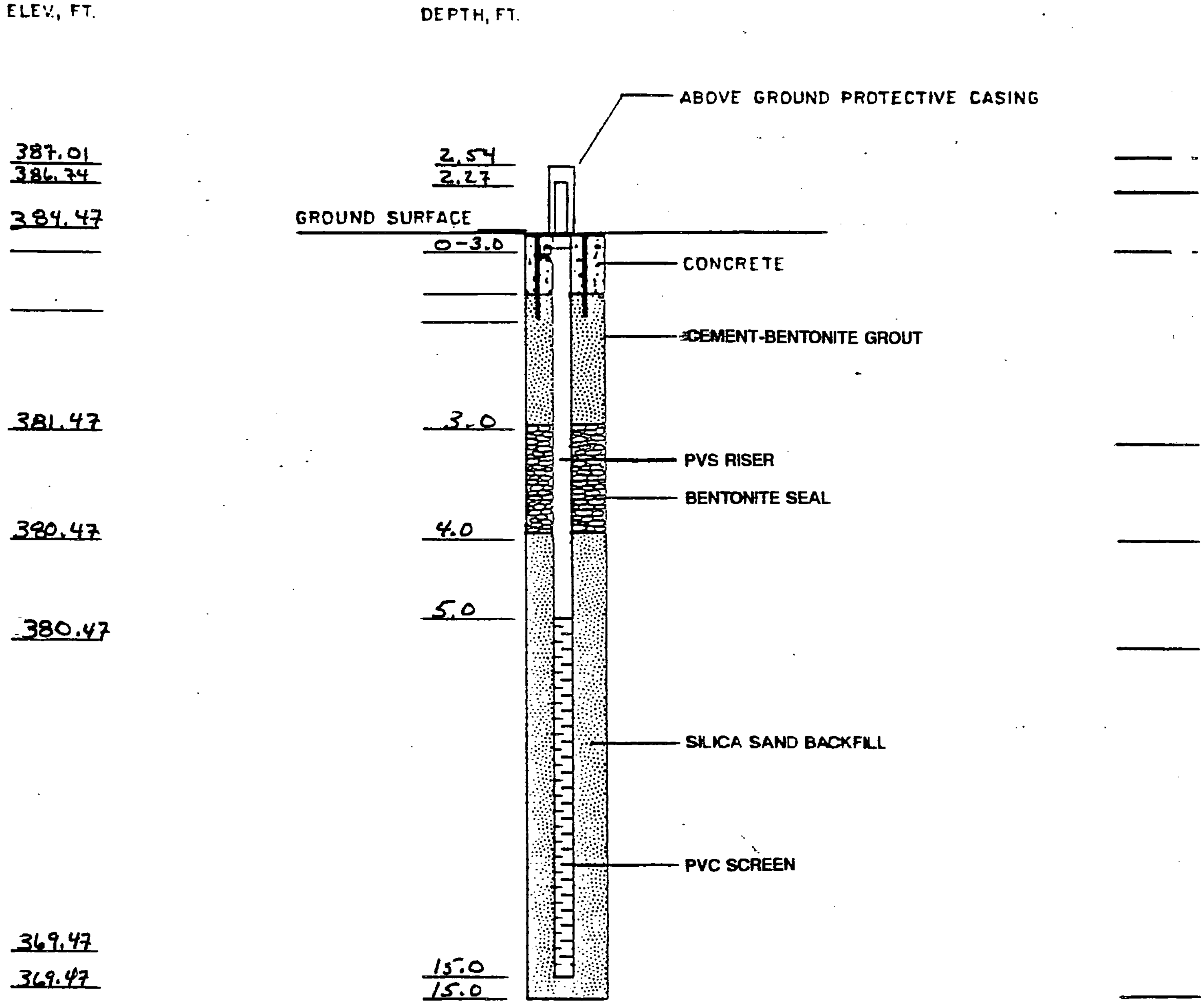
PIEZOMETER DETAIL

4DB7-00

E.C.JORDAN CO

PIEZOMETER AND MONITORING WELL INSTALLATION DIAGRAM

PROJECT NO. 5809-02	PROJECT NAME NLODS	WELL NO. PZ - 6
INSTALLED BY AA&D	DATE INSTALLED 3-14-89	BORING DIAMETER 3 7/8 INCH
WELL DIAMETER 3/4 INCH	WELL MATERIAL PVC	BACKFILL MATERIAL SILICA SAND



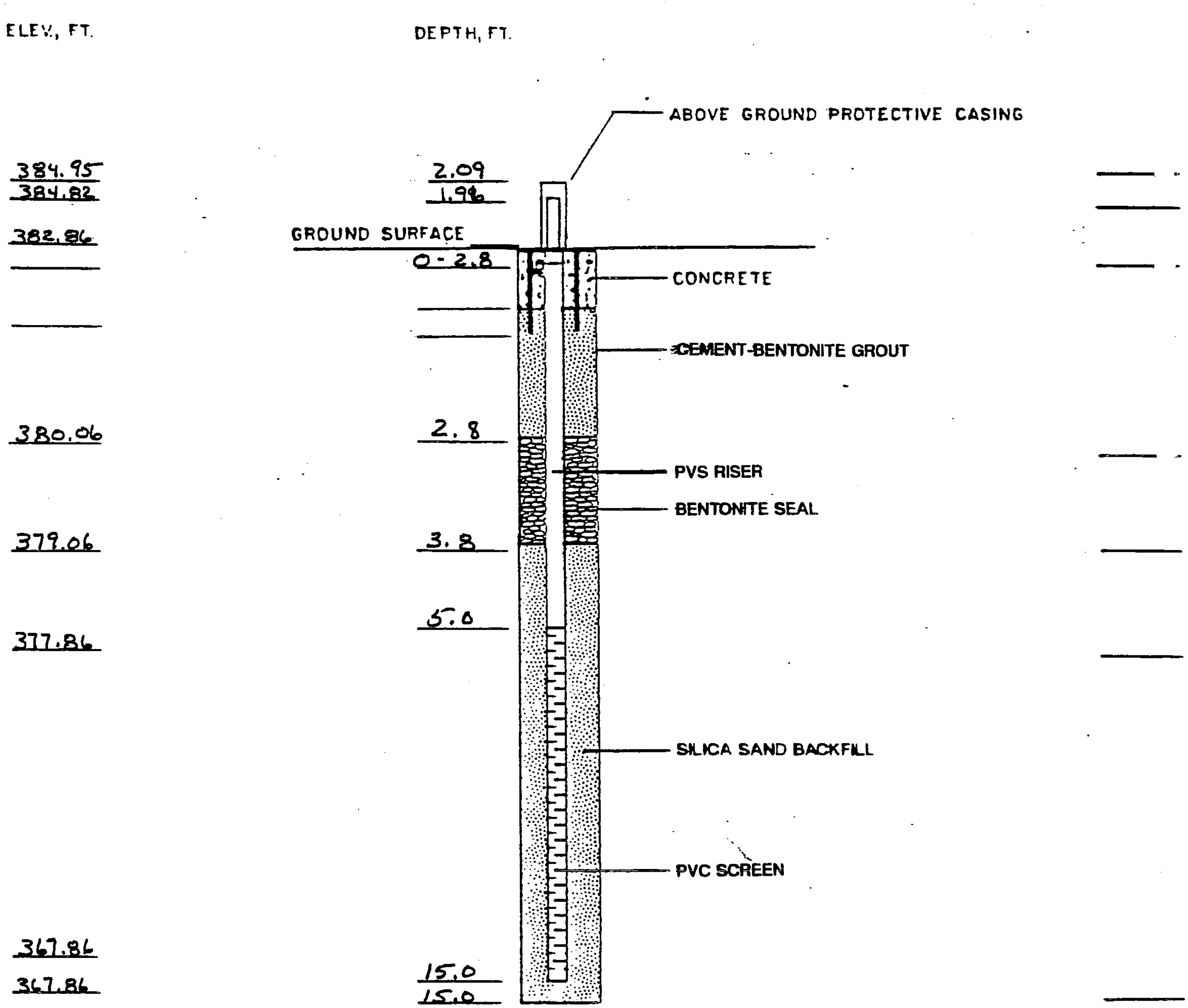
PIEZOMETER DETAIL

E.C.JORDAN CO.

4087-00

PIEZOMETER AND MONITORING WELL INSTALLATION DIAGRAM

PROJECT NO. 5809-02	PROJECT NAME NLODS	WELL NO. PZ-8
INSTALLED BY AA&D	DATE INSTALLED 3-15-89	BORING DIAMETER 2.5 INCH
WELL DIAMETER 3/4 INCH	WELL MATERIAL PVC	BACKFILL MATERIAL SILICA SAND



PIEZOMETER DETAIL

E.C.JORDAN CO

4087-00

APPENDIX A-4

FIRST PHASE MONITORING WELL BORING LOGS

			BORING NO. 101 A
IENT NORTH LAWRENCE OIL DUMP SITE			PROJECT NO. 5809-02
ONTRACTOR AMERICAN AUGER AND DITCHING, INC.		DATE STARTED 3-29-89	COMPLTD. 3-30-89
METHOD Wireline	CASING SIZE 4"	HNU 11.7/10.2	PROTECTION LEVEL MOD. D
GROUND EL	SOIL DRILLED 40.8'	ROCK DRILLED 0	BELOW GROUND
LOGGED BY M.J. Woodruff	CHECKED BY Ganchette	DATE 4-29-89	Page 2 of 2

DEPTH (FT)	HNU AMB. AIR	SAMP NO. & TYPE NO.	SAMPLE	CLP	GC	OTHER	FEET RECOVERY	SOIL/ROCK DESCRIPTION	SOIL CLASS OR ROCK FRACTURES	BLOWS/6-IN				WELL DATA	EL. (FT)
40		S-5	✓				0.8 / 0.9	Till, sand, gray, fine to medium, some medium gravel, saturated.		43	50 (4")			silica sand	40
								B.O.E. at 40.8'							
45															45

* U= THIN WALL S= SPLIT SPOON R= ROCK

E.C. JORDAN CO.

BORING NO. 102A	
CLIENT NORTH LAWRENCE OIL DUMP SITE	PROJECT NO. 5809-02

CONTRACTOR AMERICAN AUGER AND DITCHING, INC.		DATE STARTED 3-27-89	COMPLTD. 3-28-89
METHOD Wireline	CASING SIZE 4"	HNU 11.7/10.2	PROTECTION LEVEL MOD. D
GROUND EL	SOIL DRILLED 40.4'	ROCK DRILLED 0'	BELOW GROUND
LOGGED BY M.J. Woodruff	CHECKED BY Cianchetto	DATE 4-29-89	Page 1 of 2

DEPTH (FT)	HNU AMB. AIR	SAMP NO. & TYPE NO.	SAMPLE	CLP	GC	OTHER	FEET RECOVERY	SOIL/ROCK DESCRIPTION	SOIL CLASS OR ROCK FRACTURES	BLOWS/6-IN	WELL DATA	EL. (FT)
0		S-1	✓				1.5 / 2.0	0.4' organics, grass, roots, mat, frozen. 0.6' silty-sand, brown, some coarse gravel, dry, frozen. 0.2' Gravel, fine, dry. 0.3' Sand, orange-brown, fine to medium dry.		7 8 9 9		0 concrete
5		S-2	✓				1.4 / 2.0	Sand, light brown, fine to coarse, some fine gravel, trace cobbles, dry to moist.		31 22 23 29		5
10		S-3	✓				1.4 / 2.0	Sand, light brown, fine to coarse, some medium gravel, trace silt, trace cobble, moist.		33 30 47 70		10
15		S-4	✓				1.1 / 1.1	Till, sand and silt, gray, fine, moist.		35 110 50(1")		15 Grout
20		S-5	✓				1.4 / 1.9	Till, silty-sand, gray, fine, trace small to medium gravel, saturated.		21 30 43 100(4.6")		20
25		S-6	✓				1.1 / 1.4	Till, sand, gray, fine to coarse, some small to medium gravel, saturated.		38 75 100(5")		25 seal
30		S-7	✓				0.4 / 0.9	Till, silty-sand, gray, fine, little fine gravel, few boulders, wet.		96 100(4")		30 silica sand
35		S-8					0 / 0.2	Boulder - no sample.		50(4")		35
40												40

*: U= THIN WALL S= SPLIT SPOON R= ROCK

E.C. JORDAN CO.

BORING NO. 102B

[CLI]ENT NORTH LAWRENCE OIL DUMP SITE	PROJECT NO. 5809-02
[CO]NTRACTOR AMERICAN AUGER AND DITCHING, INC.	DATE STARTED 3-28-89 COMPLTD. 3-29-89

[M]ETHOD Wireline	CASING SIZE 4"	HNU 11.7/10.2	PROTECTION LEVEL MOD. D
[G]ROUND EL	SOIL DRILLED 10'	ROCK DRILLED 0'	BELOW GROUND
[L]OGGED BY M.J. Woodruff	CHECKED BY Gianchetto	DATE 4-29-89	Page 1 of 1

DEPTH (FT)	HNU AMB. AIR	SAMP NO. & TYPE NO.	SAMPLE	CLP	GC	OTHER	FEET RECOVERY	SOIL/ROCK DESCRIPTION	SOIL CLASS OR ROCK FRACTURES	BLOWS/6-IN	WELL DATA	EL. (FT)
0		S-1					0/0.4	NO RECOVERY		58 (5")		0 concrete
												3 seal 4
5												5
		S-2	✓		✓		0.3/0.9	Silty-sand, brown, little medium gravel, saturated.		65 125 (5")		silica sand
								Boulders				
10								B.O.E. at 10 feet				10

*: U= THIN WALL S= SPLIT SPOON R= ROCK

E.C. JORDAN CO.

	BORING NO. 103
CLIENT NORTH LAWRENCE OIL DUMP SITE	PROJECT NO. 5809-02

CONTRACTOR AMERICAN AUGER AND DITCHING, INC.		DATE STARTED 3-28-89	COMPLTD. 3-28-89
METHOD HSA	CASING SIZE 4.25"	HNU 11.7/10.2	PROTECTION LEVEL MOD. D
GROUND EL	SOIL DRILLED 10'	ROCK DRILLED 0'	BELOW GROUND
LOGGED BY Gianchetto/Arnold	CHECKED BY	DATE	Page 1 of 1

DEPTH (FT)	HNU AMB. AIR	SAMP NO. & TYPE NO.	SAMPLE	CLP	GC	OTHER	FEET RECOVERY	SOIL/ROCK DESCRIPTION	SOIL CLASS OR ROCK FRACTURES	BLOWS/6-IN	WELL DATA	EL. (FT)
0		S-1	✓		✓		1.7 / 2.0	0.6' Sand, light brown, fine, some organics, some medium gravel, semi-frozen. 1.1' sand, brown, fine to coarse, saturated		16 12 5 5		0 concrete 2 seal 3
5		S-2	✓		✓		1.6 / 1.6	0.4', sand, brown fine to coarse, saturated 0.2', gravel, coarse, saturated. 1.0', sand, tan-brown, some medium gravel, saturated.		5 34 90(6")		5 silica sand
10								B.O.E. at 10 feet				10

* U= THIN WALL S= SPLIT SPOON R= ROCK

E.C. JORDAN CO.

BORING NO. 105A

LIENT NORTH LAWRENCE OIL DUMP SITE			PROJECT NO. 5809-02
ONTRACTOR AMERICAN AUGER AND DITCHING, INC.		DATE STARTED 4-1-89	COMPLTD. 4-3-89
ETHOD Wireline	CASING SIZE 4"	HNU 11.7/10.2	PROTECTION LEVEL MOD. D
ROUND EL	SOIL DRILLED 42'	ROCK DRILLED 0'	BELOW GROUND
OGGED BY M.J. Woodruff	CHECKED BY Ganchetto	DATE 4-29-89	Page 1 of 2

DEPTH (FT)	HNU AMB. AIR	SAMP NO. & TYPE NO.	SAMPLE	CLP	GC	OTHER	FEET RECOVERY	SOIL/ROCK DESCRIPTION	SOIL CLASS OR ROCK FRACTURES	BLOWS/6-IN	WELL DATA	EL. (FT)
0												0 / 0.5' concrete
5								Because of this well's proximity to PZ-7, which is 30' deep, the first sample was attempted at 35 feet.				5 / Grout
10								S-1 had no recovery, in a boulder.				10
15												15
20												20
25												25 / 25.5 / seal / 28
30												30 / Silica sand
35		S-1					0/0	BOULDER NO RECOVERY				35
		S-2	✓		✓		1.2/1.2	Till, silty-sand, gray, fine to coarse, little medium gravel, wet.		20 56 50(2.5")		
40												40

* U= THIN WALL S= SPLIT SPOON R= ROCK

E.C. JORDAN CO.

			BORING NO. 105B
:IENT NORTH LAWRENCE OIL DUMP SITE			PROJECT NO. 5809-02
:NTRACTOR AMERICAN AUGER AND DITCHING, INC.		DATE STARTED 3-29-89	COMPLTD. 3-29-89
:ETHOD HSA	CASING SIZE 4.25"	HNU 11.7/10.2	PROTECTION LEVEL MOD. D
:ROUND EL	SOIL DRILLED 10'	ROCK DRILLED 0'	BELOW GROUND
:OGGED BY Gianchetty/Arnold	CHECKED BY	DATE	Page 1 of 1

DEPTH (FT)	HNU AMB. AIR	SAMP NO. & TYPE NO.	SAMPLE	CLP	GC	OTHER	FEET RECOVERY	SOIL/ROCK DESCRIPTION	SOIL CLASS OR ROCK FRACTURES	BLOWS/6-IN	WELL DATA	EL. (FT)
0											concrete	0
											3 seal 4	
5		S-1	✓		✓		0.6/0.7	Sand, brown, fine to coarse, little medium gravel, saturated.		25 17 (2")	silica sand	5
10								B.O.E. at 10 feet				10

*: U= THIN WALL S= SPLIT SPOON R= ROCK

E.C. JORDAN CO.

		BORING NO. 107A	
CLIENT NORTH LAWRENCE OIL DUMP SITE		PROJECT NO. 5809-02	
CONTRACTOR AMERICAN AUGER AND DITCHING, INC.		DATE STARTED 3-30-89	COMPLTD. 3-31-89
METHOD Wireline	CASING SIZE 4"	HNU 11.7/10.2	PROTECTION LEVEL MOD. D
GROUND EL	SOIL DRILLED 41.8'	ROCK DRILLED 0'	BELOW GROUND
LOGGED BY M.J. Woodruff	CHECKED BY Gianchette	DATE 4-29-89	Page 1 of 2

DEPTH (FT)	HNU AMB. AIR	SAMP NO. & TYPE NO.	SAMPLE	CLP	GC	OTHER	FEET RECOVERY	SOIL/ROCK DESCRIPTION	SOIL CLASS OR ROCK FRACTURES	BLOWS/6-IN	WELL DATA	EL. (FT)
0–20								Because of the proximity of this well to PZ-8, samples were not needed until 20'. Clay between 3' and 5', caused core blockage.				
21–23		S-1					0/0.2	Boulders		26(3")		
25–27		S-2	✓				1.9/2.0	Till, sand, gray, fine to coarse, little silt, little fine gravel, moist.		39 58 57 69	Seal	
27–30								Cobbles and boulders encountered				
30–32		S-3	✓					Till, sand, gray, fine to coarse, some fine gravel, trace silt, moist.		31 51 100(5")		
32–35								cobbles and boulders encountered				
35–37		S-4	✓		✓			Till, sand, gray, fine to coarse, little medium gravel, saturated.		50(5")		

* U= THIN WALL S= SPLIT SPOON R= ROCK

E.C. JORDAN CO.

	BORING NO. 107B
CLIENT NORTH LAWRENCE OIL DUMP SITE	PROJECT NO. 5809-02

CONTRACTOR AMERICAN AUGER AND DITCHING, INC.		DATE STARTED 3-29-89	COMPLTD. 3-30-89
METHOD HSA	CASING SIZE 4.25"	HNU 11.7/10.2	PROTECTION LEVEL MOD. D
GROUND EL	SOIL DRILLED 10'	ROCK DRILLED 0'	BELOW GROUND
LOGGED BY Gianchetto/Arnold	CHECKED BY	DATE	Page 1 of 1

DEPTH (FT)	HNU	AMB. AIR	SAMP NO. & TYPE NO.	SAMPLE	CLP	GC	OTHER	FEET RECOVERY	SOIL/ROCK DESCRIPTION	SOIL CLASS OR ROCK FRACTURES	BLOWS/6-IN	WELL DATA	EL. (FT)
0													0 concrete
													3 seal 4
5			S-1	✓		✓		0.6 / 0.9	0.4' sand, olive-brown, fine, some coarse gravel, saturated. 0.2' clay, gray, moist.		9 80(5")		5 silica sand
									Boulders & cobbles encountered.				
10									B.O.E. at 10 feet				10

* U= THIN WALL S= SPLIT SPOON R= ROCK

E.C. JORDAN CO.

BORING NO. 108

SOIL BORING LOG

PAGE 1 OF 1

PROJECT NO. 5809-02

DRILLING CONTRACTOR AA&D

DESCRIBED BY Cianchette / Arnold

RIG NO. 2

CHECKED BY

DRILLER John Pietruch

DATE STARTED 3-28-89

DATE FINISHED 3-28-89

GROUND ELEV. BIT SIZE NA CASING SIZE 4.25" HSA

DEPTH TO WATER (DATE) NA CORE SIZE NA INCLINATION NA

DEPTH: SOIL 8' ROCK NA TOTAL 8'

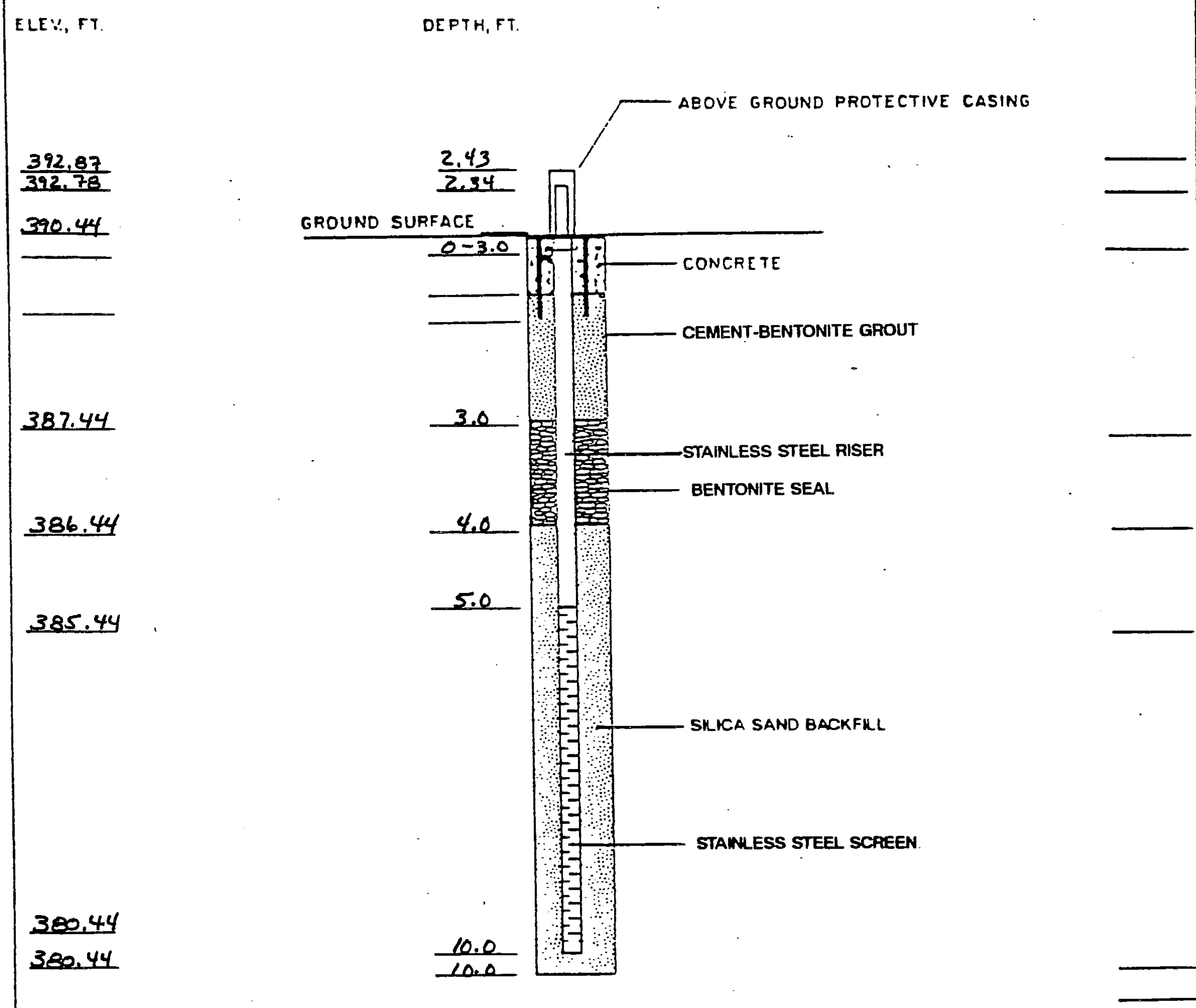
SAMPLE NO.	DEPTH FT.	NO. BLOWS PER 6 IN.	REC. IN.	P.I. ppm	DESCRIPTION
S-1	0-2	4-1-3-16 N>4 Loose	1.2 / 2.0	0	0.8' Sand, brown, fine some organics, black, with pieces of wood, leaves and roots, trace small gravel, saturated. 0.4' Sand, brown, fine, trace coarse gravel, trace silt, some pieces of sticks and roots.
S-2	5-7	20-18-23-30 N>41 Stiff to very stiff	1.0 / 2.0	0	Silty-clay, brown grading to 0.1' gray, mottled, moist to dry.
S-3	7-8	11-23-56(4") Stiff to very Stiff	1.0 / 1.3	0	Silty-clay, gray, dry to moist.

APPENDIX A-5

FIRST PHASE MONITORING WELL INSTALLATION DIAGRAMS

PIEZOMETER AND MONITORING WELL INSTALLATION DIAGRAM

PROJECT NO	PROJECT NAME	WELL NO.
5809-02	NLODS	MW-101 B
INSTALLED BY	**DATE INSTALLED**	**BORING DIAMETER**
AA&D	3-30-89	8 INCH
WELL DIAMETER	**WELL MATERIAL**	**BACKFILL MATERIAL**
2INCH	STAINLESS STEEL	SILICA SAND



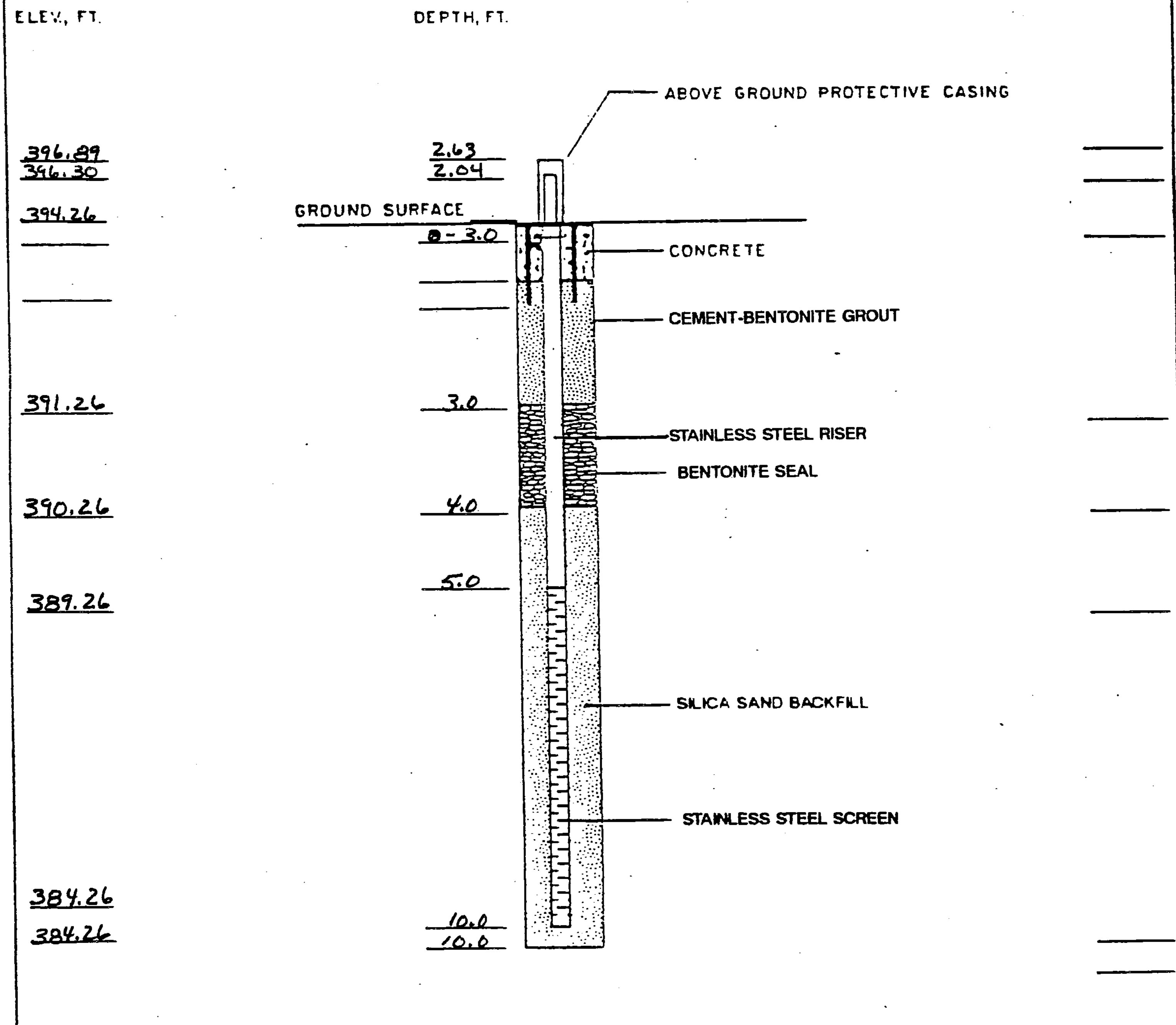
MONITORING WELL DETAIL

E.C.JORDAN CO

4087-00

PIEZOMETER AND MONITORING WELL INSTALLATION DIAGRAM

PROJECT NO 5809-02	PROJECT NAME NLODS	WELL NO. MW-102 B
INSTALLED BY AA&D	DATE INSTALLED 3-29-89	BORING DIAMETER 3 7/8 INCH
WELL DIAMETER 2INCH	WELL MATERIAL STAINLESS STEEL	BACKFILL MATERIAL SILICA SAND



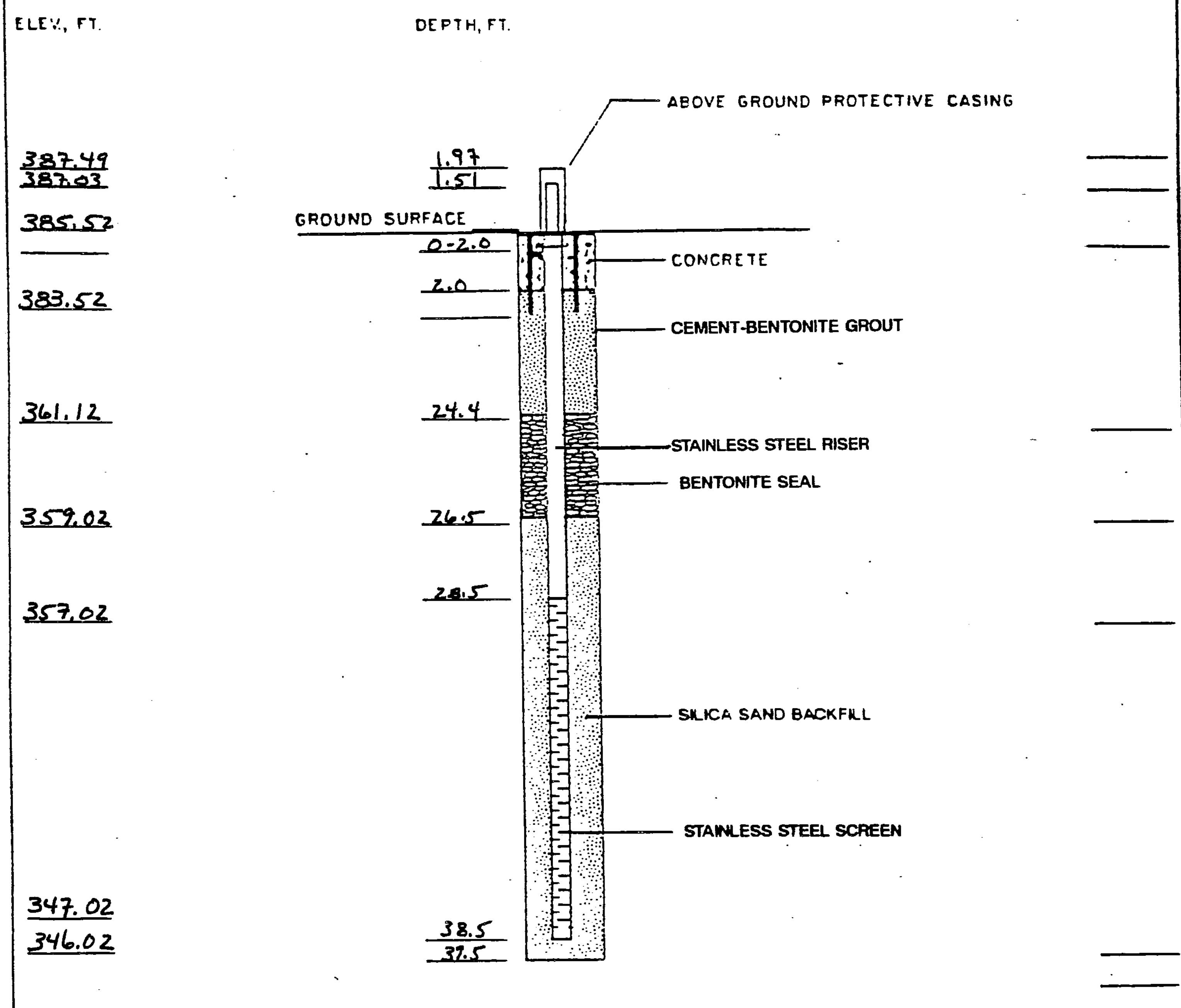
MONITORING WELL DETAIL

E.C.JORDAN CO

4087-00

PIEZOMETER AND MONITORING WELL INSTALLATION DIAGRAM

PROJECT NO	PROJECT NAME	WELL NO.
5809-02	NLODS	MW 104 A
INSTALLED BY	DATE INSTALLED	BORING DIAMETER
AA&D	4-10-89	3 7/8 INCH
WELL DIAMETER	WELL MATERIAL	BACKFILL MATERIAL
2INCH	STAINLESS STEEL	SILICA SAND



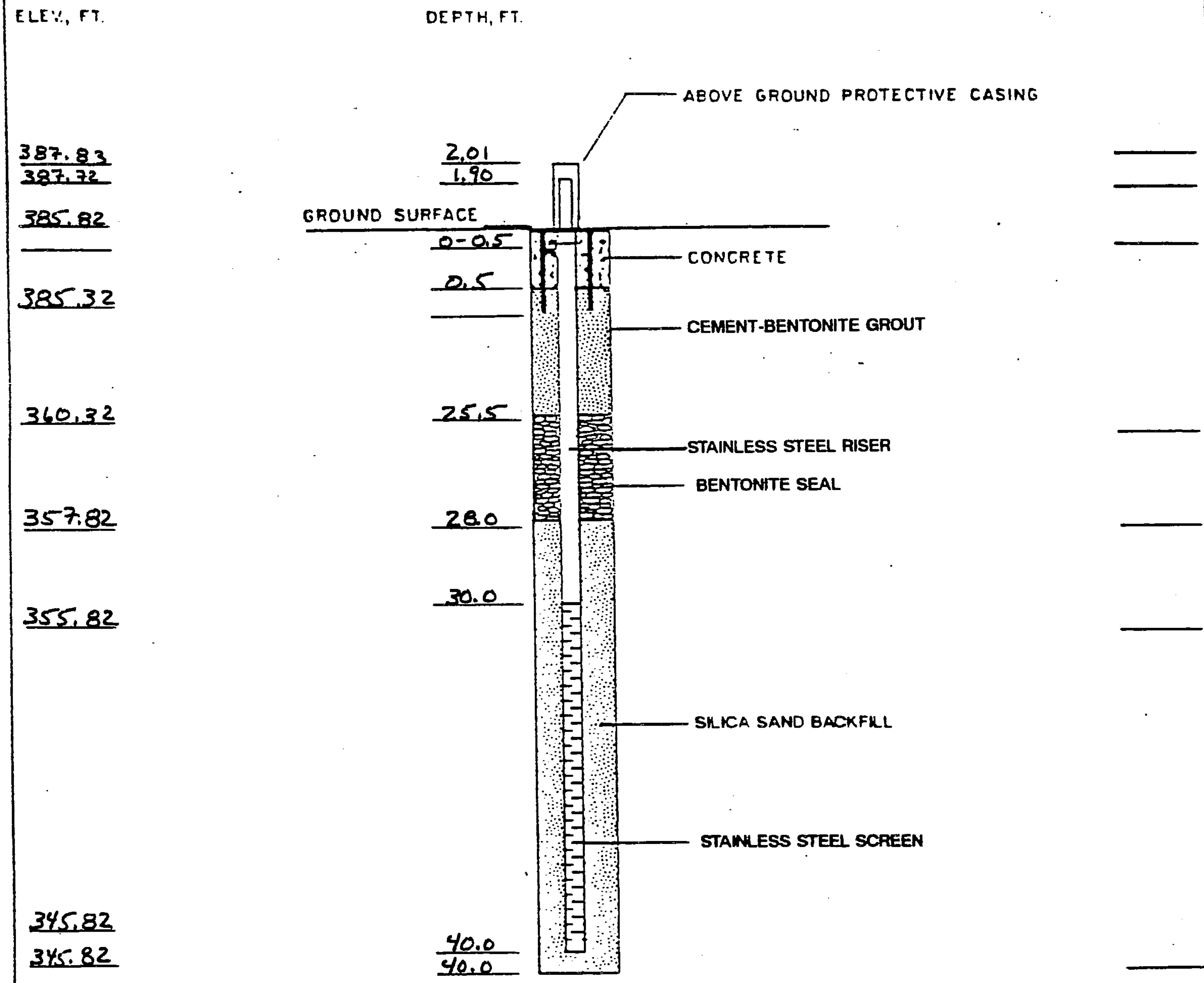
MONITORING WELL DETAIL

E.C.JORDAN CO

4087-00

PIEZOMETER AND MONITORING WELL INSTALLATION DIAGRAM

PROJECT NO	PROJECT NAME	WELL NO.
5809-02	NLODS	MW-105 A
INSTALLED BY	**DATE INSTALLED**	**BORING DIAMETER**
AA&D	4-3-89	3 7/8 INCH
WELL DIAMETER	**WELL MATERIAL**	**BACKFILL MATERIAL**
2INCH	STAINLESS STEEL	SILICA SAND



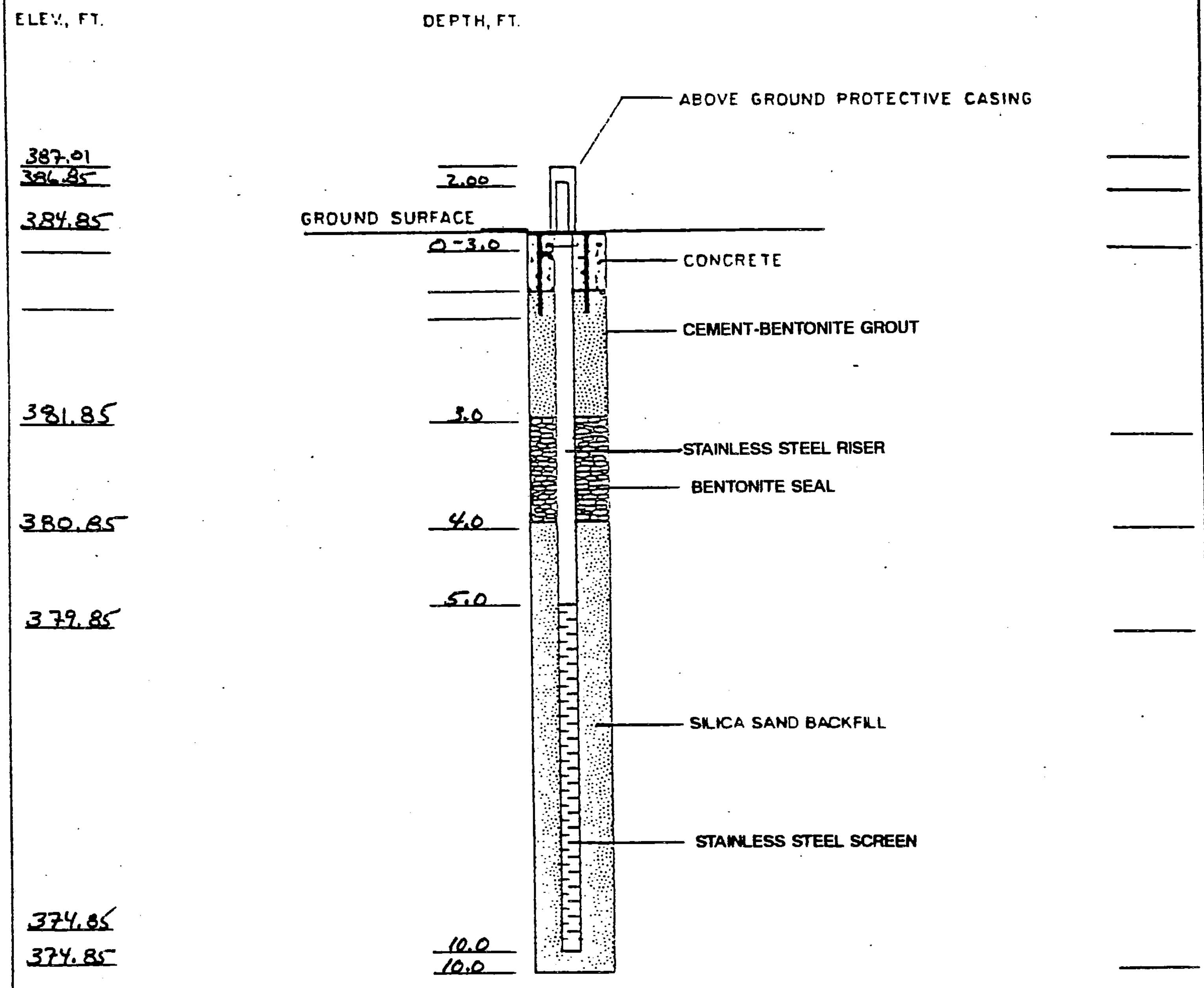
MONITORING WELL DETAIL

E.C.JORDAN CO

4087-00

PIEZOMETER AND MONITORING WELL INSTALLATION DIAGRAM

PROJECT NO	PROJECT NAME	WELL NO.
5809-02	NLODS	MW-106
INSTALLED BY	DATE INSTALLED	BORING DIAMETER
AA&D	3-29-89	8 INCH
WELL DIAMETER	WELL MATERIAL	BACKFILL MATERIAL
2INCH	STAINLESS STEEL	SILICA SAND



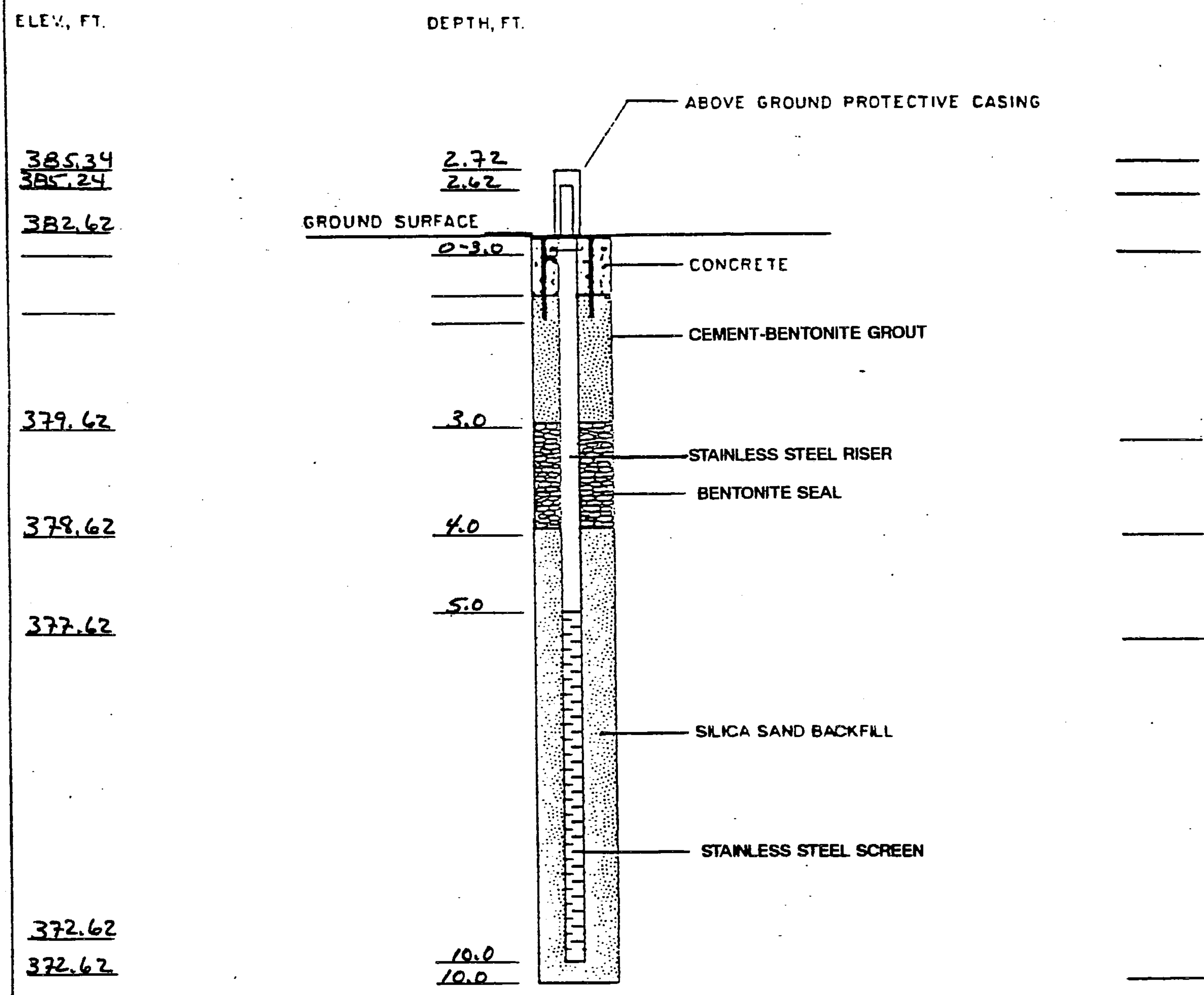
MONITORING WELL DETAIL

E.C.JORDAN CO

4087-00

PIEZOMETER AND MONITORING WELL INSTALLATION DIAGRAM

PROJECT NO 5809-02	PROJECT NAME NLODS	WELL NO. MW-107 B
INSTALLED BY AA&D	DATE INSTALLED 3-29-89	BORING DIAMETER 8 INCH
WELL DIAMETER 2INCH	WELL MATERIAL STAINLESS STEEL	BACKFILL MATERIAL SILICA SAND



MONITORING WELL DETAIL

E.C.JORDAN CO

4087-00

APPENDIX A-6

FIRST PHASE HYDRAULIC CONDUCTIVITY DATA

FIELD DATA

MW-101A(continued)
Diameter of Well Riser = 0.1666 ft.
Length of Test Zone = 12.000 ft.
Diameter of borehole test zone = 0.333 ft.

Time (min)	Head (ft.)	Time (min.)	Head (ft.)
14.0000	3.05	53.0000	0.81
15.0000	2.90	54.0000	0.78
16.0000	2.76	55.0000	0.76
17.0000	2.66	56.0000	0.75
18.0000	2.54	57.0000	0.74
19.0000	2.42	58.0000	0.73
20.0000	2.32		
21.0000	2.22		
22.0000	2.13		
23.0000	2.04		
24.0000	1.96		
25.0000	1.88		
26.0000	1.81		
27.0000	1.74		
28.0000	1.67		
29.0000	1.60		
30.0000	1.55		
31.0000	1.50		
32.0000	1.43		
33.0000	1.39		
34.0000	1.34		
35.0000	1.30		
36.0000	1.25		
37.0000	1.22		
38.0000	1.17		
39.0000	1.15		
40.0000	1.10		
41.0000	1.08		
42.0000	1.02		
43.0000	1.01		
44.0000	1.00		
45.0000	0.95		
46.0000	0.94		
47.0000	0.92		
48.0000	0.88		
49.0000	0.87		
50.0000	0.87		
51.0000	0.83		
52.0000	0.82		

MW-101A #2(continued)
Diameter of Well Riser = 0.1666 ft.
Length of Test Zone = 12.000 ft.
Diameter of borehole test zone = 0.333 ft.

Time (min.)	Head (ft.)	Time (min.)	Head (ft.)	Time (min.)	Head (ft.)
48.0000	0.79	87.0000	0.50	126.0000	0.45
49.0000	0.75	88.0000	0.49	127.0000	0.45
50.0000	0.73	89.0000	0.47	128.0000	0.45
51.0000	0.71	90.0000	0.46	129.0000	0.47
52.0000	0.72	91.0000	0.48	130.0000	0.46
53.0000	0.71	92.0000	0.47	131.0000	0.44
54.0000	0.68	93.0000	0.47	132.0000	0.46
55.0000	0.66	94.0000	0.48	133.0000	0.44
56.0000	0.66	95.0000	0.47	134.0000	0.44
57.0000	0.64	96.0000	0.46	135.0000	0.47
58.0000	0.64	97.0000	0.46	136.0000	0.46
59.0000	0.62	98.0000	0.46	137.0000	0.43
60.0000	0.63	99.0000	0.49	138.0000	0.44
61.0000	0.63	100.0000	0.49	139.0000	0.44
62.0000	0.61	101.0000	0.46	140.0000	0.44
63.0000	0.60	102.0000	0.46	141.0000	0.43
64.0000	0.60	103.0000	0.47	142.0000	0.44
65.0000	0.59	104.0000	0.47	143.0000	0.44
66.0000	0.57	105.0000	0.46	144.0000	0.46
67.0000	0.57	106.0000	0.47	145.0000	0.44
68.0000	0.56	107.0000	0.46		
69.0000	0.57	108.0000	0.47		
70.0000	0.56	109.0000	0.48		
71.0000	0.54	110.0000	0.44		
72.0000	0.54	111.0000	0.46		
73.0000	0.56	112.0000	0.47		
74.0000	0.53	113.0000	0.44		
75.0000	0.51	114.0000	0.45		
76.0000	0.52	115.0000	0.44		
77.0000	0.52	116.0000	0.46		
78.0000	0.52	117.0000	0.47		
79.0000	0.51	118.0000	0.47		
80.0000	0.51	119.0000	0.44		
81.0000	0.51	120.0000	0.46		
82.0000	0.51	121.0000	0.47		
83.0000	0.51	122.0000	0.45		
84.0000	0.52	123.0000	0.44		
85.0000	0.51	124.0000	0.44		
86.0000	0.51	125.0000	0.46		

MW-101B(continued)
Diameter of Well Riser = 0.1666 ft.
Length of Test Zone = 6.0 ft.
Diameter of borehole test zone = 0.708 ft.

Time (min.)	Head (ft.)	Time (min.)	Head (ft.)	Time (min.)	Head (ft.)
48.0000	0.25	87.0000	0.10	126.0000	0.05
49.0000	0.23	88.0000	0.08	127.0000	0.05
50.0000	0.22	89.0000	0.08	128.0000	0.05
51.0000	0.20	90.0000	0.10	129.0000	0.05
52.0000	0.19	91.0000	0.10	130.0000	0.06
53.0000	0.17	92.0000	0.09	131.0000	0.05
54.0000	0.18	93.0000	0.09	132.0000	0.05
55.0000	0.18	94.0000	0.09	133.0000	0.04
56.0000	0.19	95.0000	0.09	134.0000	0.05
57.0000	0.18	96.0000	0.08	135.0000	0.05
58.0000	0.16	97.0000	0.07	136.0000	0.05
59.0000	0.15	98.0000	0.06	137.0000	0.04
60.0000	0.15	99.0000	0.07	138.0000	0.05
61.0000	0.14	100.0000	0.08	139.0000	0.04
62.0000	0.13	101.0000	0.08	140.0000	0.05
63.0000	0.13	102.0000	0.10	141.0000	0.05
64.0000	0.13	103.0000	0.10	142.0000	0.05
65.0000	0.13	104.0000	0.10	143.0000	0.06
66.0000	0.13	105.0000	0.09	144.0000	0.04
67.0000	0.12	106.0000	0.08	145.0000	0.03
68.0000	0.11	107.0000	0.07	146.0000	0.04
69.0000	0.11	108.0000	0.06		
70.0000	0.13	109.0000	0.06		
71.0000	0.13	110.0000	0.08		
72.0000	0.13	111.0000	0.07		
73.0000	0.13	112.0000	0.09		
74.0000	0.11	113.0000	0.08		
75.0000	0.10	114.0000	0.08		
76.0000	0.10	115.0000	0.08		
77.0000	0.10	116.0000	0.08		
78.0000	0.10	117.0000	0.07		
79.0000	0.09	118.0000	0.07		
80.0000	0.10	119.0000	0.08		
81.0000	0.10	120.0000	0.08		
82.0000	0.09	121.0000	0.07		
83.0000	0.08	122.0000	0.06		
84.0000	0.09	123.0000	0.05		
85.0000	0.09	124.0000	0.05		
86.0000	0.08	125.0000	0.05		

MW-102A(continued)
Diameter of Well Riser = 0.1666 ft.
Length of Test Zone = 12 ft.
Diameter of borehole test zone = 0.333 ft.

Time (min.)	Head (ft.)	Time (min.)	Head (ft.)	Time (min.)	Head (ft.)
48.0000	0.56	87.0000	0.34	126.0000	0.29
49.0000	0.55	88.0000	0.32	127.0000	0.28
50.0000	0.54	89.0000	0.34	128.0000	0.29
51.0000	0.54	90.0000	0.32	129.0000	0.27
52.0000	0.51	91.0000	0.33	130.0000	0.29
53.0000	0.51	92.0000	0.32	131.0000	0.29
54.0000	0.48	93.0000	0.32	132.0000	0.28
55.0000	0.48	94.0000	0.32	133.0000	0.27
56.0000	0.47	95.0000	0.32	134.0000	0.28
57.0000	0.46	96.0000	0.31	135.0000	0.28
58.0000	0.46	97.0000	0.32	136.0000	0.27
59.0000	0.46	98.0000	0.32	137.0000	0.27
60.0000	0.44	99.0000	0.31	138.0000	0.29
61.0000	0.44	100.0000	0.31	139.0000	0.29
62.0000	0.44	101.0000	0.31	140.0000	0.26
63.0000	0.43	102.0000	0.30	141.0000	0.29
64.0000	0.42	103.0000	0.30	142.0000	0.27
65.0000	0.41	104.0000	0.30	143.0000	0.29
66.0000	0.41	105.0000	0.32	144.0000	0.27
67.0000	0.40	106.0000	0.29	145.0000	0.27
68.0000	0.39	107.0000	0.30		
69.0000	0.39	108.0000	0.30		
70.0000	0.39	109.0000	0.29		
71.0000	0.40	110.0000	0.30		
72.0000	0.38	111.0000	0.30		
73.0000	0.38	112.0000	0.29		
74.0000	0.37	113.0000	0.29		
75.0000	0.38	114.0000	0.29		
76.0000	0.36	115.0000	0.30		
77.0000	0.35	116.0000	0.29		
78.0000	0.37	117.0000	0.28		
79.0000	0.35	118.0000	0.28		
80.0000	0.36	119.0000	0.30		
81.0000	0.35	120.0000	0.30		
82.0000	0.37	121.0000	0.29		
83.0000	0.33	122.0000	0.29		
84.0000	0.33	123.0000	0.28		
85.0000	0.35	124.0000	0.29		
86.0000	0.32	125.0000	0.29		

MW-102A #2(continued)
Diameter of Well Riser = 0.1666
Length of Test Zone = 12 ft.
Diameter of borehole test zone = 0.333 ft.

Time (min.)	Head (ft.)	Time (min.)	Head (ft.)	Time (min.)	Head (ft.)
48.0000	0.68	87.0000	0.48	126.0000	0.45
49.0000	0.69	88.0000	0.48	127.0000	0.44
50.0000	0.66	89.0000	0.47	128.0000	0.46
51.0000	0.64	90.0000	0.48	129.0000	0.44
52.0000	0.64	91.0000	0.48	130.0000	0.47
53.0000	0.66	92.0000	0.47	131.0000	0.45
54.0000	0.63	93.0000	0.46	132.0000	0.46
55.0000	0.63	94.0000	0.48	133.0000	0.45
56.0000	0.59	95.0000	0.48	134.0000	0.45
57.0000	0.61	96.0000	0.47	135.0000	0.46
58.0000	0.61	97.0000	0.46	136.0000	0.46
59.0000	0.57	98.0000	0.48	137.0000	0.46
60.0000	0.57	99.0000	0.47	138.0000	0.46
61.0000	0.59	100.0000	0.44	139.0000	0.45
62.0000	0.56	101.0000	0.48	140.0000	0.46
63.0000	0.56	102.0000	0.49	141.0000	0.46
64.0000	0.55	103.0000	0.47	142.0000	0.46
65.0000	0.56	104.0000	0.46	143.0000	0.45
66.0000	0.56	105.0000	0.46	144.0000	0.44
67.0000	0.55	106.0000	0.46	145.0000	0.46
68.0000	0.54	107.0000	0.47		
69.0000	0.53	108.0000	0.45		
70.0000	0.52	109.0000	0.48		
71.0000	0.52	110.0000	0.46		
72.0000	0.52	111.0000	0.47		
73.0000	0.52	112.0000	0.45		
74.0000	0.51	113.0000	0.44		
75.0000	0.51	114.0000	0.47		
76.0000	0.50	115.0000	0.46		
77.0000	0.52	116.0000	0.47		
78.0000	0.50	117.0000	0.44		
79.0000	0.51	118.0000	0.44		
80.0000	0.50	119.0000	0.43		
81.0000	0.52	120.0000	0.46		
82.0000	0.48	121.0000	0.46		
83.0000	0.48	122.0000	0.46		
84.0000	0.48	123.0000	0.45		
85.0000	0.48	124.0000	0.46		
86.0000	0.48	125.0000	0.46		

MW-102A #3(continued)
Diameter of Well Riser = 0.1666 ft.
Length of Test Zone = 12 ft.
Diameter of borehole test zone = 0.333 ft.

Time (min.)	Head (ft.)	Time (min.)	Head (ft.)	Time (min.)	Head (ft.)
48.0000	0.65	87.0000	0.65	126.0000	0.39
49.0000	0.66	88.0000	0.66	127.0000	0.42
50.0000	0.65	89.0000	0.65	128.0000	0.40
51.0000	0.64	90.0000	0.64	129.0000	0.40
52.0000	0.63	91.0000	0.63	130.0000	0.42
53.0000	0.62	92.0000	0.62	131.0000	0.39
54.0000	0.61	93.0000	0.61	132.0000	0.41
55.0000	0.61	94.0000	0.61	133.0000	0.43
56.0000	0.57	95.0000	0.57	134.0000	0.40
57.0000	0.56	96.0000	0.56	135.0000	0.39
58.0000	0.56	97.0000	0.56	136.0000	0.40
59.0000	0.56	98.0000	0.56	137.0000	0.42
60.0000	0.55	99.0000	0.55	138.0000	0.40
61.0000	0.56	100.0000	0.56	139.0000	0.40
62.0000	0.52	101.0000	0.52	140.0000	0.40
63.0000	0.52	102.0000	0.52	141.0000	0.39
64.0000	0.53	103.0000	0.53	142.0000	0.40
65.0000	0.51	104.0000	0.51	143.0000	0.38
66.0000	0.51	105.0000	0.51	144.0000	0.40
67.0000	0.51	106.0000	0.51	145.0000	0.39
68.0000	0.52	107.0000	0.52		
69.0000	0.52	108.0000	0.52		
70.0000	0.52	109.0000	0.52		
71.0000	0.47	110.0000	0.47		
72.0000	0.50	111.0000	0.50		
73.0000	0.49	112.0000	0.49		
74.0000	0.48	113.0000	0.48		
75.0000	0.47	114.0000	0.47		
76.0000	0.49	115.0000	0.49		
77.0000	0.49	116.0000	0.49		
78.0000	0.48	117.0000	0.48		
79.0000	0.46	118.0000	0.46		
80.0000	0.46	119.0000	0.46		
81.0000	0.46	120.0000	0.46		
82.0000	0.46	121.0000	0.46		
83.0000	0.45	122.0000	0.45		
84.0000	0.48	123.0000	0.48		
85.0000	0.43	124.0000	0.43		
86.0000	0.46	125.0000	0.46		

MW-102B(continued)
Diameter of Well Riser = 0.1666 ft.
Length of Test Zone = 6 ft.
Diameter of borehole test zone = 0.333 ft.

Time (min.)	Head (ft.)
48.0000	0.05

MW-103
Diameter of Well Riser = 0.1666 ft.
Length of Test Zone = 7.0 ft.
Diameter of borehole test zone = 0.333 ft.

Time (min.)	Head (ft.)	Time (min.)	Head (ft.)	Time (min.)	Head (ft.)
0.0000	3.45	0.8333	2.69	14.0000	0.49
0.0033	3.62	0.9167	2.63	15.0000	0.49
0.0066	3.67	1.0000	2.57	16.0000	0.46
0.0099	3.64	1.0833	2.51	17.0000	0.44
0.0133	3.63	1.1667	2.46	18.0000	0.42
0.0166	3.67	1.2500	2.41	19.0000	0.41
0.2000	3.69	1.3333	2.35	20.0000	0.40
0.0233	3.64	1.4166	2.30	21.0000	0.40
0.0266	3.60	1.5000	2.27	22.0000	0.39
0.0300	3.61	1.5833	2.22	23.0000	0.37
0.0333	3.59	1.6667	2.17	24.0000	0.37
0.0500	3.57	1.7500	2.13	25.0000	0.38
0.0666	3.54	1.8333	2.11	26.0000	0.38
0.0833	3.51	1.9167	2.04	27.0000	0.36
0.1000	3.50	2.0000	2.02	28.0000	0.36
0.1166	3.47	2.5000	1.81	29.0000	0.35
0.1333	3.45	3.0000	1.64	30.0000	0.35
0.1500	3.41	3.5000	1.50	31.0000	0.34
0.1666	3.39	4.0000	1.38	32.0000	0.34
0.1833	3.37	4.5000	1.28	33.0000	0.34
0.2000	3.34	5.0000	1.18	34.0000	0.34
0.2166	3.33	5.5000	1.11	35.0000	0.34
0.2333	3.30	6.0000	1.04	36.0000	0.32
0.2500	3.28	6.5000	0.98	37.0000	0.33
0.2666	3.26	7.0000	0.92	38.0000	0.32
0.2833	3.24	7.5000	0.86	39.0000	0.32
0.3000	3.22	8.0000	0.83	40.0000	0.32
0.3166	3.20	8.5000	0.77	41.0000	0.32
0.3333	3.17	9.0000	0.75	42.0000	0.32
0.4167	3.08	9.5000	0.71	43.0000	0.31
0.5000	2.99	10.0000	0.67	44.0000	0.32
0.5833	2.91	11.0000	0.61	45.0000	0.31
0.6667	2.81	12.0000	0.57	46.0000	0.32
0.7500	2.76	13.0000	0.53	47.0000	0.31

890507A
0016.0.0

MW-103 #2
Diameter of Well Riser = 0.1666 ft.
Length of Test Zone = 7 ft.
Diameter of borehole test zone = 0.333 ft.

Time (min.)	Head (ft.)	Time (min.)	Head (ft.)	Time (min.)	Head (ft.)
0.0000	5.00	0.8333	3.81	14.0000	0.46
0.0033	5.00	0.9167	3.73	15.0000	0.42
0.0066	5.00	1.0000	3.64	16.0000	0.40
0.0099	5.00	1.0833	3.56	17.0000	0.36
0.0133	5.01	1.1667	3.49	18.0000	0.33
0.0166	5.00	1.2500	3.42	19.0000	0.30
0.2000	4.99	1.3333	3.35	20.0000	0.29
0.0233	4.98	1.4166	3.28	21.0000	0.26
0.0266	4.97	1.5000	3.22	22.0000	0.25
0.0300	4.97	1.5833	3.15	23.0000	0.23
0.0333	4.96	1.6667	3.09	24.0000	0.22
0.0500	4.91	1.7500	3.01	25.0000	0.21
0.0666	4.89	1.8333	2.97	26.0000	0.20
0.0833	4.85	1.9167	2.91	27.0000	0.19
0.1000	4.82	2.0000	2.85	28.0000	0.18
0.1166	4.78	2.5000	2.55	29.0000	0.18
0.1333	4.75	3.0000	2.30	30.0000	0.17
0.1500	4.72	3.5000	2.07	31.0000	0.17
0.1666	4.68	4.0000	1.89	32.0000	0.16
0.1833	4.66	4.5000	1.72	33.0000	0.15
0.2000	4.63	5.0000	1.57	34.0000	0.15
0.2166	4.60	5.5000	1.44	35.0000	0.15
0.2333	4.57	6.0000	1.32	36.0000	0.15
0.2500	4.54	6.5000	1.23	37.0000	0.15
0.2666	4.52	7.0000	1.13	38.0000	0.14
0.2833	4.50	7.5000	1.05	39.0000	0.14
0.3000	4.48	8.0000	0.97	40.0000	0.14
0.3166	4.44	8.5000	0.91	41.0000	0.13
0.3333	4.43	9.0000	0.85	42.0000	0.12
0.4167	4.31	9.5000	0.79	43.0000	0.13
0.5000	4.19	10.0000	0.73	44.0000	0.13
0.5833	4.09	11.0000	0.64	45.0000	0.13
0.6667	4.00	12.0000	0.57	46.0000	0.13
0.7500	3.91	13.0000	0.51	47.0000	0.13

890507A
0018.0.0

MW-104A
Diameter of Well Riser = 0.1666 ft.
Length of Test Zone = 12.50 ft.
Diameter of borehole test zone = 0.333 ft.

Time (min.)	Head (ft.)	Time (min.)	Head (ft.)	Time (min.)	Head (ft.)
0.0000	6.13	0.8333	5.94	14.0000	2.59
0.0033	5.94	0.9167	5.89	15.0000	2.47
0.0066	5.69	1.0000	5.84	16.0000	2.31
0.0099	6.42	1.0833	5.82	17.0000	2.21
0.0133	6.25	1.1667	5.78	18.0000	2.09
0.0166	6.03	1.2500	5.74	19.0000	1.99
0.2000	6.15	1.3333	5.72	20.0000	1.89
0.0233	6.37	1.4166	5.68	21.0000	1.80
0.0266	6.32	1.5000	5.64	22.0000	1.73
0.0300	6.31	1.5833	5.59	23.0000	1.63
0.0333	6.30	1.6667	5.58	24.0000	1.60
0.0500	6.30	1.7500	5.53	25.0000	1.51
0.0666	6.30	1.8333	5.51	26.0000	1.46
0.0833	6.27	1.9167	5.47	27.0000	1.40
0.1000	6.27	2.0000	5.45	28.0000	1.33
0.1166	6.26	2.5000	5.25	29.0000	1.28
0.1333	6.26	3.0000	5.09	30.0000	1.24
0.1500	6.26	3.5000	4.90	31.0000	1.18
0.1666	6.23	4.0000	4.73	32.0000	1.15
0.1833	6.23	4.5000	4.59	33.0000	1.12
0.2000	6.21	5.0000	4.45	34.0000	1.09
0.2166	6.23	5.5000	4.30	35.0000	1.05
0.2333	6.22	6.0000	4.18	36.0000	0.99
0.2500	6.22	6.5000	4.04	37.0000	0.95
0.2666	6.19	7.0000	3.92	38.0000	0.97
0.2833	6.18	7.5000	3.80	39.0000	0.90
0.3000	6.17	8.0000	3.69	40.0000	0.90
0.3166	6.16	8.5000	3.59	41.0000	0.86
0.3333	6.16	9.0000	3.49	42.0000	0.82
0.4167	6.12	9.5000	3.37	43.0000	0.81
0.5000	6.06	10.0000	3.27	44.0000	0.79
0.5833	6.04	11.0000	3.07	45.0000	0.79
0.6667	6.01	12.0000	2.88	46.0000	0.75
0.7500	5.96	13.0000	2.75	47.0000	0.72

MW-104B #2
Diameter of Well Riser = 0.1666 ft.
Length of Test Zone = 6.0 ft.
Diameter of borehole test zone = 0.333 ft.

Time (min.)	Head (ft.)	Time (min.)	Head (ft.)	Time (min.)	Head (ft.)
0.0000	4.50	0.8333	2.59	14.0000	0.07
0.0033	4.44	0.9167	2.47	15.0000	0.06
0.0066	4.43	1.0000	2.35	16.0000	0.06
0.0099	4.43	1.0833	2.23	17.0000	0.06
0.0133	4.41	1.1667	2.13	18.0000	0.06
0.0166	4.40	1.2500	2.02	19.0000	0.05
0.2000	4.38	1.3333	1.92	20.0000	0.05
0.0233	4.38	1.4166	1.84	21.0000	0.05
0.0266	4.38	1.5000	1.75	22.0000	0.04
0.0300	4.34	1.5833	1.67	23.0000	0.04
0.0333	4.34	1.6667	1.60	24.0000	0.04
0.0500	4.27	1.7500	1.53	25.0000	0.03
0.0666	4.22	1.8333	1.46	26.0000	0.03
0.0833	4.17	1.9167	1.40	27.0000	0.04
0.1000	4.13	2.0000	1.33	28.0000	0.03
0.1166	4.08	2.5000	1.02	29.0000	0.03
0.1333	4.04	3.0000	0.78	30.0000	0.01
0.1500	3.99	3.5000	0.62	31.0000	0.02
0.1666	3.95	4.0000	0.49	32.0000	0.02
0.1833	3.90	4.5000	0.40	33.0000	0.01
0.2000	3.87	5.0000	0.33	34.0000	0.01
0.2166	3.82	5.5000	0.28	35.0000	0.01
0.2333	3.78	6.0000	0.24	36.5000	0.20
0.2500	3.74	6.5000	0.20	37.000	
0.2666	3.71	7.0000	0.18	38.0000	
0.2833	3.67	7.5000	0.15	39.0000	
0.3000	3.63	8.0000	0.13	40.0000	
0.3166	3.59	8.5000	0.13	41.0000	
0.3333	3.55	9.0000	0.11	42.0000	
0.4167	3.34	9.5000	0.11	43.0000	
0.5000	3.17	10.0000	0.10	44.0000	
0.5833	3.04	11.0000	0.10	45.0000	
0.6667	2.88	12.0000	0.09	46.0000	
0.7500	2.73	13.0000	0.08	47.0000	

MW-105A
Diameter of Well Riser = 0.1666 ft.
Length of Test Zone = 12.0 ft.
Diameter of borehole test zone = 0.333 ft.

Time (min.)	Head (ft.)	Time (min.)	Head (ft.)	Time (min.)	Head (ft.)
0.0000	7.21	0.8333	6.93	14.0000	1.81
0.0033	6.90	0.9167	6.85	15.0000	1.68
0.0066	7.02	1.0000	6.76	16.0000	1.58
0.0099	7.54	1.0833	6.69	17.0000	1.49
0.0133	7.04	1.1667	6.61	18.0000	1.40
0.0166	7.21	1.2500	6.53	19.0000	1.34
0.2000	7.10	1.3333	6.45	20.0000	1.26
0.0233	7.87	1.4166	6.38	21.0000	1.21
0.0266	7.12	1.5000	6.30	22.0000	1.16
0.0300	7.79	1.5833	6.25	23.0000	1.12
0.0333	7.38	1.6667	6.17	24.0000	1.08
0.0500	7.77	1.7500	6.10	25.0000	1.05
0.0666	8.03	1.8333	6.04	26.0000	1.02
0.0833	7.58	1.9167	5.97	27.0000	0.99
0.1000	7.74	2.0000	5.91	28.0000	0.97
0.1166	7.71	2.5000	5.53	29.0000	0.96
0.1333	7.70	3.0000	5.21	30.0000	0.92
0.1500	7.67	3.5000	4.89	31.0000	0.91
0.1666	7.65	4.0000	4.60	32.0000	0.90
0.1833	7.63	4.5000	4.35	33.0000	0.88
0.2000	7.62	5.0000	4.10	34.0000	0.86
0.2166	7.59	5.5000	3.87	35.0000	0.86
0.2333	7.58	6.0000	3.67	36.0000	0.85
0.2500	7.56	6.5000	3.48	37.0000	0.83
0.2666	7.53	7.0000	3.31	38.0000	0.82
0.2833	7.52	7.5000	3.14	39.0000	0.82
0.3000	7.49	8.0000	2.98	40.0000	0.80
0.3166	7.47	8.5000	2.85	41.0000	0.80
0.3333	7.46	9.0000	2.72	42.0000	0.80
0.4167	7.36	9.5000	2.59	43.0000	0.78
0.5000	7.27	10.0000	2.48	44.0000	0.79
0.5833	7.19	11.0000	2.26	45.0000	0.78
0.6667	7.09	12.0000	2.08	46.0000	0.78
0.7500	7.01	13.0000	1.93	47.0000	0.77

MW-105A #2
Diameter of Well Riser = 0.1666 ft.
Length of Test Zone = 12.0 ft.
Diameter of borehole test zone = 0.333 ft.

Time (min.)	Head (ft.)	Time (min.)	Head (ft.)	Time (min.)	Head (ft.)
0.0000	5.36	0.8333	5.27	14.0000	1.19
0.0033	4.83	0.9167	5.17	15.0000	1.11
0.0066	5.11	1.0000	5.12	16.0000	1.03
0.0099	6.35	1.0833	5.05	17.0000	0.98
0.0133	4.87	1.1667	4.99	18.0000	0.88
0.0166	5.53	1.2500	4.94	19.0000	0.83
0.2000	5.76	1.3333	4.87	20.0000	0.79
0.0233	5.89	1.4166	4.82	21.0000	0.74
0.0266	5.55	1.5000	4.74	22.0000	0.71
0.0300	5.70	1.5833	4.70	23.0000	0.68
0.0333	5.61	1.6667	4.63	24.0000	0.63
0.0500	6.00	1.7500	4.58	25.0000	0.63
0.0666	5.97	1.8333	4.53	26.0000	0.58
0.0833	6.00	1.9167	4.46	27.0000	0.58
0.1000	5.96	2.0000	4.41	28.0000	0.55
0.1166	5.93	2.5000	4.11	29.0000	0.52
0.1333	5.92	3.0000	3.83	30.0000	0.54
0.1500	5.89	3.5000	3.58	31.0000	0.51
0.1666	5.88	4.0000	3.37	32.0000	0.49
0.1833	5.84	4.5000	3.17	33.0000	0.48
0.2000	5.83	5.0000	2.98	34.0000	0.51
0.2166	5.83	5.5000	2.79	35.0000	0.49
0.2333	5.78	6.0000	2.64	36.0000	0.45
0.2500	5.78	6.5000	2.49	37.0000	0.46
0.2666	5.77	7.0000	2.33	38.0000	0.47
0.2833	5.75	7.5000	2.21	39.0000	0.46
0.3000	5.73	8.0000	2.08	40.0000	0.44
0.3166	5.71	8.5000	2.00	41.0000	0.44
0.3333	5.70	9.0000	1.88	42.0000	0.43
0.4167	5.62	9.5000	1.82	43.0000	0.42
0.5000	5.55	10.0000	1.72	44.0000	0.45
0.5833	5.48	11.0000	1.56	45.0000	0.41
0.6667	5.39	12.0000	1.41	46.0000	0.42
0.7500	5.31	13.0000	1.32	47.0000	0.43

MW-105B
Diameter of Well Riser = 0.1666 ft.
Length of Test Zone = 6.0 ft.
Diameter of borehole test zone = 0.708 ft.

Time (min.)	Head (ft.)	Time (min.)	Head (ft.)	Time (min.)	Head (ft.)
0.0000	4.40	0.8333	3.84	14.0000	1.78
0.0033	4.40	0.9167	3.82	15.0000	1.67
0.0066	4.40	1.0000	3.81	16.0000	1.58
0.0099	4.39	1.0833	3.80	17.0000	1.50
0.0133	4.38	1.1667	3.78	18.0000	1.41
0.0166	4.38	1.2500	3.77	19.0000	1.34
0.2000	4.38	1.3333	3.76	20.0000	1.27
0.0233	4.37	1.4166	3.75	21.0000	1.19
0.0266	4.36	1.5000	3.75	22.0000	1.14
0.0300	4.36	1.5833	3.73	23.0000	1.08
0.0333	4.36	1.6667	3.73	24.0000	1.03
0.0500	4.33	1.7500	3.72	25.0000	0.97
0.0666	4.31	1.8333	3.71	26.0000	0.93
0.0833	4.29	1.9167	3.70	27.0000	0.88
0.1000	4.26	2.0000	3.69	28.0000	0.85
0.1166	4.24	2.5000	3.59	29.0000	0.81
0.1333	4.22	3.0000	3.46	30.0000	0.76
0.1500	4.19	3.5000	3.35	31.0000	0.74
0.1666	4.17	4.0000	3.27	32.0000	0.71
0.1833	4.15	4.5000	3.17	33.0000	0.68
0.2000	4.14	5.0000	3.10	34.0000	0.65
0.2166	4.12	5.5000	3.00	35.0000	0.63
0.2333	4.10	6.0000	2.90	36.0000	0.60
0.2500	4.09	6.5000	2.81	37.0000	0.57
0.2666	4.07	7.0000	2.72	38.0000	0.56
0.2833	4.06	7.5000	2.64	39.0000	0.54
0.3000	4.05	8.0000	2.57	40.0000	0.52
0.3166	4.04	8.5000	2.48	41.0000	0.51
0.3333	4.03	9.0000	2.42	42.0000	0.49
0.4167	3.97	9.5000	2.33	43.0000	0.47
0.5000	3.93	10.0000	2.26	44.0000	0.46
0.5833	3.90	11.0000	2.12	45.0000	0.45
0.6667	3.87	12.0000	2.00	46.0000	0.44
0.7500	3.85	13.0000	1.89	47.0000	0.43

MW-106
Diameter of Well Riser = 0.1666 ft.
Length of Test Zone = 6.0 ft.
Diameter of borehole test zone = 0.708 ft.

Time (min.)	Head (ft.)	Time (min.)	Head (ft.)	Time (min.)	Head (ft.)
0.0000	6.39	0.8333	5.93	14.0000	2.31
0.0033	6.39	0.9167	5.89	15.0000	2.17
0.0066	6.39	1.0000	5.85	16.0000	2.04
0.0099	6.39	1.0833	5.81	17.0000	1.92
0.0133	6.38	1.1667	5.77	18.0000	1.80
0.0166	6.38	1.2500	5.73	19.0000	1.70
0.2000	6.37	1.3333	5.69	20.0000	1.61
0.0233	6.38	1.4166	5.65	21.0000	1.51
0.0266	6.37	1.5000	5.61	22.0000	1.42
0.0300	6.36	1.5833	5.57	23.0000	1.34
0.0333	6.37	1.6667	5.53	24.0000	1.27
0.0500	6.36	1.7500	5.48	25.0000	1.20
0.0666	6.35	1.8333	5.45	26.0000	1.13
0.0833	6.34	1.9167	5.41	27.0000	1.07
0.1000	6.33	2.0000	5.37	28.0000	1.02
0.1166	6.32	2.5000	5.16	29.0000	0.95
0.1333	6.31	3.0000	4.96	30.0000	0.92
0.1500	6.30	3.5000	4.77	31.0000	0.86
0.1666	6.29	4.0000	4.61	32.0000	0.81
0.1833	6.29	4.5000	4.45	33.0000	0.78
0.2000	6.27	5.0000	4.29	34.0000	0.74
0.2166	6.27	5.5000	4.12	35.0000	0.71
0.2333	6.26	6.0000	3.96	36.0000	0.68
0.2500	6.25	6.5000	3.80	37.0000	0.65
0.2666	6.23	7.0000	3.67	38.0000	0.63
0.2833	6.23	7.5000	3.55	39.0000	0.59
0.3000	6.22	8.0000	3.44	40.0000	0.57
0.3166	6.21	8.5000	3.33	41.0000	0.55
0.3333	6.20	9.0000	3.22	42.0000	0.52
0.4167	6.16	9.5000	3.11	43.0000	0.51
0.5000	6.11	10.0000	3.01	44.0000	0.48
0.5833	6.06	11.0000	2.81	45.0000	0.46
0.6667	6.01	12.0000	2.64	46.0000	0.45
0.7500	5.97	13.0000	2.47	47.0000	0.44

MW-107A
Diameter of Well Riser = 0.1666 ft.
Length of Test Zone = 12.0 ft.
Diameter of borehole test zone = 0.333 ft.

Time (min.)	Head (ft.)	Time (min.)	Head (ft.)	Time (min.)	Head (ft.)
0.0000	5.48	0.8333	5.67	14.0000	3.68
0.0033	5.71	0.9167	5.66	15.0000	3.55
0.0066	5.86	1.0000	5.63	16.0000	3.46
0.0099	5.87	1.0833	5.62	17.0000	3.36
0.0133	5.86	1.1667	5.60	18.0000	3.28
0.0166	5.86	1.2500	5.60	19.0000	3.21
0.2000	5.86	1.3333	5.57	20.0000	3.10
0.0233	5.85	1.4166	5.56	21.0000	3.02
0.0266	5.87	1.5000	5.54	22.0000	2.96
0.0300	5.87	1.5833	5.52	23.0000	2.89
0.0333	5.76	1.6667	5.50	24.0000	2.80
0.0500	5.87	1.7500	5.50	25.0000	2.72
0.0666	5.87	1.8333	5.46	26.0000	2.68
0.0833	5.84	1.9167	5.47	27.0000	2.61
0.1000	5.86	2.0000	5.43	28.0000	2.54
0.1166	5.86	2.5000	5.33	29.0000	2.50
0.1333	5.84	3.0000	5.23	30.0000	2.43
0.1500	5.82	3.5000	5.08	31.0000	2.36
0.1666	5.83	4.0000	4.99	32.0000	2.33
0.1833	5.82	4.5000	4.91	33.0000	2.26
0.2000	5.83	5.0000	4.87	34.0000	2.20
0.2166	5.83	5.5000	4.75	35.0000	2.18
0.2333	5.83	6.0000	4.67	36.0000	2.13
0.2500	5.81	6.5000	4.62	37.0000	2.07
0.2666	5.82	7.0000	4.53	38.0000	2.04
0.2833	5.81	7.5000	4.46	39.0000	2.01
0.3000	5.81	8.0000	4.38	40.0000	1.97
0.3166	5.80	8.5000	4.34	41.0000	1.93
0.3333	5.78	9.0000	4.25	42.0000	1.91
0.4167	5.77	9.5000	4.17	43.0000	1.87
0.5000	5.76	10.0000	4.13	44.0000	1.82
0.5833	5.73	11.0000	3.99	45.0000	1.79
0.6667	5.72	12.0000	3.90	46.0000	1.75
0.7500	5.71	13.0000	3.78	47.0000	1.74

890507A
0032.0.0

MW-107B

Diameter of Well Riser = 0.1666 ft.
Length of Test Zone = 6.0 ft.
Diameter of borehole test zone = 0.708 ft.

Time (min.)	Head (ft.)	Time (min.)	Head (ft.)	Time (min.)	Head (ft.)
0.0000	4.85	0.8333	3.57	14.0000	0.32
0.0033	4.79	0.9167	3.47	15.0000	0.30
0.0066	4.79	1.0000	3.39	16.0000	0.28
0.0099	4.77	1.0833	3.30	17.0000	0.25
0.0133	4.77	1.1667	3.22	18.0000	0.24
0.0166	4.78	1.2500	3.15	19.0000	0.23
0.2000	4.75	1.3333	3.07	20.0000	0.23
0.0233	4.73	1.4166	3.01	21.0000	0.22
0.0266	4.76	1.5000	2.94	22.0000	0.23
0.0300	4.73	1.5833	2.88	23.0000	0.23
0.0333	4.74	1.6667	2.81	24.0000	0.23
0.0500	4.69	1.7500	2.74	25.0000	0.22
0.0666	4.68	1.8333	2.69	26.0000	0.23
0.0833	4.65	1.9167	2.63	27.0000	0.23
0.1000	4.62	2.0000	2.57	28.0000	0.22
0.1166	4.59	2.5000	2.24	29.0000	0.21
0.1333	4.56	3.0000	1.96	30.0000	0.22
0.1500	4.53	3.5000	1.73	31.0000	0.22
0.1666	4.50	4.0000	1.53	32.0000	0.22
0.1833	4.48	4.5000	1.34	33.0000	0.22
0.2000	4.46	5.0000	1.21	34.0000	0.22
0.2166	4.43	5.5000	1.07	35.0000	0.22
0.2333	4.41	6.0000	0.96	36.0000	0.22
0.2500	4.38	6.5000	0.86	37.0000	0.22
0.2666	4.35	7.0000	0.78	38.0000	0.22
0.2833	4.33	7.5000	0.71	39.0000	0.22
0.3000	4.29	8.0000	0.65	40.0000	0.22
0.3166	4.27	8.5000	0.60	41.0000	0.21
0.3333	4.26	9.0000	0.55	42.0000	0.20
0.4167	4.12	9.5000	0.52	43.0000	0.20
0.5000	4.00	10.0000	0.48	44.0000	0.20
0.5833	3.90	11.0000	0.42	45.0000	0.21
0.6667	3.78	12.0000	0.39	46.0000	0.21
0.7500	3.68	13.0000	0.34	47.0000	0.21

MW-107B(continued)
Diameter of Well Riser = 0.1666 ft.
Length of Test Zone = 6.0 ft.
Diameter of borehole test zone = 0.708 ft.

Time (min.)	Head (ft.)
48.0000	0.20
49.0000	0.20
50.0000	0.21
51.0000	0.22
52.0000	0.20
53.0000	0.21
54.0000	0.21
55.0000	0.20
56.0000	0.21
57.0000	0.21
58.0000	0.20
59.0000	0.20
60.0000	0.21
61.0000	0.21
62.0000	0.22
63.0000	0.22
64.0000	0.22
65.0000	0.20
66.0000	0.22
67.0000	0.22
68.0000	0.22
69.0000	0.22
70.0000	0.22
71.0000	0.22
72.0000	0.22
73.0000	0.22
74.0000	0.22
75.0000	0.22
76.0000	0.22

CALCULATIONS AND GRAPHS

HYDRAULIC CONDUCTIVITY CALCULATIONS

RISING-HEAD METHOD

In this method, water is removed from the monitoring well and the rate of rise of the water level is observed until it becomes negligible.

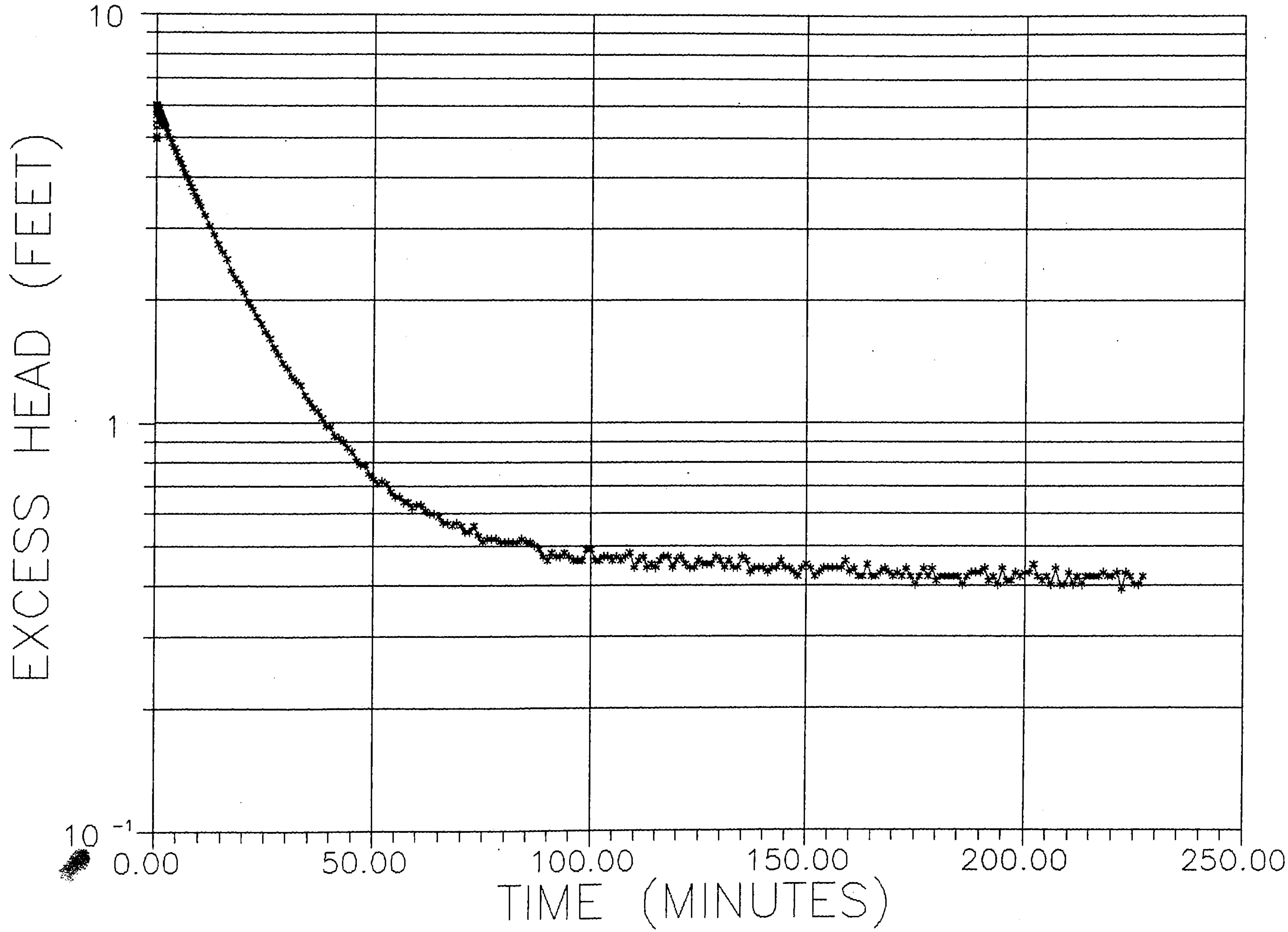
Equation:

$$K_h = \frac{d^2 \ln \left(\frac{2mL}{D}\right)}{8 \times Lx(t_2 - t_1)} \ln \frac{H_1}{H_2} \quad \text{for uniform soil conditions}$$

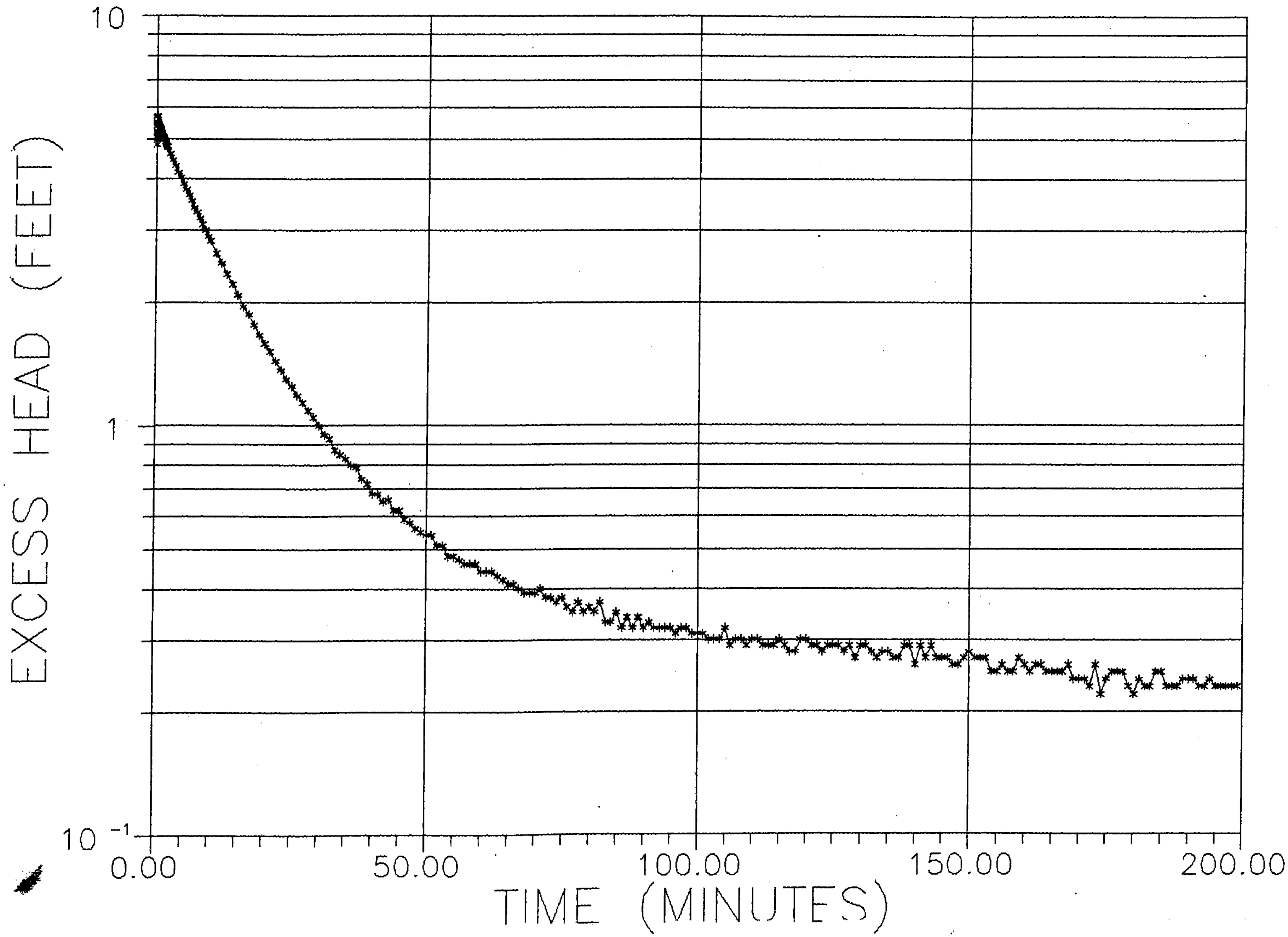
- m = Transformation ratio
- L = Length of monitored zone
- D = Diameter of borehole
- d = Diameter of well pipe
- t_1 = Time when flow rate begins to stabilize
- H_1 = Head at t_1
- t_2 = Time when flow rate stabilization drops
- H_2 = Head at t_2

MW-105A	MW-105B
m = 1	m = 1
L = 12 feet	L = 6 feet
D = 0.333 feet	D = 0.708 feet
d = 0.1666 feet	d = 0.1666 feet
t_2 = 10.00 min	t_2 = 18 minutes
t_1 = 2.50 min	t_1 = 2 minutes
H_1 = 5.53 feet	H_1 = 3.69 feet
H_2 = 2.48 feet	H_2 = 1.41 feet
K_h = 7×10^{-5} cm/sec	K_h = 5×10^{-5} cm/sec

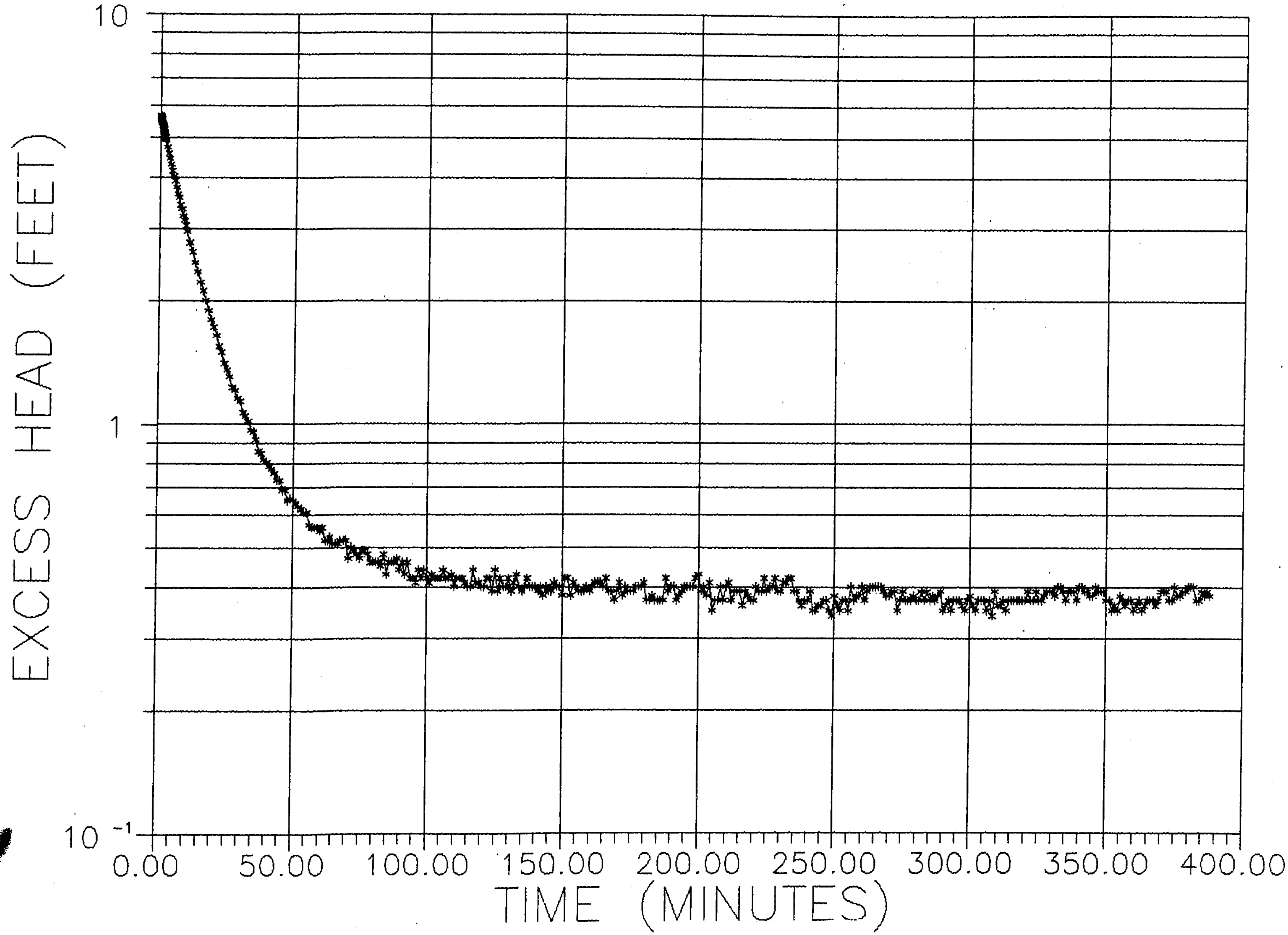
MW—101A TEST 2



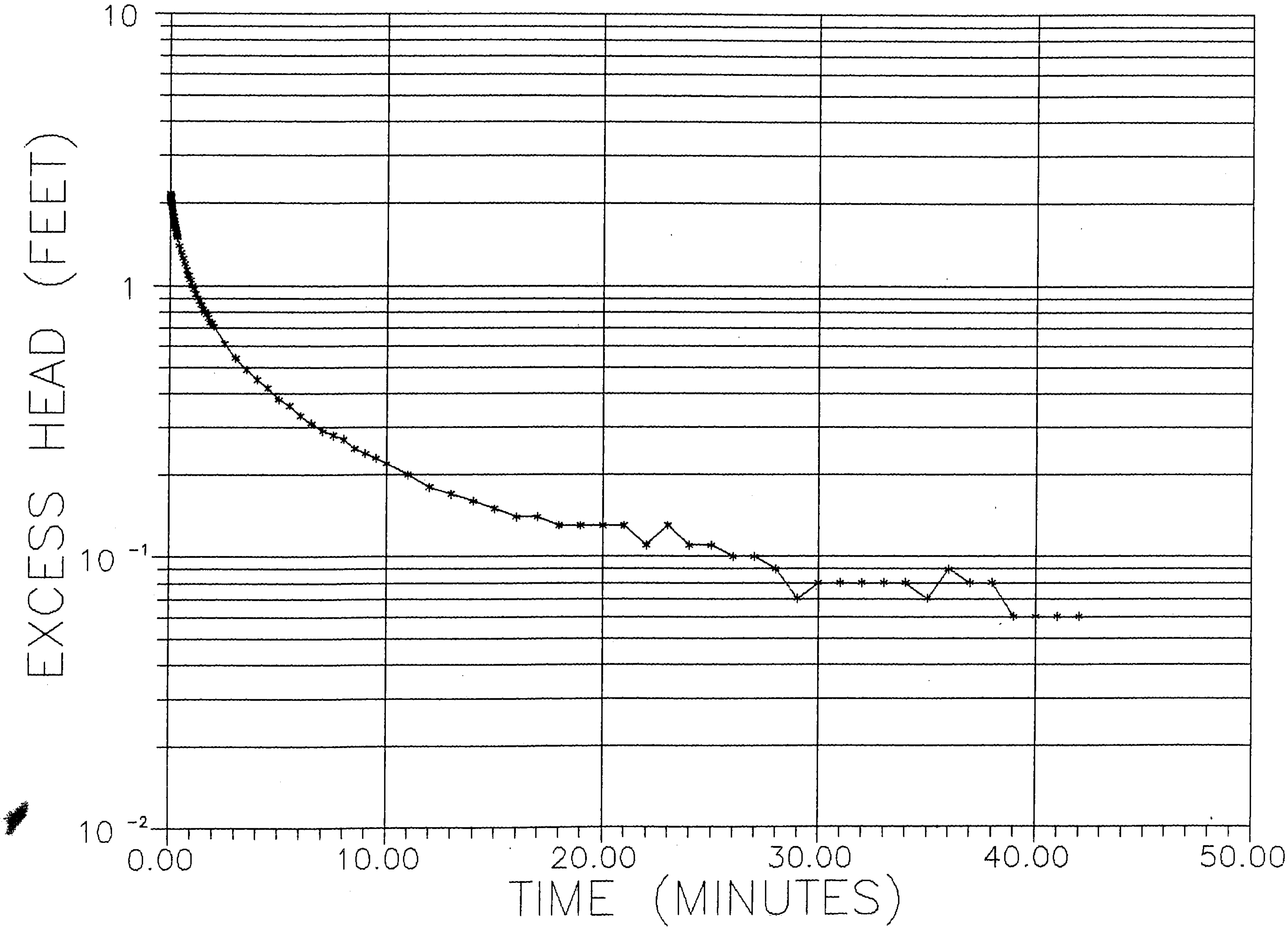
MW–102A TEST 1

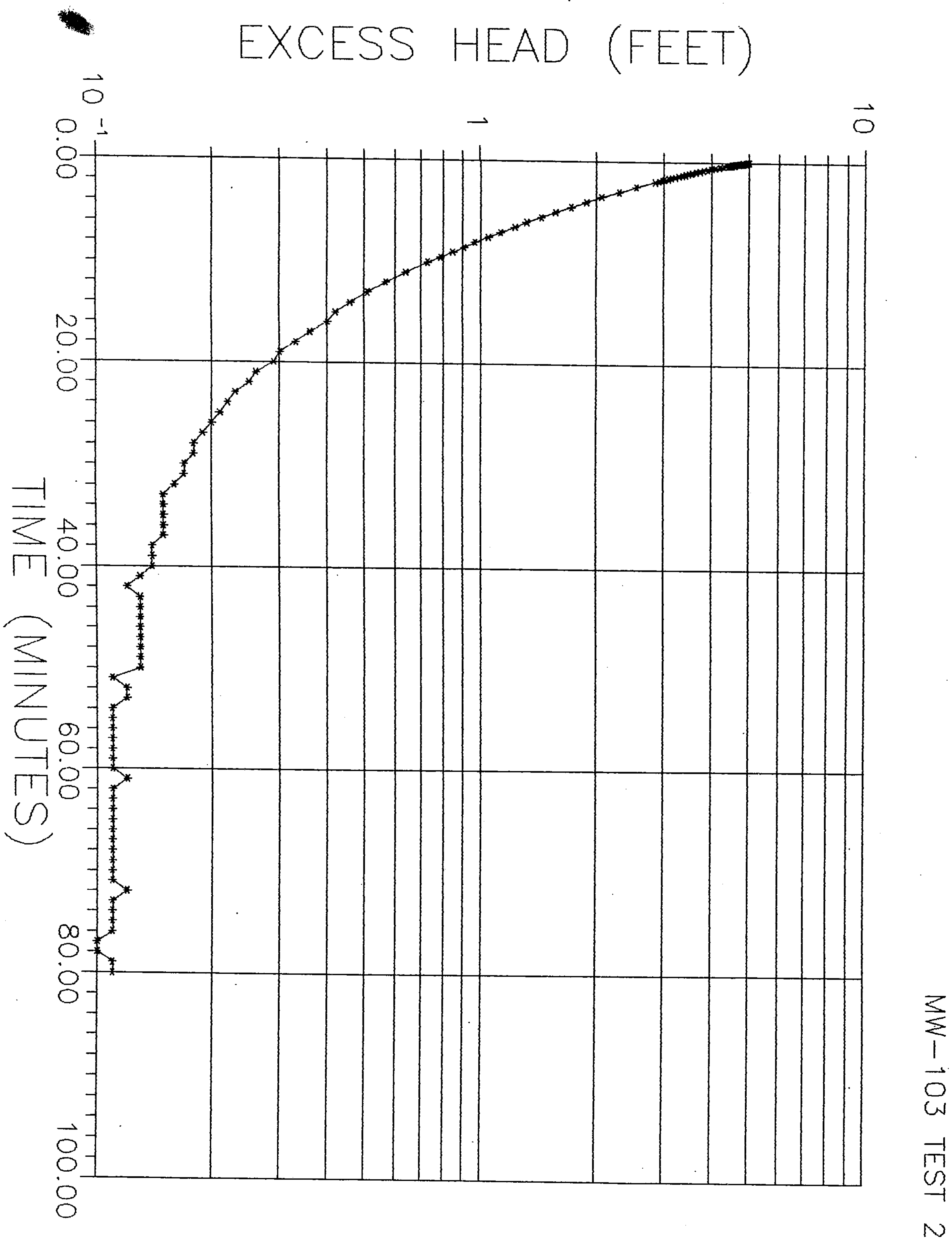


MW–102A TEST 3



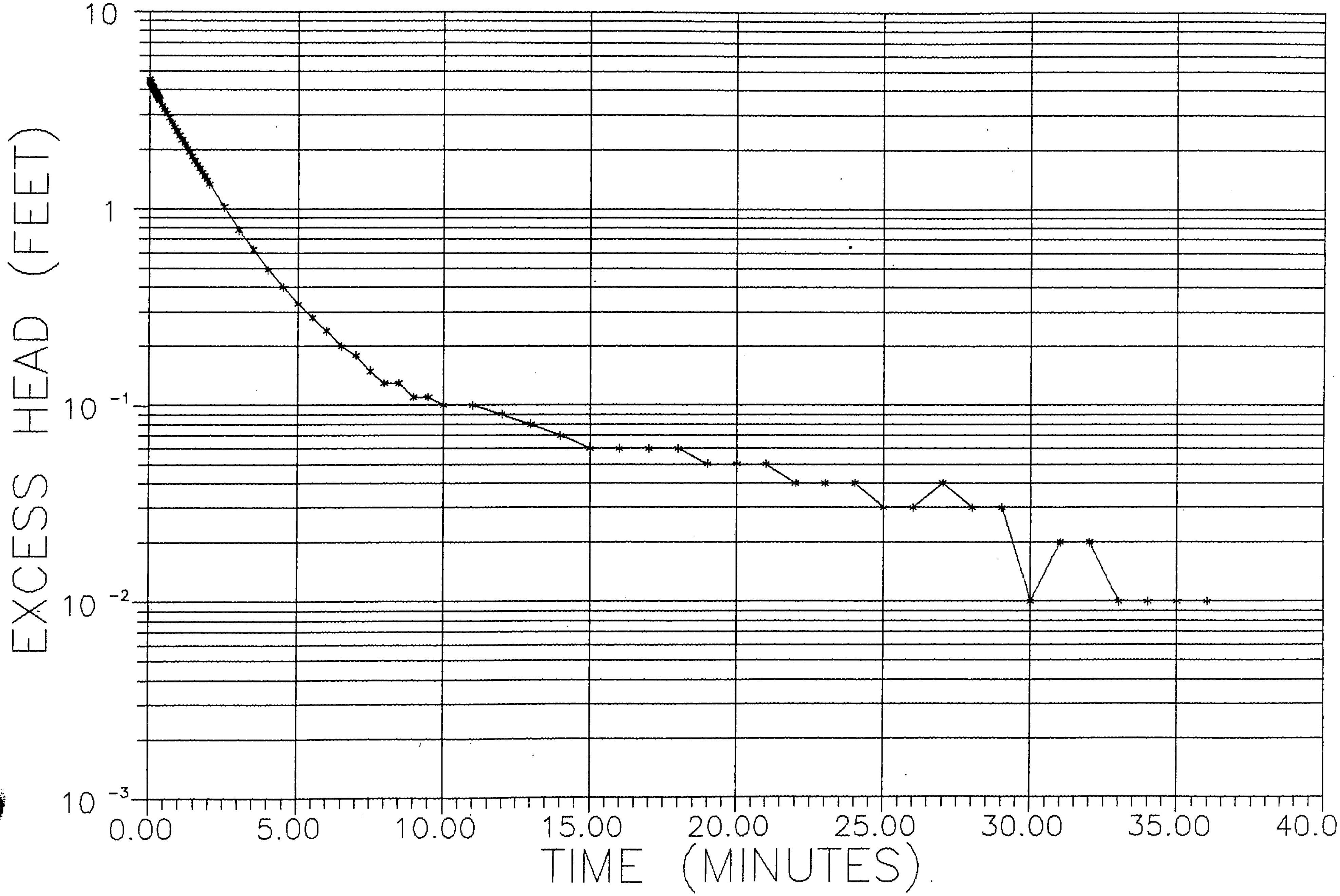
MW-102B TEST 2



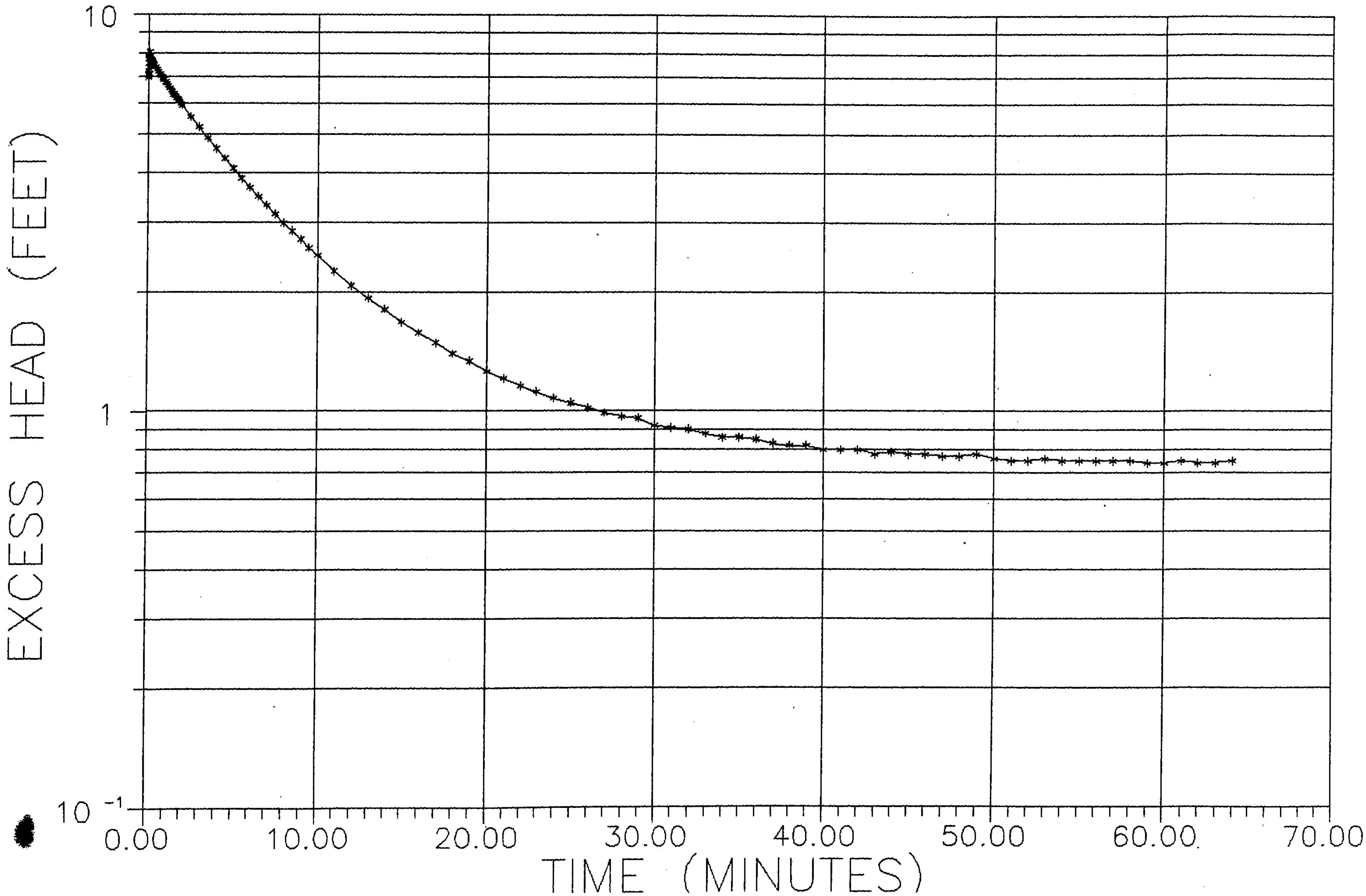


EXCESS HEAD (FEET)
10 -1
1
10
0.00
20.00
40.00
60.00
80.00
100.00
TIME (MINUTES)
MW-103 TEST 2

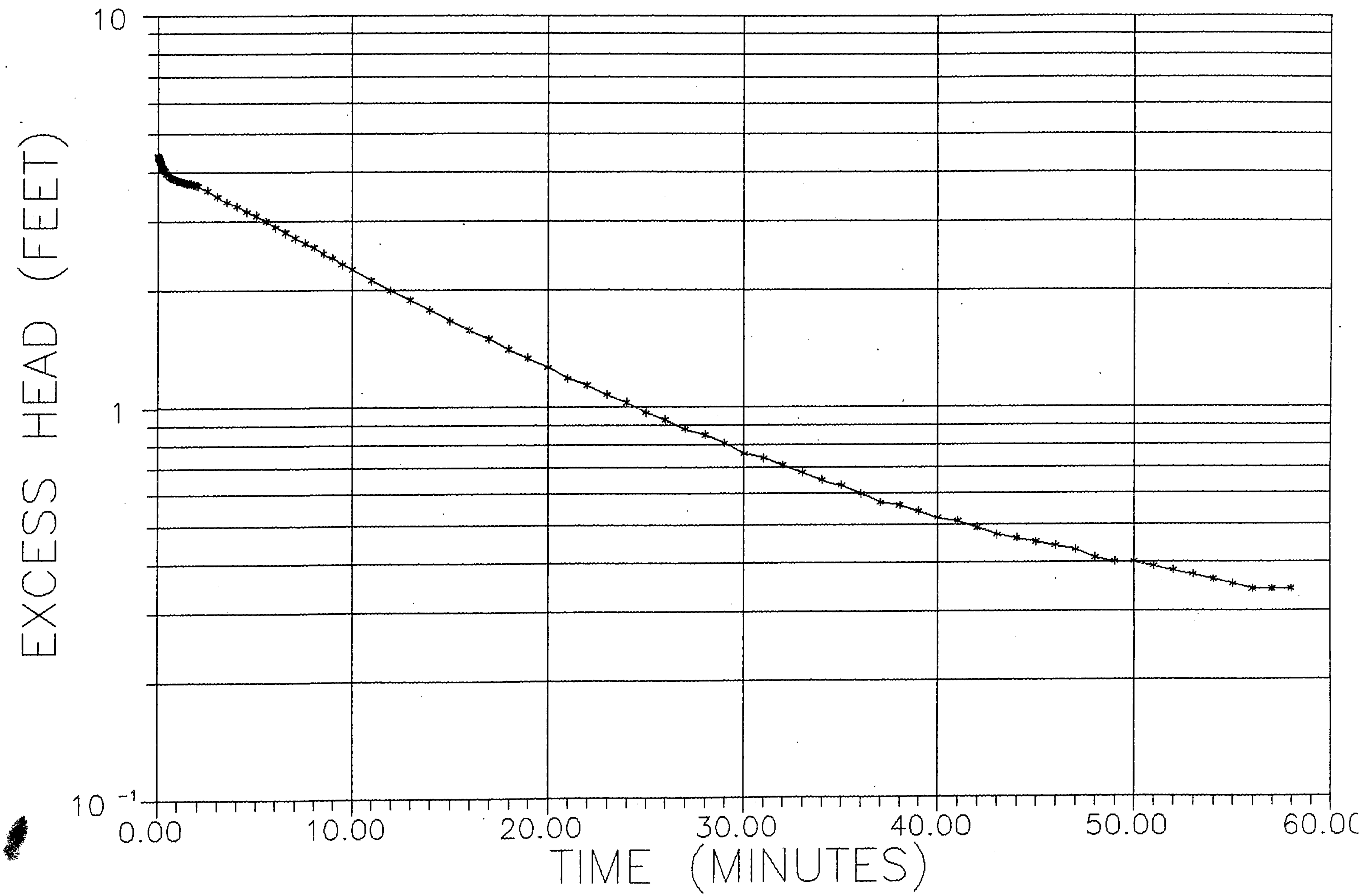
MW—104B TEST 1



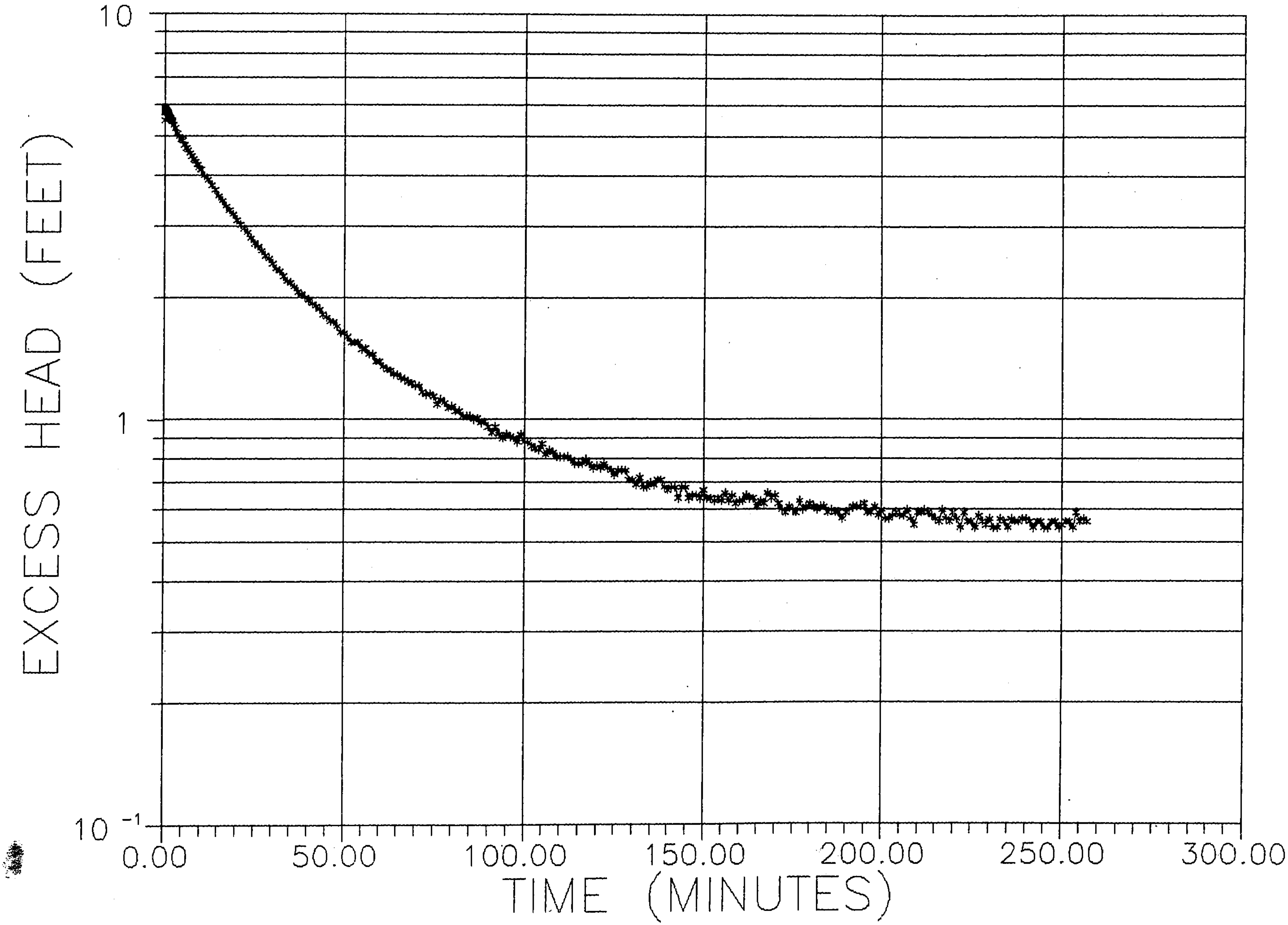
MW-105A TEST 1



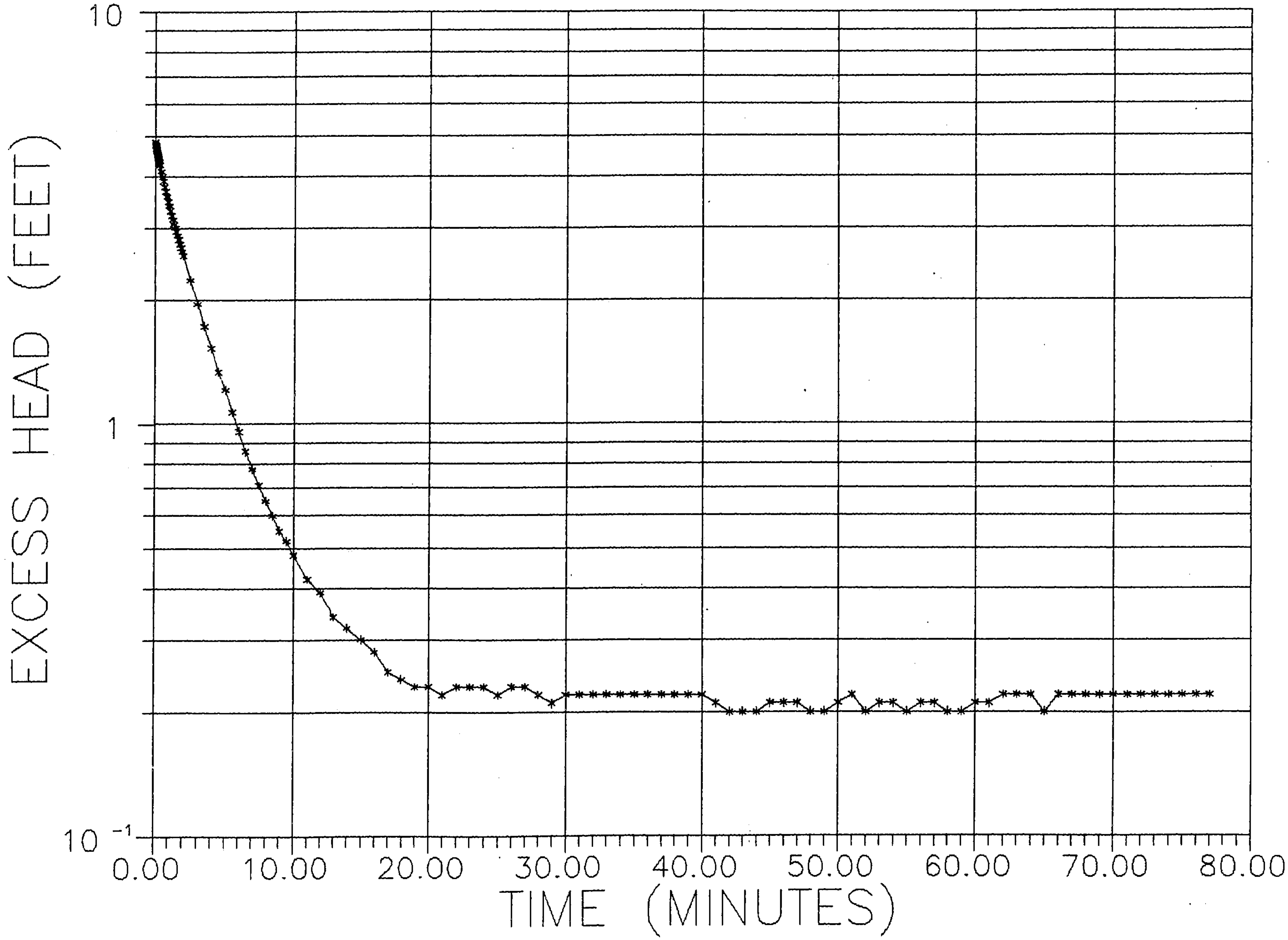
MW-105B TEST 1



MW-107A TEST 1



MW–107B TEST 1



RESULTS

HYDRAULIC CONDUCTIVITY TEST RESULTS
NORTH LAWRENCE OIL DUMP SITE
NORTH LAWRENCE, NEW YORK

STRATA TESTED	TEST LOCATION	TEST TYPE	HYDRAULIC CONDUCTIVITY cm/sec	HYDRAULIC CONDUCTIVITY ft/day	Remarks
Till	MW-101A	In Situ	$3x10^{-5}$	0.09	Rising Head
Sand and Gravel	MW-101B	In Situ	$6x10^{-5}$	0.17	Rising Head
Till	MW-102A	In Situ	$4x10^{-5}$	0.11	Rising Head
Silty-Sand	MW-102B	In Situ	$2x10^{-5}$	0.06	Rising Head
Sand	MW-103	In Situ	$1x10^{-4}$	0.28	Rising Head
Till	MW-104A	In Situ	$4x10^{-5}$	0.11	Rising Head
Sand	MW-104B	In Situ	$6x10^{-4}$	1.70	Rising Head
Till	MW-105A	In Situ	$7x10^{-5}$	0.20	Rising Head
Sand	MW-105B	In Situ	$5x10^{-5}$	0.14	Rising Head
Sand	MW-106	In Situ	$6x10^{-5}$	0.17	Rising Head
Till	MW-107A	In Situ	$2x10^{-5}$	0.06	Rising Head
Sand and Clay	MW-107B	In Situ	$2x10^{-4}$	0.85	Rising Head

JOB TITLE: NORTH LAWRENCE OIL DUMP COMP. BY:GWC
JOB NUMBER: 5809-02
DATE: 3/31/89 CHECK BY:GWC
TITLE: NLODPZ38
SAMPLE: PZ-3 S-8

MOISTURE CONTENT
****

WT. TARE=	39.1
SAMPLE + TARE,i=	154.3
SAMPLE + TARE,f=	144.9
MOISTURE=	9.4
SAMPLE,f=	105.8
% Wc=	8.9

% OF FINES
****

WT. TARE=	39.1
SAMPLE + TARE,i=	144.9
SAMPLE + TARE,f=	106.4
WT. SOIL LOST=	38.5
WT. SOIL,i=	105.8
% OF FINES=	36.39

SIEVE ANALYSIS
****

TARE= 0.000 GRAMS SAMP WT= 105.8 GRAMS

SIEVE	WEIGHT RETAINED W/TARE	WEIGHT RETAINED W/O TARE	% RETAIN	GS (mm)	% PASS
6	NA	NA	NA	150.000	NA
4	NA	NA	NA	100.000	NA
3	NA	NA	NA	76.200	NA
2	NA	NA	NA	50.000	NA
1 1/2	NA	NA	NA	37.500	NA
1	NA	NA	NA	25.400	NA
3/4	NA	NA	NA	19.100	NA
1/2	NA	NA	NA	12.500	NA
3/8	NA	NA	NA	9.510	NA
1/4	0.0	0.0	0.0	6.300	100.0
4	5.4	5.4	5.1	4.750	94.9
10	13.3	13.3	12.6	2.000	87.4
20	18.8	18.8	17.8	0.850	82.2
40	27.5	27.5	26.0	0.425	74.0
60	39.3	39.3	37.1	0.250	62.9
100	52.9	52.9	50.0	0.150	50.0
200	66.9	66.9	63.2	0.075	36.8
CRS PAN	NA	NA	NA	NA	
FNE PAN	67.0	67.0	63.3	36.7	

JOB TITLE: NORTH LAWRENCE OIL DUMP   COMP. BY:GWC
JOB NUMBER: 5809-02
DATE: 3/31/89   CHECK BY:GWC
TITLE: NLODPZ13
SAMPLE: PZ-1 S-3

MOISTURE CONTENT
****

WT. TARE=	40.4
SAMPLE + TARE,i=	145.0
SAMPLE + TARE,f=	133.3
MOISTURE=	11.7
SAMPLE,f=	92.9
% Wc=	12.6

% OF FINES
****

WT. TARE=	40.4
SAMPLE + TARE,i=	133.3
SAMPLE + TARE,f=	67.2
WT. SOIL LOST=	66.1
WT. SOIL,i=	92.9
% OF FINES=	71.15

SIEVE ANALYSIS
****

TARE= 0.000 GRAMS   SAMP WT= 92.9 GRAMS

	WEIGHT RETAINED				
SIEVE	W/TARE	W/O TARE	% RETAIN	GS (mm)	% PASS
6	NA	NA	NA	150.000	NA
4	NA	NA	NA	100.000	NA
3	NA	NA	NA	76.200	NA
2	NA	NA	NA	50.000	NA
1 1/2	NA	NA	NA	37.500	NA
1	NA	NA	NA	25.400	NA
3/4	NA	NA	NA	19.100	NA
1/2	NA	NA	NA	12.500	NA
3/8	NA	NA	NA	9.510	NA
1/4	0.0	0.0	0.0	6.300	100.0
4	3.1	3.1	3.3	4.750	96.7
10	5.1	5.1	5.5	2.000	94.5
20	6.5	6.5	7.0	0.850	93.0
40	8.8	8.8	9.5	0.425	90.5
60	11.8	11.8	12.7	0.250	87.3
100	16.5	16.5	17.8	0.150	82.2
200	26.7	26.7	28.7	0.075	71.3
CRS PAN	NA	NA	NA	NA	
FNE PAN	26.8	26.8	28.8	71.2	

JOB TITLE: NORTH LAWRENCE OIL DUMP COMP. BY:GWC
JOB NUMBER: 5809-02
DATE: 3/31/89 CHECK BY:GWC
TITLE: NLODPZ15
SAMPLE: PZ-1 S-5

MOISTURE CONTENT
****

WT. TARE=	39.4
SAMPLE + TARE,i=	148.2
SAMPLE + TARE,f=	140.8
MOISTURE=	7.4
SAMPLE,f=	101.4
% Wc=	7.3

% OF FINES
****

WT. TARE=	39.4
SAMPLE + TARE,i=	140.8
SAMPLE + TARE,f=	62.6
WT. SOIL LOST=	78.2
WT. SOIL,i=	101.4
% OF FINES=	77.12

SIEVE ANALYSIS
****

TARE= 0.000 GRAMS SAMP WT= 101.4 GRAMS

SIEVE	WEIGHT RETAINED W/TARE	WEIGHT RETAINED W/O TARE	% RETAIN	GS (mm)	% PASS
6	NA	NA	NA	150.000	NA
4	NA	NA	NA	100.000	NA
3	NA	NA	NA	76.200	NA
2	NA	NA	NA	50.000	NA
1 1/2	NA	NA	NA	37.500	NA
1	NA	NA	NA	25.400	NA
3/4	NA	NA	NA	19.100	NA
1/2	NA	NA	NA	12.500	NA
3/8	NA	NA	NA	9.510	NA
1/4	0.0	0.0	0.0	6.300	100.0
4	9.0	9.0	8.9	4.750	91.1
10	13.4	13.4	13.2	2.000	86.8
20	17.5	17.5	17.3	0.850	82.7
40	25.4	25.4	25.0	0.425	75.0
60	36.1	36.1	35.6	0.250	64.4
100	48.8	48.8	48.1	0.150	51.9
200	62.6	62.6	61.7	0.075	38.3
CRS PAN	NA	NA	NA	NA	
FNE PAN	62.6	62.6	61.7	38.3	

JOB TITLE: NORTH LAWRENCE OIL DUMP COMP. BY:GWC
JOB NUMBER: 5809-02
DATE: 3/31/89 CHECK BY:GWC
TITLE: NLODPZ35
SAMPLE: PZ-3 S-5

MOISTURE CONTENT
****

WT. TARE=	41.5
SAMPLE + TARE,i=	154.9
SAMPLE + TARE,f=	144.4
MOISTURE=	10.5
SAMPLE,f=	102.9
% Wc=	10.2

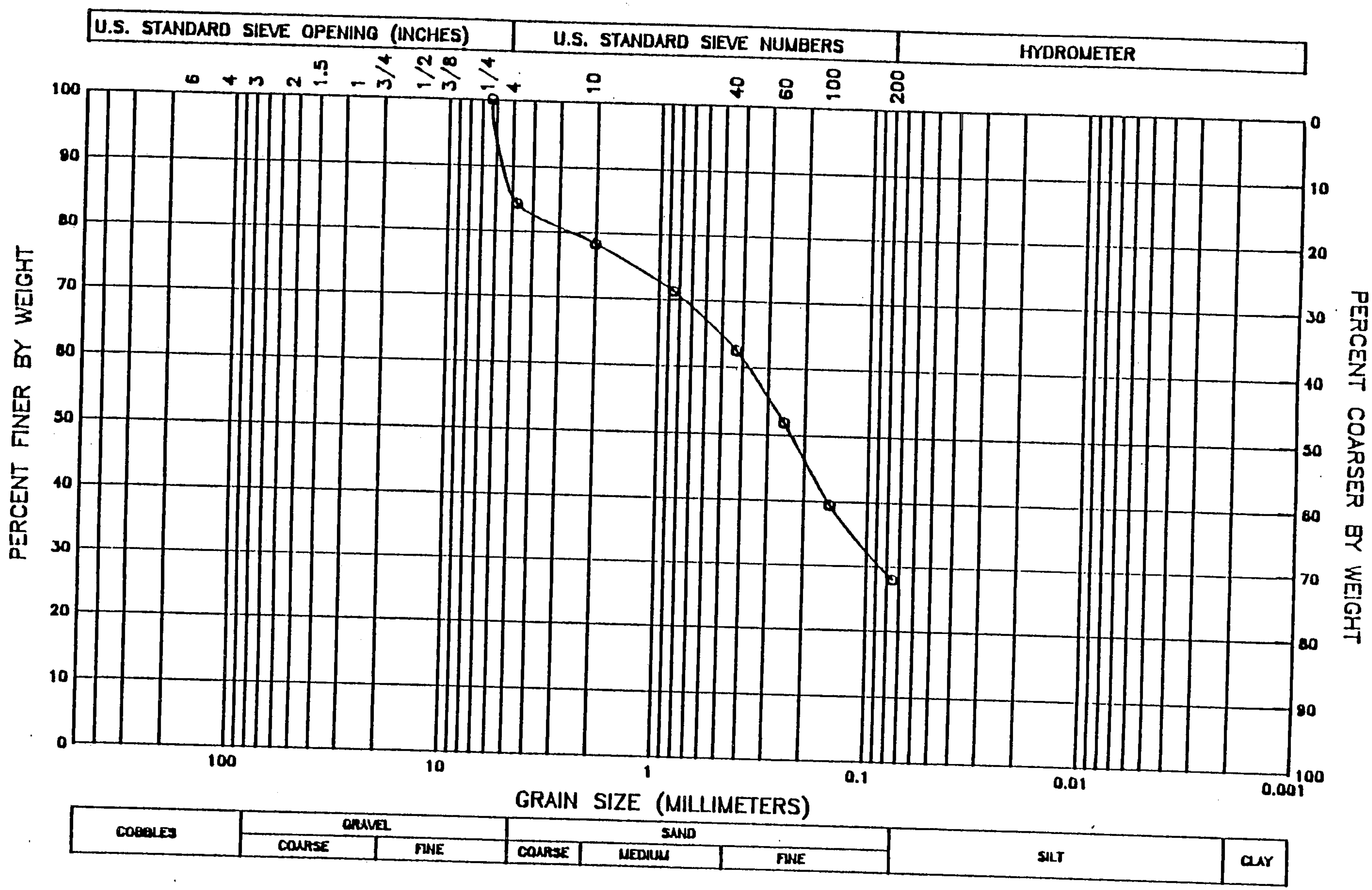
% OF FINES
****

WT. TARE=	41.5
SAMPLE + TARE,i=	144.4
SAMPLE + TARE,f=	116.0
WT. SOIL LOST=	28.4
WT. SOIL,i=	102.9
% OF FINES=	27.60

SIEVE ANALYSIS
****

TARE= 0.000 GRAMS SAMP WT= 102.9 GRAMS

SIEVE	WEIGHT RETAINED W/TARE	WEIGHT RETAINED W/O TARE	% RETAIN	GS (mm)	% PASS
6	NA	NA	NA	150.000	NA
4	NA	NA	NA	100.000	NA
3	NA	NA	NA	76.200	NA
2	NA	NA	NA	50.800	NA
1 1/2	NA	NA	NA	37.500	NA
1	NA	NA	NA	25.400	NA
3/4	NA	NA	NA	19.100	NA
1/2	NA	NA	NA	12.500	NA
3/8	NA	NA	NA	9.510	NA
1/4	0.0	0.0	0.0	6.300	100.0
4	16.2	16.2	15.7	4.750	84.3
10	22.4	22.4	21.8	2.000	78.2
20	29.6	29.6	28.8	0.850	71.2
40	38.7	38.7	37.6	0.425	62.4
60	49.6	49.6	48.2	0.250	51.8
100	62.4	62.4	60.6	0.150	39.4
200	74.2	74.2	72.1	0.075	27.9
CRS PAN	NA	NA	NA	NA	
FNE PAN	74.3	74.3	72.2	27.8	



SYMBOL/SAMPLE NO.	DEPTH	CLASSIFICATION	NAT.W%	GRAIN SIZE DISTRIBUTION CURVES	
NLOD PZ3 S5	16.5'	BROWN SAND, coarse to fine,	10.2	NORTH LAWRENCE OIL DUMP	
		trace fine gravel (<1/4 in. dia.),			
		some silt, (SM).			
				TESTED BY: GWC	CHECKED BY: DH
				DATE: 4/12/89	PROJECT NO.: 580002

APPENDIX B

SECOND PHASE FIELD DATA

APPENDIX B-1

SECOND PHASE SOIL BORING LOGS

BORING NO. SB-202

SOIL BORING LOG

PAGE 1 OF 1

PROJECT NO. 6886-03

DRILLING CONTRACTOR AA&D

DESCRIBED BY Cianchette

RIG NO. 1

CHECKED BY

DRILLER Rocky Eaye

DATE STARTED 11/19/91; 1105

DATE FINISHED 11/19/91; 1155

GROUND ELEV. ____ BIT SIZE ____ CASING SIZE ____

DEPTH TO WATER (DATE) NA CORE SIZE NA INCLINATION NA

DEPTH: SOIL 6' ROCK 0' TOTAL 6'

SAMPLE NO.	DEPTH FT.	NO. BLOWS PER 6 IN.	REC. IN.	P.I. ppm	DESCRIPTION
					No samples collected from 0 to 4 ft bgs
S-1	4.25-6.25	43 24 28 27			light brown fine to medium sand; TOC, PCBs, and VOA samples JSB202004X
					Terminated exploration @ 6' bgs

BORING NO. SB-204

SOIL BORING LOG

PAGE 1 OF 1

PROJECT NO. 6886-03

DRILLING CONTRACTOR AA & D

DESCRIBED BY Gianchette

RIG NO. 1

CHECKED BY

DRILLER Rocky Baye

DATE STARTED 11/19/91; 1420

DATE FINISHED 11/19/91, 1500

GROUND ELEV.

BIT SIZE

CASING SIZE

DEPTH TO WATER (DATE) NA

CORE SIZE NA

INCLINATION NA

DEPTH: SOIL

ROCK

TOTAL

SAMPLE NO.	DEPTH FT.	NO. BLOWS PER 6 IN.	REC. IN.	P.I. ppm	DESCRIPTION
					No sample collected from 0 to 4' bgs
S-1	4-6	12 21 18 24		10.8	light brown fine to medium sand w/ some gravel; distinct petroleum odor; wet to saturated. Collected VOA and SVOA samples JSB 204004 X
					Terminated exploration @ 6' bgs

SOIL BORING LOG

BORING NO. SB-206

PAGE 1 OF 1

PROJECT NO. 6886-03

DRILLING CONTRACTOR AA & D

DESCRIBED BY Cianchette

RIG NO. 1

CHECKED BY

DRILLER Rocky Baye

DATE STARTED 11/19/91; 1320

DATE FINISHED 11/19/91; 1345

GROUND ELEV. BIT SIZE CASING SIZE

DEPTH TO WATER (DATE) NA CORE SIZE NA INCLINATION NA

DEPTH: SOIL 6' ROCK 0' TOTAL 6'

SAMPLE NO.	DEPTH FT.	NO. BLOWS PER 6 IN.	REC. IN.	P.I. ppm	DESCRIPTION
S-1	0-2	– 1 9 20		15	1 ft of sludge over 1 ft. of light brown sand w/ some gravel; moist; hydrocarbon odor; Collected SVOAs sample JSB206000X
					No sample collected from 2 to 4' bgs
S-2	4-6	27 12 11 14		29.8	light brown sand and gravel over light brown silty clay; collected TOC, PCBs, and VOA samples JSB206004X
					Terminated exploration @ 6' bgs.

APPENDIX B-2

SECOND PHASE MONITORING WELL BORING LOGS

CLIENT NYSDEC			BORING NO. MW-202
CONTRACTOR AMERICAN AUGER			PROJECT NO.
METHOD HX CORING	CASING SIZE 4"	DATE STARTED 11/15/91	COMPLTD. 11/15/91
GROUND EL	SOIL DRILLED 18'	HNU 11.7 (10.2)	PROTECTION LEVEL C DERMAL
LOGGED BY WGC	CHECKED BY	ROCK DRILLED —	BELOW GROUND
		DATE	

DEPTH (FT)	HNU AMB. AIR	SAMP NO. & TYPE NO.	SAMPLE CLP	GC	OTHER	HNU HEADSPACE (ppm)	SOIL/ROCK DESCRIPTION	SOIL CLASS OR ROCK FRACTURES	BLOWS/6-IN	WELL DATA	EL. (FT)
							HSA Auger Refusal at 1.0' - no shallow sample taken				
5							Attempted sample at 5.0' - on boulder				5
	0	S-1					S-1 Brown fine-medium SAND - WASH				
10		S-2				0.0	S-2 Brown silty fine SAND, some gravel, poorly graded, non-plastic very dense, moist		36 77 50/4"		10
15		S-3					S-3 Gray silty fine SAND, some gravel, poorly graded, non-plastic, ~~very~~ dense, wet		36 17 24 37		
20							Terminated boring at 18.0' depth, see well installation diagram for monitoring well details				
25											
30											

* U= THIN WALL S= SPLIT SPOON R= ROCK

BORING NO. MW-204

CLIENT: NYSDEC			PROJECT NO.
CONTRACTOR: AMERICAN AUGER		DATE STARTED: 11/17/91	COMPLTD.
METHOD	CASING SIZE	HNU 11.7/10.2	PROTECTION LEVEL
GROUND EL	SOIL DRILLED	ROCK DRILLED	BELOW GROUND
LOGGED BY: WGC	CHECKED BY	DATE	

DEPTH (FT)	HNU AMB. AIR	SAMP NO. & TYPE NO.	SAMPLE	CLP	GC	OTHER	HNU HEADSPACE (ppm)	SOIL/ROCK DESCRIPTION	SOIL CLASS OR ROCK FRACTURES	BLOWS/6-IN	WELL DATA	EL. (FT)
	0	S-1					0.6	#1 0-0.2 Black organic topsoil 0.2-0.9 Tan fine SAND, poorly graded non-plastic, medium dense		4 9 9 6		
	0	S-2					10.2	Grey SILT, little fine sand, trace gravel, poorly graded, slightly plastic medium dense		16 11 12 7		
	0	S-3					0.0	Grey SILT, little gravel, trace fine sand. Clay, poorly graded slightly plastic, medium dense		6 10 11 14		
		S-4					0.0	Grey SILT, little gravel, trace fine sand slightly plastic, poorly graded, medium dense (10.0-10.9') Grey fine to medium SAND, some silt, poorly graded non-plastic medium dense (10.9-11.1) Grey silty fine SAND and GRAVEL, poorly graded, non-plastic, very dense		~~6 10 11 14~~ 4 16 41 60		

Terminated boring at 12.0' depth
See well installation diagram for monitoring well details

* U= THIN WALL S= SPLIT SPOON R= ROCK

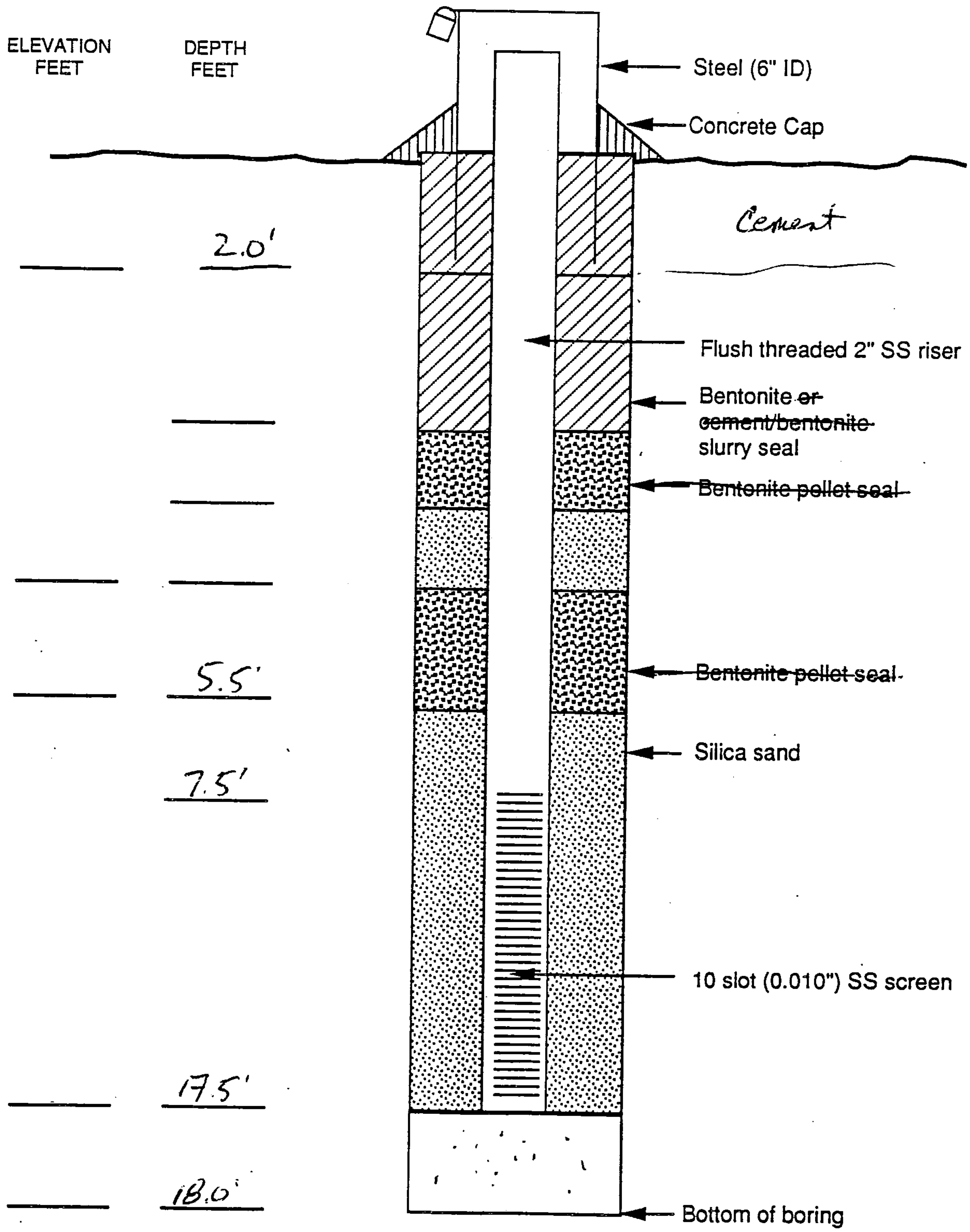
E.C. JORDAN CO.

APPENDIX B-3

SECOND PHASE MONITORING WELL INSTALLATION DIAGRAMS

WELL INSTALLATION DETAILS

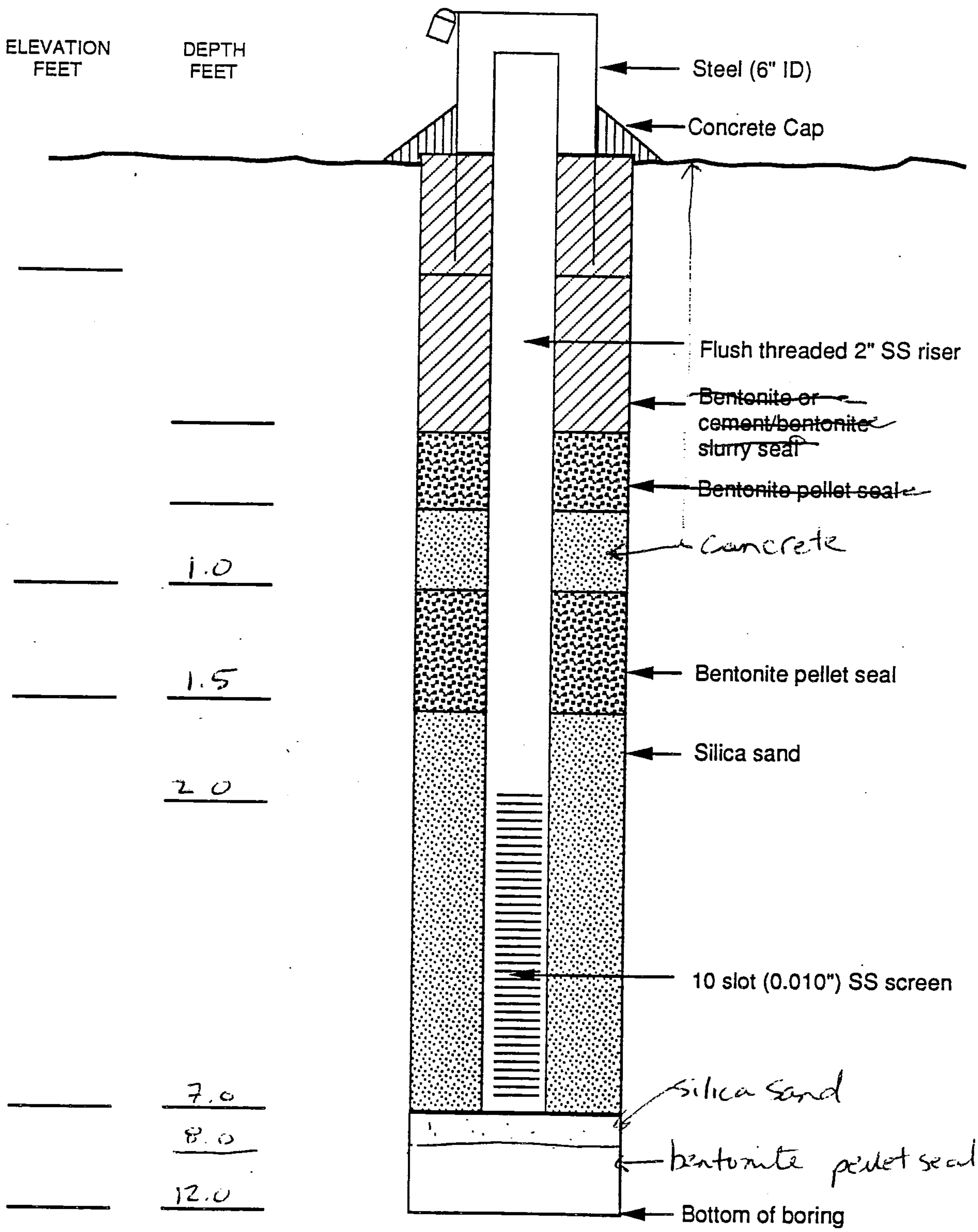
Project no.:	**Project name:** N. LAWRENCE	**Well no.:** MW-202
Installed by: AMERICAN AUGER	**Date installed:** 11/15/91	**Boring diameter:** 4"
Well diameter: 2"	**Well material:** STAINLESS	**Backfill material:** BENTONITE SLURRY



NOT TO SCALE

WELL INSTALLATION DETAILS

Project no.: 6886-03	Project name: N. LAWRENCE	Well no.: MW-204
Installed by: AMERICAN AUGER	Date installed:	Boring diameter:
Well diameter: 2" ID	Well material: STAINLESS STEEL	Backfill material: BENTONITE SLURRY



NOT TO SCALE

APPENDIX B-4

SECOND PHASE HYDRAULIC CONDUCTIVITY DATA

RESULTS

FIELD DATA
SECOND PHASE HYDRAULIC CONDUCTIVITY TEST
APRIL 18, 1992
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

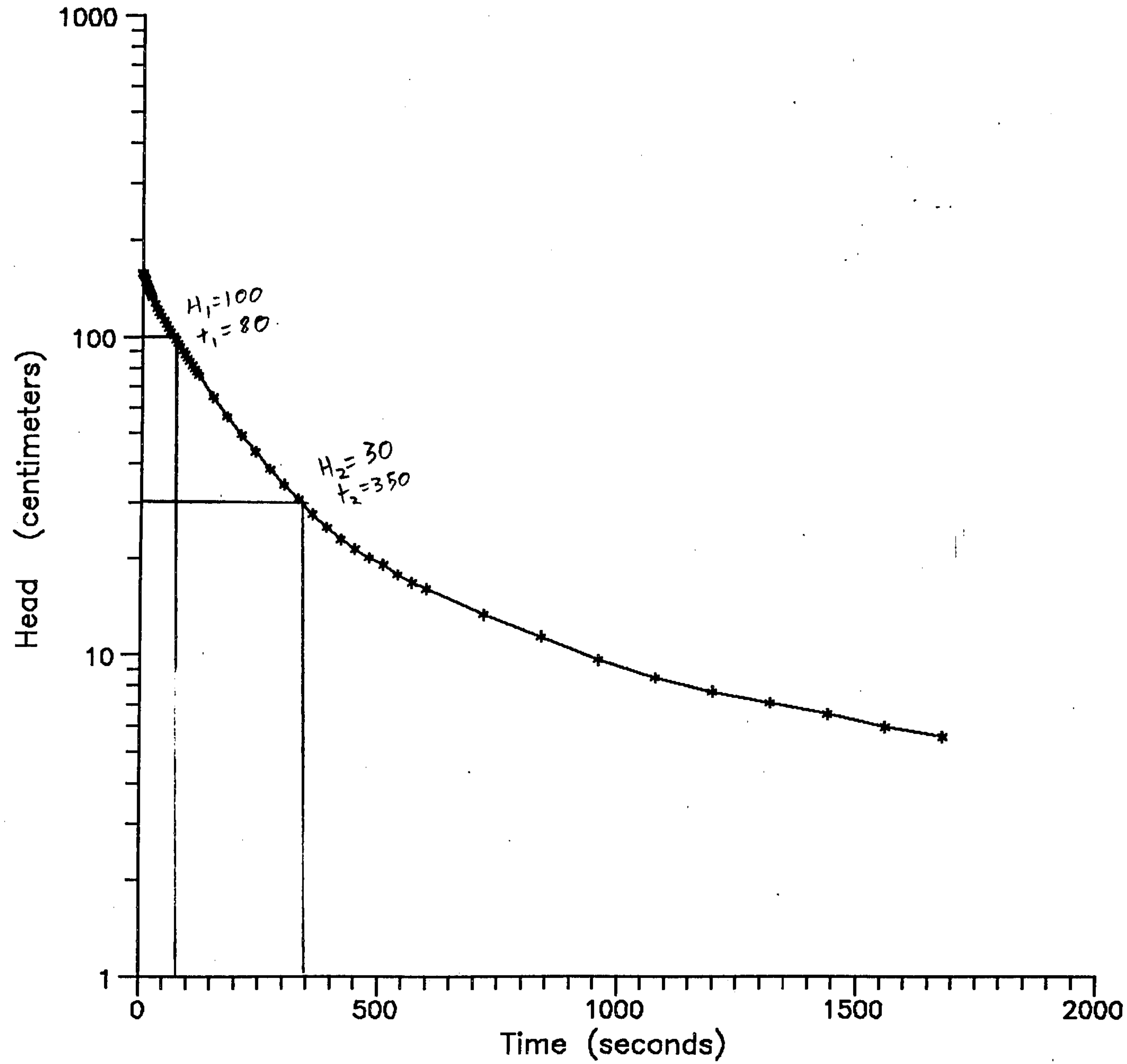
MW-201		MW-202		MW-203		MW-204			
TEST 3		TEST 0		TEST 4		TEST 1		TEST 2	
Time (min)	Head (H/Ho)	Time (min)	Head (H/Ho)	Time (min)	Head (H/Ho)	Time (min)	Head (H/Ho)	Time (min)	Head (H/Ho)
1.5833	0.873178	1.6666	0.524741	1.5000	0.484639	1.4166	0.417597	1.5000	0.368274
1.6666	0.869581	1.7500	0.511507	1.5833	0.469372	1.5000	0.397113	1.5833	0.350919
1.7500	0.864849	1.8333	0.499232	1.6666	0.452988	1.5833	0.379422	1.6666	0.335300
1.8333	0.861253	1.9166	0.485999	1.7500	0.438838	1.6666	0.361731	1.7500	0.317945
1.9166	0.856520	2.0000	0.475067	1.8333	0.424688	1.7500	0.344040	1.8333	0.304755
2.0000	0.852924	2.5000	0.407172	1.9166	0.410538	1.8333	0.329143	1.9166	0.289482
2.5000	0.828885	3.0000	0.352704	2.0000	0.397691	1.9166	0.317504	2.0000	0.276292
3.0000	0.806170	3.5000	0.308975	2.5000	0.328244	2.0000	0.302607	2.5000	0.206178
3.5000	0.785917	4.0000	0.272727	3.0000	0.275181	2.5000	0.232309	3.0000	0.155501
4.0000	0.766799	4.5000	0.239930	3.5000	0.232917	3.0000	0.179236	3.5000	0.118361
4.5000	0.747681	5.0000	0.214422	4.0000	0.199962	3.5000	0.141061	4.0000	0.091981
5.0000	0.728374	5.5000	0.193901	4.5000	0.171662	4.0000	0.111731	4.5000	0.072197
5.5000	0.710581	6.0000	0.173187	5.0000	0.150437	4.5000	0.090782	5.0000	0.056924
6.0000	0.693734	6.5000	0.157460	5.5000	0.132936	5.0000	0.073091	5.5000	0.043734
6.5000	0.678213	7.0000	0.144227	6.0000	0.117482	5.5000	0.061452	6.0000	0.035057
7.0000	0.661555	7.5000	0.134445	6.5000	0.104636	6.0000	0.049813	6.5000	0.028462
7.5000	0.645845	8.0000	0.126006	7.0000	0.094023	6.5000	0.040968	7.0000	0.021867
8.0000	0.631648	8.5000	0.119869	7.5000	0.085831	7.0000	0.038175	7.5000	0.017355
8.5000	0.615937	9.0000	0.111430	8.0000	0.078756	7.5000	0.029329	8.0000	0.015272
9.0000	0.601552	9.5000	0.105293	8.5000	0.071681	8.0000	0.029329	8.5000	0.012842
9.5000	0.588491	10.0000	0.100498	9.0000	0.065723	8.5000	0.023277	9.0000	0.008677
10.0000	0.575241	12.0000	0.083621	9.5000	0.061068	9.0000	0.020484	9.5000	0.008677
12.0000	0.523944	14.0000	0.071538	10.0000	0.057531	9.5000	0.020484	10.0000	0.006247
14.0000	0.479651	16.0000	0.060606			10.0000	0.020484		
16.0000	0.438955	18.0000	0.053317						
18.0000	0.404315	20.0000	0.048331						
20.0000	0.370812	22.0000	0.044687						
22.0000	0.343176	24.0000	0.041235						
24.0000	0.316865	26.0000	0.037591						
26.0000	0.296611	28.0000	0.035097						
28.0000	0.276168								
30.0000	0.258375								
32.0000	0.240393								
34.0000	0.227143								
36.0000	0.212947								
38.0000	0.200832								
40.0000	0.188907								
42.0000	0.179443								
44.0000	0.169789								
46.0000	0.161461								
48.0000	0.154268								

FIELD DATA
SECOND PHASE HYDRAULIC CONDUCTIVITY TEST
APRIL 18, 1992
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

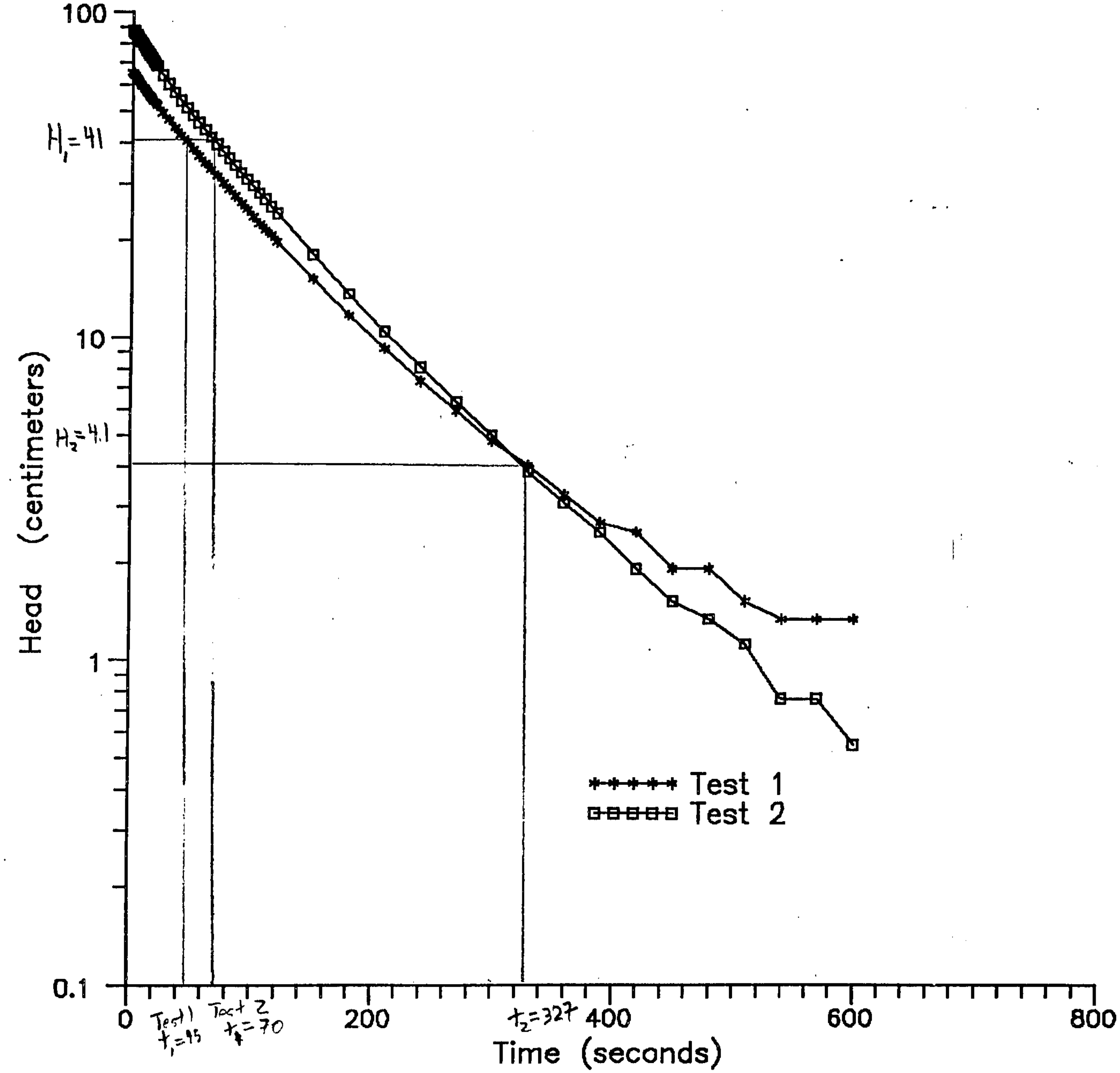
MW-201		MW-202		MW-203		MW-204			
TEST 3		TEST 0		TEST 4		TEST 1		TEST 2	
Time (min)	Head (H/Ho)	Time (min)	Head (H/Ho)	Time (min)	Head (H/Ho)	Time (min)	Head (H/Ho)	Time (min)	Head (H/Ho)
50.0000	0.147075								
52.0000	0.141018								
54.0000	0.135150								
56.0000	0.130229								
58.0000	0.125496								
60.0000	0.119628								
62.0000	0.117168								

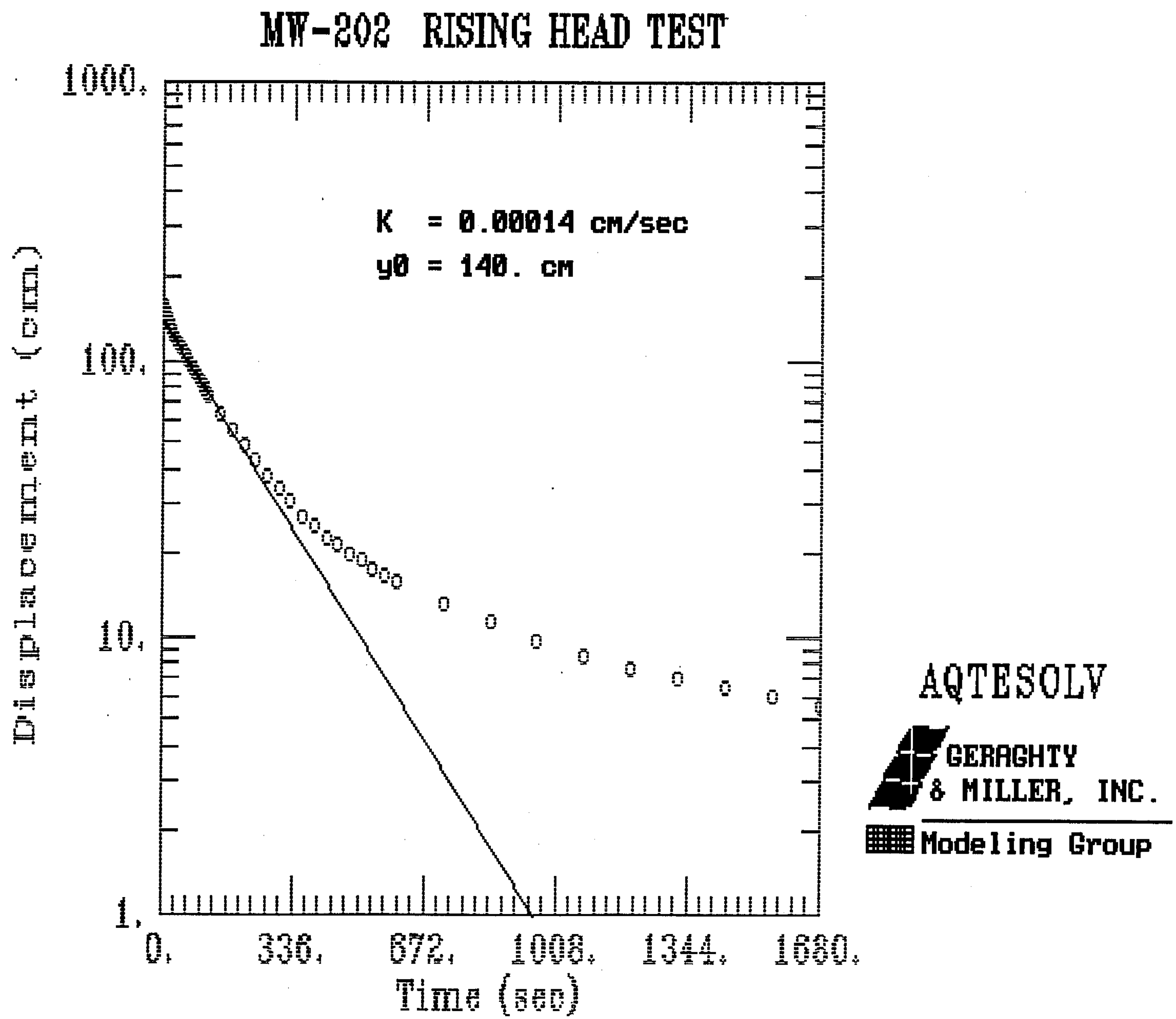
CALCULATIONS AND GRAPHS

Head vs. Time for Hvorslev Analysis
MW-202

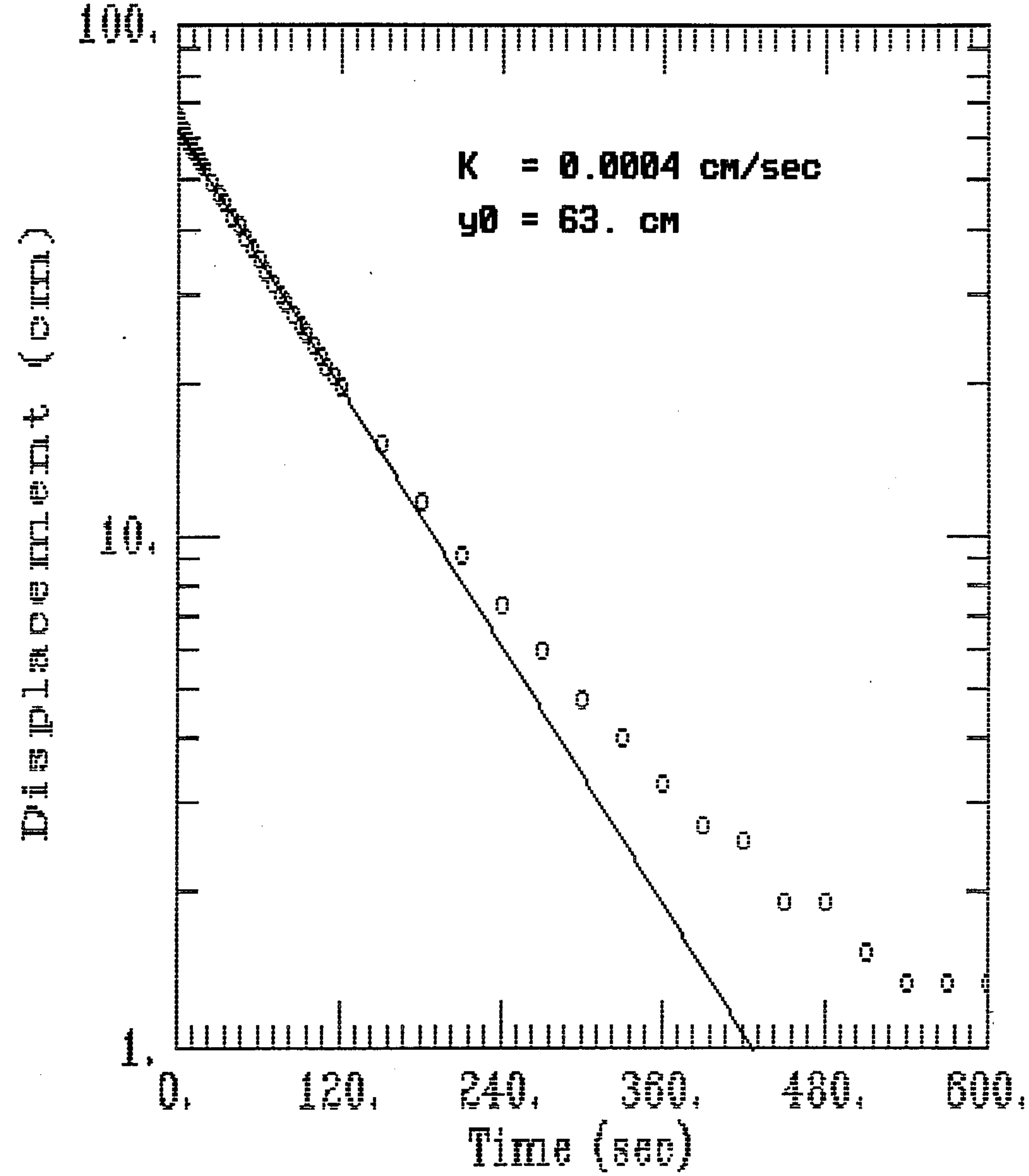


Head vs. Time for Hvorslev Analysis
MW-204




MW-202 RISING HEAD TEST
K = 0.00014 cm/sec
y0 = 140. cm
1000.
100.
10.
1.
Displacement (cm)
0.
336.
672.
1008.
1344.
1680.
Time (sec)
AQTESOLV
GERAGHTY
& MILLER, INC.
Modeling Group

MW-204 RISING HEAD TEST (1)

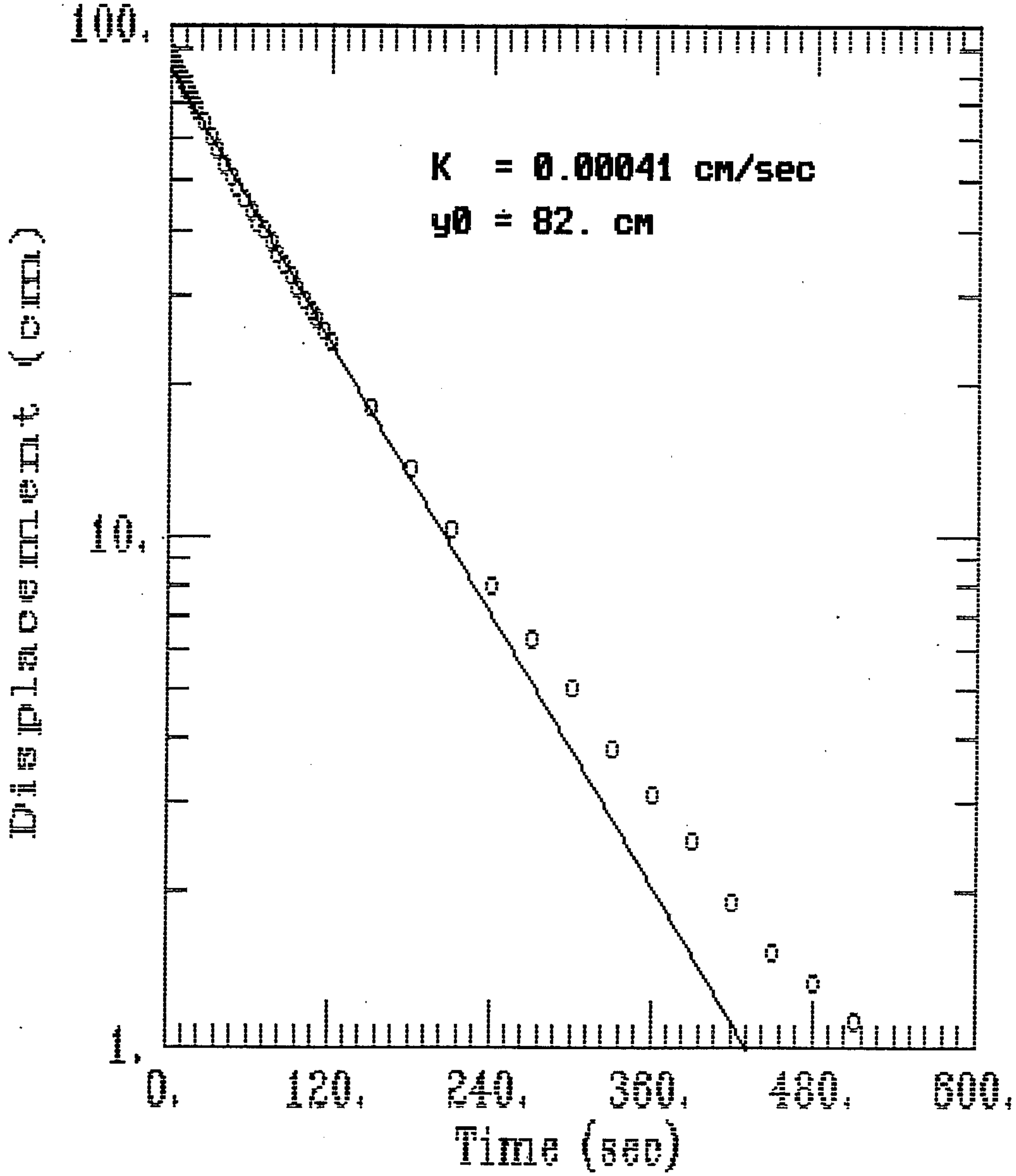


AQTESOLV

GERAGHTY & MILLER, INC.

Modeling Group

MW-204 RISING HEAD TEST (2)



AQTESOLV

GERAGHTY & MILLER, INC.

Modeling Group

RESULTS

MONITORING WELL SLUG TEST PARAMETERS
SECOND PHASE FIELD INVESTIGATION
NORTH LAWRENCE OIL DUMP SITE
REMEDIAL INVESTIGATION

Well Parameter	MW–201 Test 3	MW–202 Test 0	MW–203 Test 4	MW–204	
				Test 1	Test 2
d (cm)	5.09	5.09	5.09	5.09	5.09
D (cm)	15.24	10.16	10.16	10.16	10.16
L (cm)	335	335	335	183	183
t2 (s)	1850	350	268	327	327
t1 (s)	500	80	60	45	70
t2 – t1	1350	270	208	282	257
H2 (cm)	40	30	30	4.1	4.1
H1 (cm)	100	100	100	41	41
H1/H2	2.50	3.33	3.33	10	10

WHERE:

d = casing diameter (cm)
D = borehole diameter (cm)
L = effective screen length (cm)
t = time (seconds)
H = head (cm)

Hydraulic Conductivity (cm/s)	MW–201 Test 3	MW–202 Test 0	MW–203 Test 4	MW–204	
				Test 1	Test 2
Hvorslev	2.5E–05	1.8E–04	2.3E–04	5.2E–04	5.7E–04
Bouwer–Rice	2.1E–05	1.4E–04	1.9E–04	4.0E–04	4.1E–04

HYDRCOND.WK1/NLODS/NLT1