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E.C.JORDAN CO. ENGINEERS & SCIENTISTS

REMEDIAL INVESTIGATION FEASIBILITY STUDY NORTH LAWRENCE OIL DUMP SITE

ST. LAWRENCE COUNTY, N.Y.

SUBMITTED TO:

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

RI/FS WORK PLAN

PREPARED BY:

E. C. JORDAN CO.

MARCH 1989

NORTH LAWRENCE OIL DUMP SITE
TOWNSHIP OF LAWRENCE
ST. LAWRENCE COUNTY, NEW YORK
REMEDIAL INVESTIGATION/FEASIBILITY STUDY
WORK PLAN

Submitted to:

DIVISION OF HAZARDOUS WASTE REMEDIATION
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
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1.0 INTRODUCTION

E.C. Jordan Co. (Jordan), under contract to New York State Department of Environmental Conservation (NYSDEC), is submitting this Work Plan for a Remedial Investigation/Feasibility Study (RI/FS) of the North Lawrence Oil Dump site in the Township of Lawrence, St. Lawrence County, New York. This Work Plan has been prepared in accordance with the requirements of NYSDEC as identified in the Request for Proposal and the site meeting on October 29, 1987.

This Work Plan presents a technical scope of work, as well as an estimated level of effort and schedule for conducting field activities and preparing the remedial investigation (RI) and feasibility study (FS) reports for the North Lawrence site. The RI and FS will be conducted using a phased approach in accordance with the guidelines in the Superfund Amendments and Reauthorization Act (SARA). This approach integrates the field investigations, risk assessment, and treatability studies performed during the RI with the screening and evaluation of alternatives performed during the FS. The result is a more efficient use of resources in the field, improved data to support the alternative selection, and a shorter overall time frame to select a remedy for the site.

The objectives of the RI are to determine the nature and distribution of contaminants and to identify potential threats to human health and the environment presented by the release of hazardous substances from the North Lawrence site. The objective of the FS is to evaluate potential remedial alternatives from an engineering, environmental, public health, and economic perspective. This Work Plan presents the present understanding of the problems at the site and rationale for the technical approach contained within.

2.0 SUMMARY OF EXISTING DATA

2.1 SITE LOCATION AND DESCRIPTION

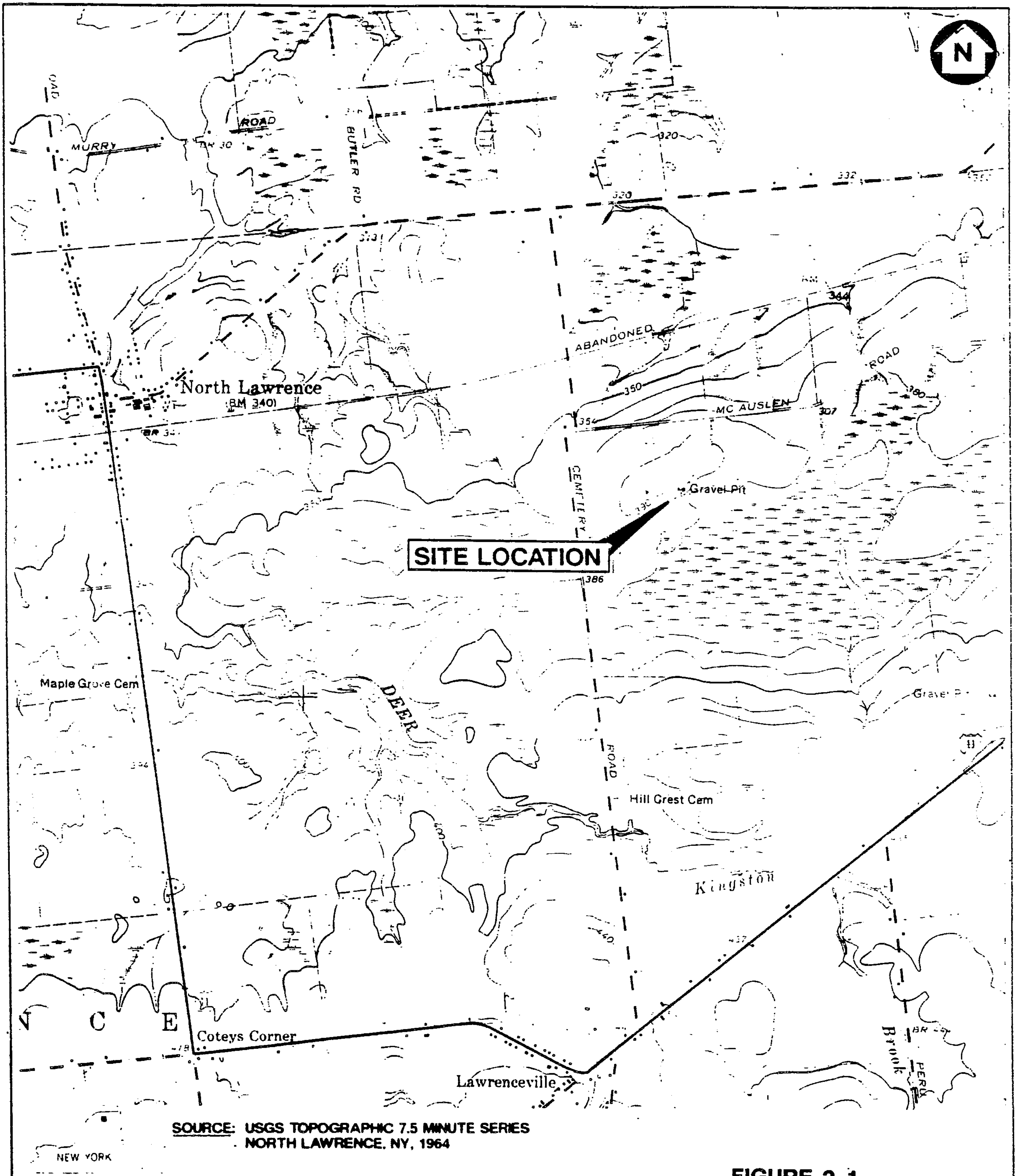
The North Lawrence Oil Dump site (NLODS) is an inactive hazardous waste site in the Town of Lawrence, St. Lawrence County, New York. The site occupies an area approximately 600 feet long and 75 feet wide, located south of McAuslen Road and east of Cemetery Road (see Figure 2-1). A regulated wetland is located adjacent to the southern portion of the site which drains to Redwater Brook.

2.2 SITE TOPOGRAPHY AND DRAINAGE

The NLODS is at an elevation of approximately 390 feet (MSL). Higher terrain is located south of the site. Drainage in the area flows to the northwest into small tributaries of Redwater Brook. The southeastern and eastern portions of the site border on a regulated wetland.

2.3 SITE GEOLOGY AND HYDROGEOLOGY

The NLODS is believed to consist of a cobbly till which would act as a restrictive layer to downward migration of contaminants. There is little known information available on groundwater flow conditions at the site. The regional flow is anticipated to be northwest. The groundwater gradients at the



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

FIGURE 2-1

SITE LOCATION MAP
NORTH LAWRENCE OIL DUMP SITE
NORTH LAWRENCE, NEW YORK

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site are expected to be nearly flat. As a result, the RI focuses on the shallow flow system and assumes the dense till is the base of the contamination. Should the results of the First Phase RI suggests that deeper contamination is likely, a Second Phase RI will then be needed and will focus on characterization of the deeper flow system (possibly including characterization of the bedrock).

2.4 SITE HISTORY

It is understood that during the middle to late 1960s, the NLODS was used for the disposal of waste oil and oil sludge. Sometime prior to the dumping, the property was operated as a gravel pit. The excavation of gravel from the pit shaped the area into a small depression which has a mounded perimeter. The lagoon is approximately 250 feet in length and 75 feet in width. The depth of contamination is unknown.

On October 7, 1980, oil stains were observed on vegetation 18 inches above the surrounding water. Numerous site inspections have been conducted since the discovery of the NLODS in 1980, and they have identified waste oil and sludge deposits in the disposal area. On November 27, 1984, a NYSDEC engineer collected two samples for analyses of polychlorinated biphenyls (PCBs). One sample had a concentration of 100 mg/kg of PCBs while the second sample yielded a concentration of 5 to 30 mg/ℓ of PCBs. Surface features that have been observed on the site suggest that the oil dump was operated as a lagoon. Observations in 1980 and 1984 of oil deposits outside the perimeter berm and on the vegetation in the adjacent wetland indicates that free floating oil was transported outside the lagoon during periods of high water.

3.0 DEVELOPMENT OF REMEDIAL INVESTIGATION AND FEASIBILITY STUDY

3.1 TASK I - SCOPING OF THE RI/FS

3.1.1 Subtask A - Objectives of the Remedial Investigation and Feasibility Study (RI/FS)

The primary objective of the RI/FS is to provide the supporting data, analyses, and conclusions necessary to determine the need for and if necessary select a remedy for the site. The RI and FS will be conducted simultaneously, as integrated phased studies leading to recommendation of a remedy.

The objectives of the RI portion of this study are to:

1. Characterize the source(s), nature, and distribution of contaminants released.

2. Identify and quantify potential exposure pathways.

3. Assess risks to public health and the environment.

4. Provide sufficient information to select a remedy, and design the remedial action.

The RI shall include, but is not limited to, data gathering (sampling, monitoring, and testing), and developing methodology, procedures and assessments for characterizing the physical and chemical attributes of the site.

The variety of procedures used to address the objectives listed above include, but are not limited to: evaluating all existing site information including data generated by the site operators and owners, NYSDEC and their respective contractors; identifying data gaps; performing field sampling and laboratory analyses; conducting bench scale field pilot studies as appropriate; and consulting all available, applicable, relevant, and appropriate information, regulations (ARARs), and/or environmental laws (ARARs).

The objectives of the FS are to develop, screen, and evaluate site-specific remedial alternatives for:

- on-site soil and sediments;
- surface water and sediments in the regulated wetland; and
- on-site groundwater.

The FS will include, but is not limited to, conceptualizations, engineering analyses, cost analysis, and scheduling for engineered aspects of the site cleanup to select among alternative remedies.

3.1.2 Subtask B - Data Quality Objectives (DQO) Determination

DQOs are qualitative and quantitative statements specified to ensure that data of the appropriate quality are obtained during field investigation activities. DQOs are established because different data uses require different levels of data quality. Data quality is the degree of uncertainty with respect to precision, accuracy, reproducibility, completeness, and comparability of a data base. The four general categories of data quality for RI/FS analytical work are presented in Table 3-1.

Data generated for the RI at the North Lawrence site will be used for several purposes, depending on the RI phase and the media of concern. DQOs for the NLODS are identified by media in Table 3-2.

Groundwater

Level IV analyses will include Target Compound List (TCL) chemicals (Appendix A). These analyses were chosen based on contaminants already identified on-site and substances suspected to be present on-site. There is no data base for groundwater sampling for the site; therefore, confirmational CLP-RAS analyses are required.

In addition to the Level IV parameters specified above, screening level and field analysis level data (Levels I and II) are appropriate for the following measurements: pH, specific conductance, temperature, and dissolved oxygen.

TABLE 3-1

LEVELS OF DATA QUALITY
NORTH LAWRENCE OIL DUMP SITE

Level I - Field Screening

This is the lowest level of data quality designed to provide rapid results for use in identifying sampling locations and providing information for personnel health and safety planning. Field screening generally provides qualitative rather than quantitative results; identifying the presence or absence of certain chemical species.

Level II - Field Analysis

Level II data quality requires the use of analytical instrumentation designed primarily for use under field conditions. Analyses may involve use of portable instrumentation and mobile laboratory facilities. Data obtained from field analysis may be qualitative and/or quantitative depending on the sophistication of the instruments.

Level III - Laboratory Analysis

Level III data quality represents laboratory data generated using EPA approved procedures. The applied procedures are not conducted under EPA Contract Laboratory Program - Routine Analytical Services (CLP-RAS) quality control protocols. These generally quantitative data are used to characterize source or extent of contamination and to support engineering treatability studies.

Level IV - CLP-RAS Laboratory Analysis

This level of analysis represents confirmational laboratory data subjected to rigorous quality assurance/quality control (QA/QC) and validation procedures. This standard of data quality is used for site characterization activities, risk assessment, enforcement cases, engineering alternative selection and design, and cost recovery documentation. Level IV data is generally quantitative.

TABLE 3-2

DATA QUALITY LEVELS
NORTH LAWRENCE OIL DUMP SITE

Media	I	II	III	IV
Groundwater	*	*		*
Surface Water and Sediment	*	*		*
Soils	*	*		*
Wetland Sediments	*	*	*	*
Air	*		*	

Level I - PI Meter, Explosimeter, Others
II - Field Gas Chromatograph
III - Non-CLP EPA Laboratory Protocols
IV - CLP EPA Laboratory Protocols

Surface Water and Sediment

Level IV surface water and sediment analyses will include TCL organics and inorganics, and PCBs. These analyses were chosen based upon previously identified site contaminants and the possibility that solvents could have been disposed of in the Town Dump. There is no data base for surface water and sediment sampling for the site therefore confirmational CLP-RAS analyses are required.

In addition to the Level IV parameters specified above, screening level and field analyses level data (Levels I and II) of surface water samples are appropriate for the following measurements: pH, specific conductance, temperature, and dissolved oxygen. Level III analyses will include total organic carbon (TOC).

Soils

Site soil sampling will include split-spoon sampling during soil boring, piezometer and monitoring well boring and hand-augered soil collection. During sample collection, Levels I and II analyses will be used as convenient field screening and analytical techniques. These will be used to establish personnel health and safety requirements and to screen samples for laboratory analysis.

Selected split-spoon and hand-augered soil samples will be sent for CLP laboratory analysis (Level IV) compounds and PCBs. These parameters were chosen to correspond with proposed groundwater analyses.

Wetland Sediments

Wetlands sediment sampling will consist of hand-augered sediment collection. During sample collection, Levels I and II analyses will be used for field screening purposes.

Air

Preliminary on-site air monitoring activities for site characterization will be conducted using a photoionization (PI) meter and a digital dust indicator for Level I screening. The proposed air monitoring program will utilize Level III laboratory analyses to quantify the presence of PCBs.

3.1.3 Subtask C - Evaluate Existing Data

Jordan will develop an understanding of past environmental conditions at the site by collecting and reviewing background information pertaining to adjacent wetlands and waterways, including threatened and endangered species lists, national wetlands inventory maps (Fish & Wildlife Department), soils maps (Soil Conservation Service), climatological data, and aerial photographs of the site and surrounding areas. This information will support the environmental risk assessment which will be used in establishing target cleanup levels, to mitigate identified contamination.

3.1.4 Subtask D - Community Relation Support

To develop a program that meets the community relations needs at the North Lawrence site, Jordan will conduct the following steps:

1. Investigate the site's history of public involvement by meeting with or telephoning community officials.

2. Identify potentially affected interests and compile a list of names, addresses, and telephone numbers to be maintained throughout the project.

3. Determine the apparent degree of public concern.

4. Identify objectives of a public participation program.

5. Implement a public participation program throughout the site investigations and remediation.

An important part of the program will be the designation of a single point of contact at NYSDEC to address inquiries and disseminate information concerning the project.

Jordan will support NYSDEC in its public participation program. Jordan will provide support to NYSDEC before the public, government officials, or news media in the following areas:

- Responses to technical questions.
- Visual aids to facilitate communications.
- Briefing NYSDEC speakers and representatives.
- Experts to discuss complex engineering, hydrogeological, and chemical issues.
- Copies of materials, schedules, etc., approved by NYSDEC.
- Fact sheets and technical information for meetings and news releases.

Jordan will assist NYSDEC in conducting a minimum of three public meetings. The first meeting, which will serve as a question/answer session, will occur prior to the field investigation. The second meeting will be held after completion of the First Phase RI/FS. The third meeting will be held during the remedy selection phase so that the public has an opportunity to review and comment on the alternatives. Jordan may recommend an alternative type of public meeting if public concern is overwhelming.

3.2 TASK II - SITE CHARACTERIZATION (FIRST PHASE RI)

3.2.1 Subtask A - First Phase RI: Project Planning, Field Investigation, Sampling Program and Data Evaluation

3.2.1.1 Project Planning.

Permits, Rights of Entry, and Other Authorization Requirements

Permission to access the NLODS on which work is to be conducted must be obtained prior to the initiation of site activities. Jordan will identify the necessary permits to conduct RI activities and on-site treatability studies, and to obtain rights of entry, and utility easements. NYSDEC will be responsible for securing the required approvals.

Review and Search for Additional Information Pertinent to the RI/FS

This task comprises a continuation of the literature search for published and unpublished information not available during formulation of this scope of work. Written or verbal contact will be made with pertinent individuals and/or organizations to obtain additional information as needed.

Site Survey

A site survey which incorporates an aerial photo analysis will be performed to establish a topographic map of the site. The site will be represented on two maps of different scale. One map will cover the immediate site (about 7.5 acres) and will be prepared at an accuracy enabling it to be used for remedial design (assumed to be 1-inch equals 40 feet). A second map will cover the site, town landfill, and adjacent wetland (assumed to be about 700 acres) at a scale of about 1-inch equals 200 feet. These maps will be prepared with a two-foot contour interval, and will be prepared digitally to allow the scale to be easily changed as needed.

The 1 inch equals 200 feet site map (including 2-foot elevation contours) will be constructed from survey data collected at the site. The map will encompass the study area and contain the standard topographic, physiographic, cultural, and facility features. This map will provide the basis for sample locations.

Following completion of these field activities, the location of all field explorations will be surveyed to the nearest 0.01 foot vertically, and the nearest 0.1 foot horizontally. The locations for the wetland sampling program will be noted by a spot elevation. The summary will be of sufficient detail to facilitate future expansion of the map, in directions where contaminants may be migrating or may be likely to migrate and the addition of future sampling locations as they are needed.

<u>Preparation of Project Plans</u>

The preparation of the project plans includes preparation of draft and final versions of the Quality Assurance Program Plan (QAPP) and the site-specific Health and Safety Plan (HASP).

- The QAPP includes sampling and analytical objectives; the site-specific quality assurance requirements; detailed procedures for field activities; and data management elements.

- The HASP includes site-specific information, a hazard assessment, training requirements, monitoring procedures for site operations, safety and disposal procedures, and other requirements.

Development of Remedial Response Objectives and Response Actions

Based on the data collected and evaluated during this task, preliminary remedial response objectives will be developed. Prior to establishment of the response objectives, significant site problems, preliminary contaminant migration pathways and ARARs will be identified and assessed. Accounting for these factors, the remedial response objectives may be refined to address any substantial risks to public health and the environment with consideration given to site-specific conditions. Based on the response objectives, general response actions will be formulated to address each of the sites problem areas. These response actions will form the foundation for subsequent technology identification and for alternative development and screening.

During the development of remedial response objectives, a project review meeting will be conducted with NYSDEC representatives to discuss proposed methodology for developing response objectives and, if necessary, deriving target levels for contaminant clean-up of media presenting potentially significant human health or environmental risk.

3.2.1.2 Field Investigation.

Project Mobilization. This part of the subtask will consist of field personnel orientation and equipment mobilization and will be performed at the initiation of each phase of field activities as necessary. A field team orientation meeting will be held to familiarize personnel with the site history, health and safety requirements, and field procedures.

Equipment mobilization will include, but is not limited to, the setup of the following equipment:

- Site office trailer;
- Field Laboratory trailer;
- Drilling subcontractor equipment;
- Utilities (electrical power, telephone);
- Sampling equipment;
- Health and safety decontamination equipment; and
- Generator for on-site power.

Mobilization activities shall commence in March 1989, after approval of the Work Plan by NYSDEC.

Air Monitoring Program. The air monitoring program is designed to provide the information necessary to ensure the safety of on-site personnel and to evaluate the potential risk to receptors downwind from the site. In order to evaluate the impact of RI activities to on-site air quality, air monitoring will be conducted before as well as during the RI program. The objective of the background air monitoring program is to determine the ambient PCB levels on-site prior to any intrusive site activity.

Quantitative Air Monitoring Program. The quantitative air monitoring program has been designed to determine an on-site baseline background ambient air concentration of PCBs and to determine the effect of RI field activities on this level. Ambient air concentrations of PCBs will be measured prior to and during the RI program.

The National Institute of Occupational Safety and Health (NIOSH) recommends an exposure limit for PCBs of 1 $\mu g/m^3$. The Occupational Safety and Health Administration (OSHA) and American Conference of Governmental Industrial Hygienists (ACGIH) exposure limits are 1 mg/m^3.

Sampling and analysis will be conducted in accordance with the NIOSH Method 5503 for PCBs. This method involves the use of low flow personal sampling pumps and dual-stage glass filter plus florisil. Analysis is performed with gas chromatography and electron capture detection (GC/ECD). NIOSH Method 5503 has been included as Appendix B of this document, providing detailed sampling and analytical procedures.

Sampling locations for both the background and RI air sampling program will be proposed in the field and accepted by a NYSDEC representative prior to the implementation of the sampling program. If elevated levels of VOCs are detected and sustained (1-5 ppm in the breathing zone) during either the background air monitoring or the RI program, the air monitoring plan will be modified to provide additional sampling and analysis of VOCs.

Site Safety Practices. The level of personal protection equipment specified in the HASP will be verified by the results of air quality screening performed on-site during the field mobilization activities. This screening will be performed with a PI meter and a digital dust indicator.

PI readings steadily above background in the breathing zone may require upgrade to Level C from an initial personnel protection Level of Modified D (Level C dermal protection).

Particulate levels will be measured upwind of the work site on a daily basis, before the start of each work day, to establish background levels. Particulate measurements will be taken periodically at each work station during the day. If particulate concentrations reach two and one-half times background levels, work will be immediately suspended and personnel protection will be upgraded to Level C.

The HASP details the air monitoring and personnel protection upgrade procedures to be followed during the field investigation. Air monitoring equipment used on-site will include a PI meter, O_2/Explosimeter, radiation detector, and a digital dust indicator.

Seismic Survey. The geophysical investigation at the NLODS will be conducted using seismic refraction. The survey will be completed prior to piezometer and monitoring well installation. The seismic survey is planned to define subsurface conditions across the site. Approximately 2000 lineal feet will be completed. A Geometrics ES2415-F Signal Enhancement Seismograph will be used, with 10- to 20-foot geophone spacings. The energy generation points will be spaced 10 to 20 feet apart.

On-site Soil Investigation

The on-site soil investigation will consist of a soil boring program. The results of this investigation will be used to estimate the distribution of contamination in the soil and be used to complete the site characterization as well as for estimating volumes of contaminated soil.

Soil Borings. A total of 35 soil borings will be drilled for the site during the RI. These borings are designed to define the horizontal and vertical distribution of contamination within the lagoon and to collect samples to aid in the development of treatment alternatives. Because the disposal area was reportedly operated as a lagoon, it is expected that the ponding action caused a fairly uniform distribution of contaminants to be deposited across the floor of the lagoon. As a result, Jordan will conduct the soil borings on a gridline basis as shown on Figure 3-1.

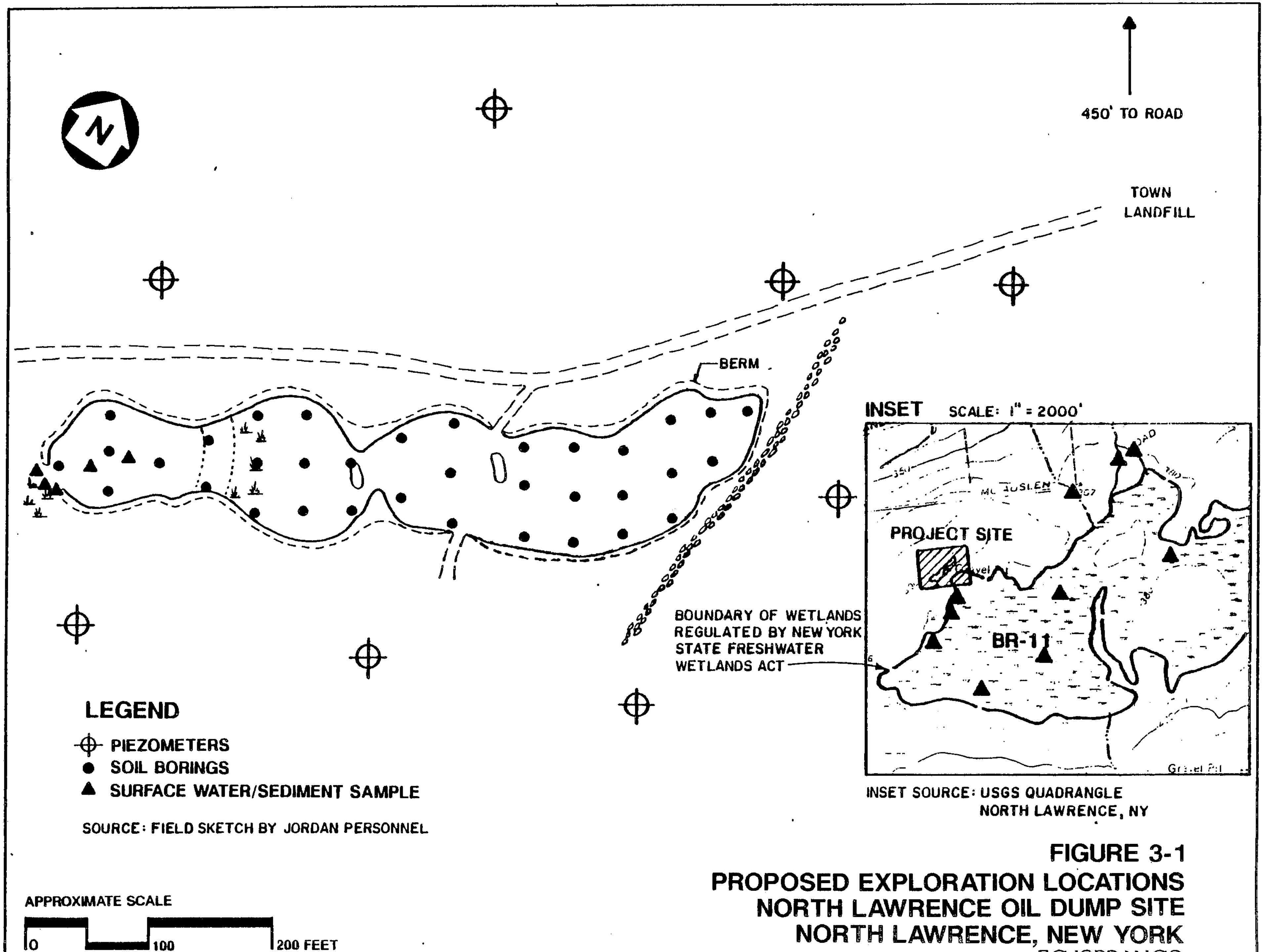

FIGURE 3-1
PROPOSED EXPLORATION LOCATIONS
NORTH LAWRENCE OIL DUMP SITE
NORTH LAWRENCE, NEW YORK

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Borings will be advanced to a depth of 15 feet using hollow-stem augers at Level C dermal protection. Organic vapors will be monitored in the breathing zone and at the well head with a PI meter. If PI readings steadily above background are encountered, personal protection levels will be reassessed as described in the HASP. Soil samples will be obtained on a continuous basis, starting at the ground surface, using a split-spoon sampler. These samples will be screened in the field for petroleum hydrocarbons using a gas chromatograph (GC) with a flame ionization detector (FID) and for PCBs using a GC with an electron capture detector (ECD). A field laboratory will be established in a second trailer that will be located in North Lawrence so that it can be equipped with utilities. Radio communications between the site and the trailer in North Lawrence will allow rapid data reporting back to the site. The first sample showing a non-detect or the sample having the lowest detected concentration from each boring will be submitted to the laboratory for confirmation. In addition, 10 soil samples will be selected from the soil samples which exhibit contamination for CLP laboratory analysis to confirm the accuracy of the field screening. Use of the field screening will enable the task leader to evaluate the adequacy of the data generated and decide whether adjustments (depth and/or density of borings) need to be made to satisfy the objectives of the soil sampling program.

Test Pits. If geologic conditions prohibit good recovery of soil samples, test pits will be used as an alternative method to collect shallow subsurface soil samples. There are several adverse affects of using test pits where there is shallow or perched groundwater. It is extremely difficult to excavate below the groundwater due to the instability of the pit walls caused by the groundwater. An additional problem with test pits occurs when the pit is excavated through a contaminated zone into a clean zone. It is difficult to prevent introduction of contamination into the clean zone either from the excavation process or backfilling. If a confining layer is encountered, the excavation will be terminated.

Up to twelve samples will be composited from the borings and test pits for analysis of a number of physical parameters to aid in evaluating treatment alternatives including the following:

- Incineration: Analyses for heating value, moisture content, metals, PCBs, ultimate and proximate analysis (C, H, O, S, Cl, volatile matter, fixed carbon, and ash).

- Solvent extraction: Analyses for total solids, particle size distribution and viscosity.

- Solidification: Toxicity Characteristic Leaching Procedure (TCLP) testing to determine the potential for leaching of organics into groundwater or surface water.

- Biological: Analyze for phosphorus content, cyanides, and pH.

These data will be used to help scope the Second Phase RI treatability studies.

Because of the unrestricted access to the site and the noticeable tire tracks in the disposal area, six surface soil samples will be collected from the access road and analyzed for PCBs to determine if contaminants are being transported from the lagoon area on vehicle tires.

All soil samples sent to the laboratory trailer which are not selected for chemical analysis will be transported back to the site and disposed of in approved drums. The drums will be staged on pallets for disposal, at an area to be determined by NYSDEC.

Piezometer Installation. Following interpretation of the seismic survey data eight piezometers will be installed at the North Lawrence site to establish an understanding of the shallow local groundwater flow system at the site. The piezometers will also be used to allow differentiation of groundwater flow from beneath the site from that which flows from the town landfill. Three of the piezometers will be advanced at least 30 feet into the till or to the bedrock surface, whichever comes first, so that the hydraulic characteristics of the till can be determined. A preliminary groundwater contour map will be prepared from water level data obtained from these piezometers. This data along with the geophysical data will be used to determine locations for the monitoring wells. The final monitoring well locations will be established in conjunction with NYSDEC. The shallow piezometer boreholes will be advanced using a minimum 3.25-inch ID hollow-stem augers or by a minimum 2.5-inch I.D. flush joint casing (spun casing technique). Flush joint casing will be used if auger refusal is encountered or at Jordan's request. It is anticipated that flush joint casing will have to be used.

The deep boreholes will be double cased to prevent vertical migration of contaminants during drilling. The borehole will be advanced with 4.0-inch flush joint casing using the drive and wash method and will be set into the dense till formation (estimated to be an average depth of 5 feet below the ground surface). The 2.5-inch flush joint casing will be telescoped through the 4.0-inch casing to a depth of approximately 30 feet using the spun casing technique and recirculating drill fluids. Both casings will be removed from the ground upon completion of the piezometer installation. All borings will be installed using Level C dermal personnel protection with the ability to upgrade to Level C as specified in the HASP. Tentative locations are shown on Figure 3-1. The shallow piezometers are assumed to be 15-feet in depth and the deep piezometers 30-feet. Soil samples will be obtained at 5-foot intervals using a split-spoon sampler. One soil sample from each piezometer boring will be analyzed for TCL inorganics for reference purposes. In addition, a single complete TCL analysis will be run on a randomly selected sample to provide background organic data. Reference samples will be obtained from each split-spoon and placed in wide mouth pint size jars. Drill cuttings and fluids from the shallow borings will be disposed at each boring location in accordance with NYSDEC policy. Drill cutting and fluids from the deep borings will be collected in DOT-approved 55-gallon drums. The drums will be stored at each boring location, pending analytical results from groundwater and soil chemical analyses.

The eight piezometers will be constructed of 3/4-inch ID, flush jointed, Schedule 40 PVC well risers and screens with 0.010-inch machine-slotted well screens. The screen length will be 10 feet. A silica sandpack will be placed around each screen, filling the annulus and extending 1 to 2 feet above the top of the screen. A 2 foot minimum bentonite seal will be placed on top of the sandpack. The remainder of the boring will be filled with a Portland cement/bentonite grout slurry to the ground surface. A protective casing with locking cover (4-inch ID and 6 feet in length) will be placed over the top of the piezometer. Each piezometer and protective casing will extend up to 3 feet above the ground surface and to the frost line below the ground surface and be concreted into place.

Monitoring Well Installation. Based on the groundwater flow system defined by the piezometers and the result of the seismic refraction survey, eight paired monitoring wells will be installed at the site. Monitoring wells will be located to intercept groundwater moving toward potential receptors such as the wetlands and domestic wells. Monitoring wells will also be located to determine the impact of the nearby town dump on receptors and the contribution of the dump to contamination at the site.

Jordan will install eight paired shallow and deep monitoring wells. The shallow boring will be advanced with a minimum 4.25-inch ID hollow stem auger or by a minimum 4.0-inch flush joint casing (spun casing technique). Flush joint casing will be used if auger refusal is encountered or at Jordan's request. It is anticipated that flush joint casing will have to be used. The deep boreholes will be double cased to prevent vertical migration of contaminants during drilling. The borehole will be advanced with 6.0-inch flush joint casing using the drive and wash method and will be set into the dense till formation (estimated to be an average depth of 5 feet below the ground surface). The 4.0-inch flush joint casing will be telescoped through the 6.0-inch casing to a depth of approximately 40 feet using the spun casing technique and recirculating drill fluids. Both casings will be removed from the ground upon completion of the piezometer installation. Locations for these monitoring well pairs will be determined in the field by Jordan and approved by NYSDEC personnel pending initial results from the piezometer installations. All borings will be installed using Level C dermal personnel protection with the ability to upgrade to Level C as specified in the HASP.

The borings shall be advanced using 4.25-inch ID hollow stem augers at Level C dermal personal protection. Soil samples will be collected from the deeper boreholes of the pairs at 5-foot intervals with a 2-inch ID, split-spoon sampler in accordance with the procedures described in the QAPP. Split-spoon samples will be screened with a PI meter and examined for visual signs of contamination. Reference samples will be obtained and placed in wide mouth pint size jars from each split-spoon.

Drill cuttings and fluids from the shallow borings will be disposed at each location in accordance with NYSDEC policy. Drill cuttings and fluids from the deep borings will be collected in DOT-approved 55-gallon drums. The drums will be stored at each boring location, pending analytical results from groundwater and soil chemical analyses.

Each of the paired wells will have one well at the water table (a depth of approximately 10 feet) and one well at a depth of 40 feet. The monitoring wells will be constructed of 2-inch ID, flush-jointed stainless steel with 0.010-inch machine slotted well screens. The shallow wells will have 5-foot screens and the deep wells will have 10-foot screens. A silica sandpack will be placed around each well screen, filling the annulus and extending a minimum of 2 feet above the top of the screen. A 2-foot minimum bentonite seal will be placed on top of the sandpack using a 0.5-inch tremi-pipe to isolate the screened zone from the remainder of the boring. The remainder of the boring will be filled with a Portland/bentonite grout slurry to the ground surface. A protective casing with locking cover (4-inch ID and 6 feet in length) will be placed over the top of the well. Each well and protective casing will extend up to 3 feet above the ground surface and to the frost line below the ground surface and will be concreted into place.

Each monitoring well will be developed by the drilling contractor using the pump-and-surge or airlift method. Development water from shallow monitoring wells will be disposed at each monitoring well location in accordance with NYSDEC policy. Development water from deep monitoring wells will be collected in DOT-approved 55-gallon drums. These drums will be stored at each monitoring well location pending analytical results from groundwater chemical analyses. In-situ hydraulic conductivity tests will be conducted on each well after development. These data will be used to design and cost remedial alternatives for groundwater treatment.

Wetlands Investigation. Oily material from the NLODS has been observed in the wetlands at the eastern end of the lagoon. The wetland sediments may serve as a sink for metals and less mobile organic contaminants. For more mobile contaminants in surface and groundwater, the wetland may be a transport pathway. The objectives of Jordan's wetland investigation are to characterize the nature and distribution of wetland contamination and to identify contaminant transport mechanisms in the wetlands.

Fourteen surface water and sediment samples will be obtained to determine the potential off-site migration of contaminants to the wetlands. Approximate sampling locations are shown on Figure 3-1. Two samples will be collected in the ponded area of the lagoon. These samples will be analyzed for TCL compounds.

In addition, a wetland characterization of the existing environment of the on-site and direct off-site areas will be conducted. This description will include the development of a cover type map from aerial photographs, the identification of major vegetative communities, aquatic communities, and their associated fish and wildlife communities. Included will be a description of trophic pathways where contaminants could bioaccumulate and biomagnify through the food chain.

This wetland characterization shall be a baseline description of the site, if it is determined through the sampling program that these cover types and fish and wildlife receptors could be impacted, more intensive biological studies should be conducted to evaluate potential adverse impacts. This characterization will utilize the criteria outlined in the Freshwater Wetlands Act, Article 24 of the Environmental Conservation Law.

Biological information collected during the field investigations will be used to identify potential receptors of contamination, and supplement the sediment and surface water data. Biological information will include descriptions of terrestrial vegetative cover types (herbaceous plants, shrubs, and trees), aquatic vegetation (photoplankton, submerged and floating macrophytes, and emergents), aquatic organisms (fish and aquatic invertebrates) and wildlife, observed or collected in the field. Aquatic organisms will be sampled using the Eckman dredge (benthic macro-invertebrates), plankton tow (zooplankton and phytoplankton) and dip net (other invertebrates and fish).

Biota Tissue Sampling and Analysis. The objectives of the biota tissue sampling program are to determine if migration of PCBs and metals off-site in the food chain is occurring and if so, to determine if additional data are required to evaluate potential human health and environmental impacts. Depending on the organisms present, Jordan will sample frogs, tadpoles, fish, and terrestrial invertebrates for PCB and metals analyses. A total of 15 analytical samples are budgeted. The analytical program will include percent lipid so that PCB content can be expressed on a percent lipid basis. The samples of the aquatic organisms will be collected from the water bodies adjacent to the site and the invertebrate samples will be collected near the soil sampling locations. Final locations will be selected following consultation with NYSDEC. The analysis of the invertebrates will be whole body analyses while only the edible tissues of the larger aquatic organisms will be analyzed.

3.2.1.3 Sampling Program. Groundwater, surface water, sediment, subsurface soil, and air sampling will be conducted as part of the NLODS RI. Proposed sample collection locations are shown in Figure 3-1. The number of samples and sampling rationale are shown in Table 3-3. The appropriate sample bottle preservative and holding time are shown in Table 3-4. The number of samples and anticipated number of QA/QC samples to be collected are shown in Table 3-5. The following sections summarize the detailed procedures presented in the QAPP.

Groundwater Sampling

A total of 16 groundwater samples, not including QA/QC samples, will be collected from each of the monitoring wells. QA/QC samples will be collected at the minimum frequencies described in Table 3-5.

Groundwater sampling equipment will be decontaminated prior to use in accordance with the procedures outlined in the QAPP.

Groundwater sampling will be conducted at levels of personal protection specified in the site-specific HASP. Sampling of groundwater wells will proceed from the upgradient or background wells to the downgradient or contaminated wells, as best as can be determined based on existing data.

Tools, equipment, and instruments used to collect groundwater samples will be decontaminated before and after each sample is collected. Decontamination will be accomplished using a methyl hydrate/deionized water wash followed by a deionized water rinse.

TABLE 3-3
SUMMARY OF ANALYTICAL PROGRAM
NORTH LAWRENCE OIL DUMP SITE

Number of Samples[1]	Media	Analysis	Rationale
Task II			
245	Soil	field screen for hydrocarbon/ PCBs	Limit laboratory analytical costs, determine quantity of contaminated soils
35	Soil	TCL	Confirm bottom of contaminated soils
10	Soil	TCL	Verify screening accuracy
6	Soil	PCBs	Investigate if PCBs carried out of pit on vehicle tires
8	Soil	TCL metals (7), TCL (1)	Determine background soil conditions
16	Groundwater	TCL	Verify groundwater quality
16	Surface water/ Sediment	TCL	Investigate potential for contamination of regulated wetland
16	Sediment	TOC	Adsorption of PCBs
14	Surface water	pH, hardness	Mobility of metals; bioavailability of toxicants
14	Surface water	DO	Identification of aerobic/ anaerobic conditions
14	Surface water	Temperature	Biological limiting factor
12	Source	pH, ultimate and proximate analyses, cyanides & sulfides, BTUs, TCLP	Treatability
2	Air	PCBs	Established background concentrations
15	Air	PCBs	Evaluate potential PCB exposures during RI activities
15	Biota Tissue	PCBs, metals	Evaluate food chain impacts
Task V			
8	Groundwater	TCL	To investigate boundaries of plume
6	Surface water/ Sediment	TCL	To investigate chemical distribution in regulated wetland
5	Treatability Samples	Various	To determine effectiveness of technologies
4	Soil	TCL	To characterize soil at the closed town dump.
3	Groundwater	TCL	To characterize groundwater quality at the closed town dump.

[1] QA/QC samples not included.

TABLE 3-4 (cont.)

SUMMARY OF FIELD SAMPLING REQUIREMENTS
NORTH LAWRENCE SITE

Type, Number of Sample Locations and Analysis	Number/Type of QA/QC Samples	Sample Volume	Sample Container	Preservation	Holding Time	Field Measurements
(Sampling Device: Split Spoon)						
Subsurface Soil - up to 59						
TCL VOA	2 field duplicates	2 x 60mℓ (4oz)	wide mouth glass	Cool to 4°C	7 days	
		2 x 120mℓ (4oz)	wide mouth glass	Cool to 4°C	10 days to extraction[1]	
TCL Semi-VOA	2 field duplicates	1 x 120mℓ (4oz)	wide mouth glass	Cool to 4°C	NA	
		2 x 40mℓ	borosilicate glass	Cool to 4°C	7 days	
TCL Metals	2 field duplicates	4 x 1ℓ	amber glass	Cool to 4°C	5 days to extraction	
		2 x 120mℓ (4oz)	wide mouth glass	Cool to 4°C		
PCBs		2 x 120mℓ (4oz)	wide mouth glass	Cool to 4°C		

[1] 40 days after extraction

TABLE 3-4

SUMMARY OF FIELD SAMPLING REQUIREMENTS
NORTH LAWRENCE SITE

Type, Number of Sample Locations and Analysis	Number/Type of QA/QC Samples	Sample Volume	Sample Container	Preservation	Holding Time	Field Measurements
Groundwater - 16						
(Sample Device: Stainless Steel Bailer)						
TCL VOA	1 trip blank/day	2 x 40mℓ	borosilicate glass	Cool to 4°C	7 days	Temperature
TCL Semi-VOA	4 field duplicate	4 x 1ℓ	amber glass	Cool to 4°C	5 days to extraction[1]	pH, specific
	4 sampler blank	2 x 1ℓ				conductance
(Sampling Device: Pumped)						
TCL Metals	4 sampler blank	1ℓ	high density polyethylene	HNO_3 to pH<2	6 months (Hg-23 days)	
NH_4		1ℓ	high density polyethylene	H_2SO_4 to pH<2	28 days	
BOD, TSS		1ℓ	high density polyethylene	Cool to 4°C	48 hours	
COD, TOC, PO_4		1ℓ	high density polyethylene	H_2SO_4 to pH<2	28 days	
Surface Water - up to 16						
(Sampling Device: Sample Bottle)						
TCL VOA	1 trip blank/day	2 x 40mℓ	borosilicate glass	Cool to 4°C	7 days	Temperature
TCL Semi-VOA	1 field duplicate	4 x 1ℓ	amber glass	Cool to 4°C	5 days to extraction[1]	pH, specific
TCL Metals	1 sampler blank	1ℓ	high density polyethylene	HNO_3 to pH<2	6 months (Hg-28 days)	conductance
Sediment up to 16						
(Sampling Device: S.S. Scoop)						
TCL VOA	1 field duplicate	2 x 60mℓ (4oz)	wide mouth glass	Cool to 4°C	7 days	
TCL Semi-VOA		2 x 120mℓ (4oz)	wide mouth glass	Cool to 4°C	10 days to extraction[1]	
		2 x 120mℓ (4oz)	wide mouth glass	Cool to 4°C	NA	
TCL Metals	1 sampler blank	2 x 40mℓ	borosilicate glass	Cool to 4°C	7 days	
	(aqueous)	4 x 1ℓ	amber glass	Cool to 4°C	5 days to extraction	

TABLE 3-5

QA/QC SAMPLES FOR ANALYTICAL PROGRAM[1]
NORTH LAWRENCE OIL DUMP SITE

	No. of Samples[2]				QA SAMPLES				
Analysis	Water	Soil	Air	Biota Tissue	Sampler Blanks	Filtration Blanks	Trip Blanks	MS/MSD[3]	Total
TCL[3] VOA	55	79	--	--	3	--	18	16	171
TCL SVOA	45	79	--	--	11	--	--	14	149
TCL Inorganics	55	87	--	--	11	--	--	15	170
TCL Pest/PCB	45	86	--	--	11	--	--	14	156
TCL Cyanide	55	87	--	--	11	--	--	15	170
Other: TOC, hardness, DO	16	--	--	--	2	--	--	--	18
Other: pH, BTU, ultimate and proximate analyses, TCLP	--	12	--	--	--	--	--	--	12
PCB (Air)	--	--	20	--	2	--	--	2	24
PCB (Biota)	--	--	--	17	--	--	--	--	17
% Lipid Content	--	--	--	17	--	--	--	--	17
TCL Metals	--	--	--	17	--	--	--	--	17

NOTES

[1]Number of samples including field QC replicates.
[2]Matrix spike/matrix spike duplicate required by the NYDEC Contract Laboratory Program (CLP) protocols.
[3]Target compound list as defined by the current Statement of Work for USEPA's CLP.

Where applicable, scrubbing or brushing of equipment may be incorporated following the methyl hydrate rinse. Hand-wiping with paper towels may also be done before the decontamination procedure.

Groundwater sampling activities will be conducted at Level D personal protection with the ability to upgrade as specified in the site-specific HASP.

River and Wetland Surface Water and Sediment Sampling

A total of 16 surface water and 16 sediment samples, not including QA/QC samples will be collected at the locations shown in Figure 3-1. QA/QC samples will be collected at the minimum frequencies described in Table 3-5.

Surface water and sediment sampling equipment will be decontaminated before sample collection. Monitoring equipment used during the sampling event will be calibrated prior to each day's activities in accordance with the manufacturer's suggested procedures.

Sediment and surface water sampling activities will be conducted at Level C dermal personal protection with the ability to upgrade as specified in the site-specific HASP.

The location of each sampling station will be established in the field in the vicinity of the location shown in Figure 3-1. The sample site will be noted on a site plan or aerial photograph and marked in the field with flagging and a wooden stake. The stake will be labeled with the sample location number.

The surface water samples will be collected by immersing a clean beaker.

The sediment sample will be collected in conjunction with surface water sample to help define the partitioning of the contaminants between the soil and water. If both water and sediment samples will be collected at a given sampling site, the water sample will be collected before the sediment sample. Where sediments are to be obtained in wetlands during Phase II, a grab sample will be obtained in the immediate vicinity of the associated surface water sample. Grab or composited samples will be obtained from the surface of the sediment at all sites.

Sediment samples will be obtained using stainless steel scoops or spoons for shallow water locations, and a gravity corer or split-spoon sampler in deep water locations.

Subsurface Soil Sampling

A total of 59 analytical soil samples, not including QA/QC samples will be collected from the test borings, piezometers, monitoring wells, and access road. QA/QC samples will be collected at the minimum frequencies described in Table 3-5.

Personal Protection. Soil sampling from borings and test trenches, and for off-site borings, will be completed using Level C dermal personal protection with the ability to upgrade as specified in the site-specific HASP.

Background Air Monitoring Program

The background sampling program will consist of two monitoring locations. The sampling locations will be on-site, at least 100 feet from any potential PCB source and 100 feet from any potential wind flow obstruction. The sampling stations will be located at a height of approximately three to five feet above ground level. Sampling will be conducted for an eight-hour period. Ambient air will be sampled at a rate of 100 cubic centimeters per minutes (cc/min.) for a total sample volume of 48± liters for each sample.

One field blank will be obtained at the site and analyzed with the samples to determine contaminant levels due to transport and handling of the sample collection media.

The objective of the background air sampling program is to evaluate baseline PCB concentrations. Due to the anticipated low background levels, no meterology (wind speed and wind direction) monitoring will be performed. General weather observations including approximate wind direction and speed, precipitation, and ambient temperatures will be noted during sampling.

Background air monitoring activities will be conducted at Level D personnel protection with the ability to upgrade as specified in the site-specific HASP.

RI Air Monitoring

The objectives of this phase of air monitoring is to determine the effect of RI field activities on the previously established baseline ambient PCB concentrations at this site and to determine the potential ambient exposures of PCBs during the RI program. The RI sampling program will be an expansion of the background air sampling and use the same sampling and analytical procedures. The expansion will involve additional sampling sites.

Five sampling sites will be used. One sampling site will be an upwind "background" site. The other four sampling sites will be located near the RI activities as follows:

	Site	Purpose
1 sampler	At the edge of drilling or excavation activity.	Sample exposure and emissions.
1 sampler	Approximately 50 feet directly downwind from drilling or excavation activity.	Sample exposure and immediate downwind dispersion of any emissions.
2 samplers	Approximately 100 feet downwind of drilling or excavation activity. Each sampler would be offset approximately 50 feet off center of direct downwind.	Sample downwind of dispersion of any emissions.

As with the baseline samples, the sampling stations will be located at a height of approximately 3 to 5 feet above ground level. Sampling will be conducted over three 8-hour periods during one week of on-site activity. Ambient air will be sampled at a rate of 100 cc/min. for a total sample volume of 48±

liters for each sample. One field blank will be collected for each day of sampling.

An on-site meterology station will monitor wind speed and wind direction during the sampling program. Ambient temperature will be noted on each day of sampling. Results of the air monitoring program will be compared to relevant criteria from OSHA and NYSDEC.

RI air monitoring activities will be completed at Level D personal protection with the ability to upgrade as specified in the site-specific HASP.

3.2.1.4 Data Evaluation. The purpose of data quality evaluation is to assure that data generated during the project are adequate in quantity and applicable to project objectives. In order to make this determination, the body of data must be reviewed for the quality of data coverage, compatibility of data collection methods, and completeness with respect to meeting project objectives.

Data evaluation efforts will be organized as follows:

1. Source Characterization - will be based on chemical analyses results for water, soil, and sediment as well as pathway hydrodynamics, to define the possible location, size, and types of sources of contamination on-site.

2. Geologic and Hydrogeologic Characterization - incorporates the results of exploration and sampling activities, groundwater sampling and monitoring

activities as well as general hydrogeologic and hydrologic features of the site. This characterization will result in an understanding of the directions, rates, and fluctuations of surface water and groundwater throughout the site environs.

3. Water Quality Characterization - based upon the chemical analyses performed on groundwater and surface water samples, measured concentrations of the various substances will be evaluated with respect to drinking water standards and other health and safety guidelines. The evaluation will be geared to addressing the specific concerns identified for the project.

4. Ecological Assessment - consists of a biological characterization, an evaluation of exposure pathways and concentrations, and a determination of risk of environmental receptors based on ecotoxicity test results and observable manifestations of stress.

5. Air Quality Assessment - utilizing the data obtained during the monitoring and sampling of air during the field investigation, an evaluation of air quality problems will be performed.

To facilitate the interpretation of data generated during the RI field activities, the data will be reduced to the form of appropriate summary tables. A detailed environmental assessment including, as appropriate, determination of environmental fate and transport patterns will be performed.

3.2.2 Subtask B - Study Area Boundary Definition

Results from the First Phase RI will be submitted to NYSDEC, including raw data and applicable interpretations. Based on these data (cross-sections, boring logs and analytical data), the boundaries of the site and the distribution of contamination in various site media shall be further defined. This information will be used in Task III to aid in recommending removal actions or operable units; and will be used to help scope the Second Phase RI.

3.2.3 Subtask C - Identification of Applicable or Relevant and Appropriate Requirements (ARARs)

The National Contingency Plan (NCP) defines ARARs as "applicable or relevant and appropriate requirements," and identifies two categories for consideration during the RI/FS and remedial action design: (1) ARARs, and (2) additional guidance to be considered.

(1) Applicable Requirements. Applicable requirements are those federal requirements that would be legally applicable to the response action if that action were not taken pursuant to Section 104 or 106 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

(2) Relevant and Appropriate Requirements. Relevant and Appropriate Requirements are those federal requirements although not "applicable," designed for problems sufficiently similar to those encountered at CERCLA sites to make their application appropriate.

Relevant and Appropriate Requirements are intended to have the same weight and consideration as Applicable Requirements. Therefore, once a requirement is identified as relevant and appropriate, it is applied in the same manner as an Applicable Requirement.

According to these NCP definitions, only federal regulatory requirements are considered ARARs. The Superfund Amendment and Reauthorization Act (SARA) further expanded this definition of ARARs to include state regulatory requirements, as well as certain federal nonregulatory requirements. Prior to the enactment of SARA, state regulatory requirements that are more stringent than federal requirements, and are fully promulgated, and consistently applied, must generally be attained. SARA also requires that in the absence of regulatory requirements, certain specific federal nonregulatory guidance and criteria be attained, including Ambient Water Quality Criteria (AWQC).

ARARs are used as a guide in evaluating the appropriate extent of site cleanup, scoping, and formulating remedial action alternatives, and governing the implementation and operation of the selected action. ARARs are identified and considered so that CERCLA responses are consistent with pertinent state and federal environmental laws. In the absence of ARARs that address a particular site problem, federal or state guidance and criteria other than those specified herein may be considered and used, as appropriate.

Jordan will identify federal and state ARARs and any local requirements. In addition to ARARs, Jordan will also make preliminary determinations on the extent that other criteria, advisories, and guidelines are pertinent to the hazardous substances, location of the site, and remedial actions. ARARs and other criteria, advisories, and guidelines shall be:

1. considered in terms of their chemical-specific, location-specific, and action-specific attributes;

2. evaluated for each media (surface water, groundwater, sediments, soil, and air biota), particularly for chemical-specific ARARs, but including other ARARs as appropriate;

3. distinguished for each technology considered, particularly for action-specific ARARs, but including other ARARs as appropriate; and

4. considered at each major stage of the RI/FS where they are indicated.

Under the description of ARARs set forth in SARA, ARARs fall into three general categories:

- chemical-specific (i.e., govern the extent of site remediation)
- location-specific (i.e., pertain to existing site features)
- action-specific (i.e., pertain to proposed site remedies and govern the implementation of the selected site remedy)

In general, identification of chemical and location-specific ARARs are more important in the early stages of the RI/FS process; identification of action-specific ARARs gain importance later, during the FS tasks. If a requirement is determined to not be applicable, Jordan will subsequently consider whether it is relevant and appropriate. When new site-specific information becomes available, ARARs will be re-examined.

A preliminary list of chemical- and location-specific ARARs is shown in Table 3-6. This list will be updated as part of the draft RI. Action-specific ARARs will be identified during the development of remedial alternatives.

3.2.4 Subtask D - Baseline Risk Assessment

The information collected in the field investigations will be used in a baseline risk assessment to establish the extent to which contaminants detected at the site may present a risk to the public health, welfare, or the environment. The baseline risk assessment will consist of three components: a Public Health Evaluation (PHE), an Environmental Evaluation, and a Wetlands Assessment. These evaluations will assess present and potential impacts at the site in the absence of any further remedial actions.

Public Health Evaluation. The PHE will be a characterization of current and potential public health that could result if no further remedial action is taken. The purpose of the PHE is to identify areas for additional investigation, if necessary, and to support the development and evaluation of remedial alternatives.

TABLE 3-6

POTENTIAL FEDERAL AND STATE ARARs
NORTH LAWRENCE OIL DUMP SITE

Media	Potential Federal ARARs	Potential State ARARs	Other Requirements to be Considered	Consideration for RI/FS
Location-Specific				
<u>Wetlands</u>	Guidelines for Specification of Disposal Sites for Dredged or Fill Materials (40 CFR 230 Section 40(b)) for Wetlands	6 NYCRR Parts 662-665 - Regulations for Freshwater Wetlands	Wetlands Executive Order (EO 11990)	Impacts to the wetland onsite must comply with wetlands protection regulations.
	Clean Water Act (CWA) - 40 CFR Part 404	ECL Article 24 and Article 71, Title 23 - Freshwater Wetlands Act		
	Fish and Wildlife Coordination Act (16 U.S.C. 661)			
	National Environmental Policy Act - 40 CFR Part 6			
<u>Waste Lagoon</u>	RCRA - Surface Impoundments (40 CFR 264.220 - 264.269)			Requirements pertaining to the treatment, storage, transport and disposal will also be considered for some alternatives.
	RCRA - Waste Piles (40 CFR 264.250 - 264.269)			
Chemical-Specific				
<u>Groundwater</u>	Safe Drinking Water Act - Maximum Contaminant Levels (MCLs) (40 CFR 141.11-141.16)	6 NYCRR Part 703 - NYSDEC Groundwater Quality Regulation	Safe Drinking Water Act - Maximum Contaminant Level Goals (MCLGs)	Impacts to the shallow groundwater must comply with groundwater protection regulations
	RCRA - Subpart F Groundwater Protection Standards, Alternate Concentration Limits (ACLs)	Technical and Operations Guidance Series (TOGS)	Clean Water Act - Ambient Water Quality Criteria	
		State Sanitary Code, Part 5 - Drinking Water Supplies	Health Advisories (EPA Office of Drinking Water)	
		Title 10 NYCRR Part 170 - Water Supplies	EPA Risk Reference Doses (RfDs)	
		NYSDOH PWS 69-Organic Chemical Action Steps for Drinking Water	EPA Carcinogen Assessment Group Potency Factors	
		NYSDOH PWS 159 - Responding to Organic Chemical Concerns at Public Water Systems	Acceptable Intake - Chronic (AIC) and Subchronic (AIS) - EPA Health Assessment Documents	

TABLE 3-6 (cont.)

POTENTIAL FEDERAL AND STATE ARARs
NORTH LAWRENCE OIL DUMP SITE

Media	Potential Federal ARARs	Potential State ARARs	Other Requirements to be Considered	Consideration for RI/FS
			EPA Office of Water Guidance - Water-Related Fate of 129 Priority Pollutants (1979)	
Surface Water/ Wetlands	NPDES Regulations (40 CFR 122, 125)	6 NYCRR - Parts 701, 702, 704 - Surface Water Quality Standards	Federal Ambient Water Quality Criteria (AWQC)	Impacts to onsite surface water must comply with surfac water protection regulations
		Technical and Operations Guidance Series		
		6 NYCRR Parts 750-757 - Implementation of NPDES Program in NYS		
Soils/Sediment/ Waste	Toxic Substance Control Act PCB Disposal Requirements (40 CFR Part 761)	6 NYCRR - Part 371 Identification and Listing of Hazardous Waste (Includes Regulation of PCBs)		Onsite soils, wetland sediments, and lagoon wastes must comply with appropriate regulations
	Land Disposal Restrictions for Certain "California List" Hazardous Wastes (40 CFR Part 260)			

The basic approach to the PHE is described in the EPA Superfund Public Health Evaluation manual (EPA, 1986). It would be based on the information currently available as well as that collected during this investigation.

The first step in the PHE is the selection of indicator chemicals for which quantitative risk analyses will be performed. Indicator chemicals will be selected based on prevalence, concentrations observed, distribution among environmental matrices, toxicity, and environmental behavior as representative of the entire spectrum of compounds found on-site using the method described in the Superfund Public Health Evaluation Manual.

The second step in the PHE is the identification and characterization of potential exposure pathways, receptors, and exposure concentrations. Based on available information, important exposure pathways would be direct contact with surficial contaminants and consumption of potentially contaminated groundwater from private or public wells. Sampling of biota for tissue analysis will be performed. This will serve to determine exposure concentrations in ingestion exposure scenarios. Other possible routes of exposure that will be examined include inhalation of vapors or particulates originating from the site, dermal or inhalation exposure during recreational activities, and other human exposure pathways that may be identified in the Preliminary Risk Assessment. The need to model air impacts will be assessed following completion of the air monitoring program described in Section 3.2.1.3.

The data available should provide the exposure concentrations necessary in the baseline risk assessment; however, some estimation or modeling may be required.

Any modeling will be conducted in accordance with Superfund Public Health Evaluation Manual. The exposure concentrations will be compared to the ARARs agreed upon with NYSDEC.

Human intakes for the chemicals being considered for quantitative risk assessment will be estimated using the exposure concentration, appropriate standard human intake values (as provided in the Superfund Public Health Evaluation Manual), and other site-specific exposure assumptions as necessary will be developed and discussed with NYSDEC. The populations exposed will be evaluated, and the information derived from state and local officials regarding activities in the area will be summarized.

The toxicity of the chemicals being considered for quantification will be evaluated in toxicity profiles, which will describe acute toxicity and chronic toxicity, including carcinogenicity, mutagenicity, teratogenicity, reproductive effects, and other chronic effects. A summary of toxicity profiles, in lay person's language will be presented in the main text of the RI report. Reference doses and target risk levels will be identified from available information and in agreement with NYSDEC.

For an assessment of non-carcinogenic effects, the overall impact will be evaluated through the use of the Hazard Index Approach described in the Superfund Public Health Evaluation Manual. For chemicals exerting similar toxic effects, this method basically involves summing the ratio of each chemical's estimated dose exposure to its reference dose. Non-carcinogenic effects of both systemic toxins and carcinogens will be evaluated.

For potential carcinogens, risks are evaluated as probabilities, as the carcinogenic potency factor represents an upper 95 percent confidence limit on the probability of response per unit intake over a 70 year lifetime. These values multiplied by the chronic daily intake result in an estimated risk at the given level of exposure. Risks associated with exposure to individual chemicals can be summed assuming additivity, to determine a total carcinogenic risk for a given pathway. If certain receptors could be exposed through more than one pathway, risk associated with each pathway can be combined for the same chemical.

Uncertainties in this process will be identified to the extent possible. These could include such factors as uncertainties related to exposure scenarios, unknown future conditions, uncertainties related to exposure concentrations, especially if estimation or modeling is necessary, as well as uncertainties inherent in risk extrapolation.

Environmental Evaluation. The environmental evaluation at the NLODS will be a characterization of the current and potential environmental risks that could result if no further remedial action is taken. The purpose is similar to that identified for the PHE, that is to identify areas for additional investigation, if necessary, and to support the development and evaluation of remedial alternatives.

The approach to environmental assessment is similar to that described for the PHE in that exposure pathways, receptors, and exposure concentrations will be evaluated. The pathways will be evaluated based upon monitoring data for the site and visual observations. The environmental receptors will be identified based on a biological investigation including identification of plant species and sampling of aquatic invertebrates. Interviews with local officials or state fish and wildlife staff will be conducted to identify additional species found in the area, including migratory birds and anadromous fish, and to determine if rare, threatened, or endangered species are present in the vicinity of the site. Additional analysis or modeling in addition to that performed in the PHE, may be required to consider pathways unique to environmental receptors. The indicator chemicals used in the environmental evaluation will be selected independently of those chosen for the PHE. In selecting indicator chemicals, the chemicals present will be evaluated in order to identify any that are particularly toxic to biota, based upon available information.

If ARARs are available for environmental effects, they will be compared to exposure concentrations. Under SARA, Superfund actions must attain Ambient Water Quality Criteria (AWQC) for the protection of aquatic life. For aquatic organism exposure, the exposure concentration equals the concentration in water. For other routes of exposure and other receptors, however, exposures are more difficult to quantify. Based on information for species identified in the biological characterization such as home range, feeding behavior, and habitat requirements, or qualitative evaluation of exposure will be performed. Where exposure levels can be quantified, they will be compared to no observed effect levels, lowest observed effect level, or other appropriate measures of toxic responses.

Wetlands Assessment. The NLODS is located adjacent to a regulated wetland. As a result, a wetlands assessment is required in the RI, and will be incorporated into the environmental evaluation described above. The steps required are as follows:

- Review Information and Conduct Site Visit - Available information on the wetland will be collected and a site visit conducted by environmental risk assessment staff to initially study the area at the beginning of the field program. The purpose of the site visit is to characterize potential environmental receptors, evaluate wetland functional attributes, and record any observable existing ecosystem stress. Species lists of existing plant and animal communities will be developed based on field observations and sampling of aquatic invertebrates. Interviews with fish and wildlife officials will be conducted to characterize any populations of anadromous fishes and migratory birds using the wetland, and to determine if any threatened or endangered species exist in the wetland. Information contained in Fish and Wildlife Service, National Wetlands Inventory, and floodplain maps will be used in conjunction with characterization of the plant community in delineating boundaries of wetlands and floodplains.

- Collect Additional Information - In order to support the environmental assessment, Jordan will develop an understanding of past environmental conditions at the site by collecting and reviewing background information pertaining to adjacent wetlands and waterways, including threatened and endangered species lists, national wetlands inventory map (Fish and

Wildlife Department), soil maps (Soil Conservation Service), climatological data, and aerial photographs of the site and surrounding areas.

- o <u>Conduct Wetlands Characterization</u> - The wetlands in the site study area will be identified and mapped. The wetlands will be characterized by type according to the U.S. Fish and Wildlife Service (USFWS) classification scheme, and an estimate of the size and boundary delineation will be developed. USFWS National Wetlands Inventory maps, local and state wetlands maps, and the extent of the wetland plant community will be used for wetland boundary delineation. The wetlands identified will be related to overall ecosystem structure and function for the study area. Specifically, this element will consider the following:

  - Physical and hydrological characteristics;
  - Biological characteristics; and
  - Functional attributes of wetlands (i.e., water quality, habitat, recharge/discharge and socio-economic attributes).

- o <u>Determine the Effect of Contamination on the Wetlands</u> - Contamination in the wetlands will be evaluated as described earlier. The impact of any contamination, now or in the future, on the wetlands and their functional attributes will be evaluated. This assessment will serve as a baseline for the evaluation of any remedial alternatives proposed for the site.

- o <u>Floodplain Assessment</u> - In accordance with the Floodplain Management Executive Order (E.O. 11988), a floodplain assessment of the site will also be completed. The functional attributes of the wetlands and waterways adjacent to the NLODS will be assessed, using qualitative techniques, on the basis of water quality, hydrology, habitat, and socioeconomic function. Jordan will contact a number of agencies and groups, including the New York State Division of Fisheries and Wildlife and other appropriate parties, to ensure the technical accuracy of the RI/FS documents.

3.3 TASK III - DEVELOPMENT OF ALTERNATIVES (FIRST PHASE FS)

The basis for the FS and eventual selection of a remedial alternative will be generated by activities conducted in this task. Activities include deciding if the site should be approached as a series of discrete problems (operable units) or as a single remediation problem. The need for a removal action will be determined based on data from the Phase I field investigation. Potential remedial alternatives will be compiled from appropriate technologies prior to being screened in the next task. This information will be prepared for NYSDEC in a manner appropriate for presentation at a public meeting. The activities performed under this task are described in the following paragraphs.

Throughout the FS process, Jordan will use references including SARA; USEPA Guidance on Feasibility Studies Under CERCLA (1985), National Oil and Hazardous Substances Pollution Contingency Plan: Final Rule, NCP (1985), and Remedial Action Costing Procedures Manual; Interim Guidance on Superfund Selection of Remedy, OSWER Directive (1986); and technology-specific guidance and evaluation documents, as appropriate. As additional guidance documents reflective of SARA become available, they will be incorporated in the FS process.

The overall objectives of the NLODS FS are to develop and evaluate remedial alternatives that will allow NYSDEC to select a remedial action that:

- protects human health and the environment;
- attains federal and state public health and environmental requirements identified for the site, including ARARs;
- utilizes permanent solutions and alternative treatment technologies to the maximum extent practical, given technological feasibility and availability;
- utilizes treatment to permanently and significantly reduce the toxicity, mobility, or volume of wastes;
- adheres to CERCLA as amended by SARA; and
- minimizes costs.

The selected remedial response should represent the best mix of effectiveness, implementability, and cost factors examined in the detailed analysis of alternatives.

3.3.1 Subtask A - Development of Remedial Response Objectives and Remedial Action Target Levels

Using data collected during the Phase I RI, Jordan will develop remedial response objectives addressing the substantial risks to public health and the environment at the site. Contaminant- and location-specific ARARs assist in determining the extent of site cleanup, and will be used to develop remedial response objectives. Remedial action target levels will be developed from the response objectives. Jordan will discuss with NYSDEC the method for developing target levels and the exposure assumptions.

3.3.2 Subtask B - Identification and Screening of Applicable Remedial Technologies

Based on the remedial response objectives and remedial action target levels, Jordan will identify a list of applicable technologies. During this process, Jordan will assess the need for source control and management of migration measures and evaluate the applicable technologies for both remedial classifications. Technologies will be screened on the basis of effectiveness and implementability at the site. In addition, implementability in terms of technical feasibility, demonstrated performance, and availability of contractors and equipment will be considered. Technologies relevant to SARA's emphasizing the use of permanent solutions, innovative treatment, and resource recovery will pass through the screening, if appropriate. Reasons for eliminating technologies in this stage will be documented in the FS report.

Several sources will be utilized during the screening of initial technologies, including but not limited to:

- Remedial Action at Waste Disposal Sites Handbook (Revised), EPA, October 1985.

- Handbook for Evaluating Remedial Action Technology Plans, EPA, September, 1984.

- Review of In-Place Treatment Techniques for Contaminated Surface Soils Volume I Technical Evaluation, EPA, September, 1984.

- Technologies Applicable to Hazardous Waste, EPA, May 1985.

- RCRA/CERCLA Alternative Treatment Technology Seminar, EPA, May 1986.

- Handbook for Stabilization/Solidification of Hazardous Wastes, EPA, June 1986.

- PCB Sediment Decontamination Processes Selection for Test and Evaluation, Research Triangle Institute, May 1987.

3.3.3 Subtask C - Assembly of Potential Remedial Action Alternatives

After remedial technologies have been defined, Jordan will develop feasible remedial action alternatives. These will be further categorized as either source control or management of migration alternatives.

The purpose of source control alternatives is to prevent or minimize migration of hazardous substances from the source material. Management of migration alternatives involves groundwater response actions where contaminated groundwater has moved downgradient from the site. Selection of remedial alternatives from each category will allow a comprehensive site response that is effective and protective of both human health and the environment.

In keeping with CERCLA amendments and the NCP, a range of treatment alternatives will be developed by Jordan based on the need for long-term management and each alternative's ability to reduce the mobility, toxicity, or volume of contaminants. A containment option involving little or no-action alternatives will also be developed. Thus, the following guidelines will be used to develop alternatives:

1. To the extent that it is both feasible and appropriate, treatment alternatives for source control remedial actions will be developed. Alternatives that contain treatment technologies which permanently reduce the toxicity, mobility, or volume of site waste will be highlighted.

2. To the extent that is both feasible and appropriate, treatment alternatives that address management of migration will be developed. For groundwater response actions, Jordan will evaluate a limited number of remedial alternatives within a performance range that is defined in terms of varying remediation levels and different rates of restoration.

3. An alternative that involves containment of waste with little or no treatment but provides protection of human health and the environment (primarily by potential exposure or reducing the mobility of the waste) will be developed. Under SARA, the off-site transport and disposal of hazardous substances or contaminated materials without treatment should be the least favored alternative remedial action where practicable treatment technologies are available.

4. A no-action alternative will also be developed.

A meeting will be held with NYSDEC following assembly of remedial alternatives to discuss the technology screening and alternative development before proceeding with the screening of remedial action alternatives.

3.3.4 Subtask D - Screening of Remedial Action Alternatives

The list of remedial action alternatives will be screened to narrow the number of alternatives for subsequent detailed analysis, while still preserving a range of treatment options. The evaluations comprising this screening are not intended to substitute or supplement the detailed analysis of each alternative to be conducted in later phases.

The screening is accomplished by considering the alternatives in terms of effectiveness, implementability, and cost factors. Cost is an important factor when comparing alternatives that provide similar results. However, costs may not be used to discriminate between treatment and nontreatment alternatives. The list of alternatives will be narrowed by eliminating the following:

- o Alternatives that are not technically reliable, do not effectively and adequately protect public health and the environment, or do not attain ARARs.

- o Alternatives that are not technically feasible or available, or require significant institutional or administrative effort during implementation or operation.

- o Alternatives that are significantly more costly than other alternatives, but fail to provide greater reliability, effectiveness, or environmental/ public health benefits.

Rationale for eliminating alternatives at this stage will be documented in the FS report. Innovative technologies will be carried through the screening if Jordan believes they offer potential for better treatment performance or implementability, few or lesser adverse impacts than other available approaches, or lower costs than demonstrated technologies.

A meeting will be held between Jordan and NYSDEC following the screening of remedial alternatives to present results and to obtain input prior to the remedial alternatives evaluation.

3.4 TASK IV - REMEDIAL ALTERNATIVES EVALUATION (SECOND PHASE FS)

Remedial alternatives passing the initial screening process will be further evaluated and compared as required in the NCP and CERCLA (as amended). Depending on the results of the field investigation and remaining data gaps, the detailed analysis may be performed after treatability studies and any additional site investigation work that might have to be performed.

As part of the FS process, SARA requires that waste, site, and technical/operational limitations, as well as the ability of each alternative to meet Federal and state ARARs, be considered. Factors that will receive special consideration during the detailed evaluation of remedial alternatives include:

- long term uncertainties of land disposal;
- persistence, toxicity, mobility, and propensity for bioaccumulation of contaminants at the site;
- short- and long-term potential for adverse human health effects;
- long-term maintenance costs;

- potential for future remedial action costs if the remedy fails; and

- potential threat to human health and the environment from the excavation, transportation, and redisposal or containment of hazardous substances, pollutants, or contaminants.

Both short- and long-term effects for each of the above listed factors will be assessed. As in the alternative screening process, effectiveness, implementability, and cost factors will be considered.

3.4.1 Subtask A - Effectiveness Evaluation

The effectiveness of each alternative will be determined by evaluating the following:

- the ability of the remedial alternative to adequately protect public health;

- the ability of the remedial alternative to adequately protect the environment;

- the ability of the remedial alternative to significantly and permanently reduce the toxicity, mobility, or volume of hazardous constituents; and

- the technical reliability of the remedial alternative.

Criteria used to assess effectiveness are described further in the following paragraphs.

Public Health Evaluation (PHE). A comparison will be made between the potential public health risks for each remedial alternative and those for baseline site conditions, as predicted in the RI. Baseline site conditions represent the no-action alternative, which constitutes the minimal effort required to protect public health.

Environmental Impacts Evaluation. Potential environmental impacts from each alternative will be compared with current (baseline) conditions described in the RI. Beneficial effects of each alternative will be evaluated by Jordan in terms of contaminant levels expected in environmental media during and after implementation of the remedial alternative, improvement in the biological environment as a result of decreased contamination levels, and improvement in human use resources (if applicable). Adverse effects associated with construction and operation of each alternative will be described in terms of direct effects (e.g., loss of habitat) or indirect effects (e.g., increased erosion and sedimentation). Measures to mitigate adverse effects will be outlined in this discussion. Because wetlands are an environmentally sensitive area at the NLODS, a wetlands and floodplain assessment will also be performed, and responses which have the potential to impact wetland systems will be evaluated in detail.

Attainment of ARARs. ARARs will be considered during the detailed evaluation of alternatives. In this task, action-specific ARARs will be outlined for each alternative and chemical- and location-specific ARARs will be summarized. Jordan will develop tables for each alternative specifying what the remedial alternative must accomplish to attain ARARs. The tables will be used to establish design criteria for the selected remedial alternative.

Evaluation of Reduction in Mobility, Toxicity, Volume. In this evaluation, Jordan will address the ability of the remedial alternative to achieve a significant reduction in the mobility, toxicity, or volume of hazardous constituents. Permanence of remedial action and secondary waste management issues will also be discussed. Secondary waste management issues may include long-term monitoring of a site where wastes are contained with little or no treatment, or the management of concentrated hazardous waste residues remaining after the application of primary treatment methods.

Technical Reliability. This will be an assessment indicating how well the technology under consideration is expected to perform once constructed. Each technology will be evaluated against the occurrence of failure and extend to repairs and maintenance required under existing site conditions.

3.4.2 Subtask B - Implementability Evaluation

The implementability of each alternative will be determined by evaluating the following:

- o the technical feasibility, availability, and constructability of the technologies that each remedial alternative would employ; and o the administrative feasibility of implementing each remedial alternative.

The implementability criteria are described further in the following paragraphs.

Technical Feasibility. This will be an assessment of whether the technologies comprising each remedial alternative could be applied under existing site conditions by available contractors. Individual work activities will be described and technologies will be evaluated for on-site constructability and the availability of necessary equipment, personnel, and special services. This assessment will also evaluate the degree of difficulty involved in implementing the remedial alternatives, short-term and long-term threats to the safety of nearby communities and the on-site workforce, the time required to complete construction, and the time required to achieve the response objective. Included in this discussion will be demonstrated performance, the development status of new treatment processes, and the technical complexity of the remedial alternative. The ability to perform operation and maintenance functions and the potential for replacing technologies will be discussed. The technical and institutional ability to monitor the effectiveness of the remedial alternative will also be evaluated.

Administrative Feasibility. In this assessment, an evaluation of the ability to obtain necessary permits, institutional controls associated with remedial alternatives, long-term management, and administrative concerns will be discussed.

To the extent possible, special consideration will be given to technologies that provide treatment, resource recovery, or permanent solutions. The long-term uncertainties and administrative requirements of each alternative will be highlighted.

3.4.3 Subtask C - Cost Evaluation

A detailed cost analysis will be performed for each alternative and will consist of the following steps:

- estimation of capital, operation, and maintenance costs (including long-term maintenance costs);
- calculation of annual costs and present worth;
- evaluation of the sensitivity of cost estimates to changes in key parameters (e.g., discount rates, design, or effective life);
- summarization of the data used in the alternative analysis; and
- assessment of the potential for future remedial action costs if the remedy fails.

For each alternative the cost will be estimated within a range of -30 percent to +50 percent. The cost analysis will include separate evaluation of capital, operation, and maintenance costs. Capital costs will consist of short-term installation costs such as engineering/design fees, materials and equipment, construction, and off-site treatment or disposal. Operation and maintenance costs will consist of long-term costs associated with operating and monitoring the remedial actions such as a groundwater extraction and treatment facilities or groundwater monitoring programs. Capital and annual operation and maintenance costs will be based on the anticipated time necessary for the alternative to achieve established cleanup criteria.

Cost estimates will be prepared using data available from Jordan project files, standard estimating guides, the current USEPA Remedial Action Costing Procedures Manual (1984), and quotations from equipment vendors and remedial contractors. Equipment replacement costs will be included when the required performance period exceeds equipment design life.

3.4.4 Subtask D - Evaluate ARARs

Following initial screening of alternatives Jordan will meet with NYSDEC to discuss the alternatives which passed the screening step. Prior to this meeting Jordan will prepare a summary report of the Second Phase FS including successful alternatives and the site- and action-specific ARARs which apply to each alternative. The report will discuss the ability of each alternative to meet or exceed ARARs. The successful alternatives will be discussed and additional ARARs will be identified at the meeting. This meeting will also cover proposed Second Phase RI activities including bench-scale treatability tests and additional site characterization, if warranted.

3.5 TASK V - POST SCREENING FIELD INVESTIGATIONS (SECOND PHASE RI)

Phase II RI activities have a more focused scope than a Phase I RI. Primary activities to be conducted in the Phase II RI includes collection of specific field data required to refine site characterization.

Factors that could trigger additional investigations include:

- additional data necessary to determine the effectiveness of a potential remedial alternative(s);
- further delineation of a contaminated groundwater plume;
- further need to delineate wetlands contamination; and
- characterization of the closed town dump.

A Work Plan which addresses the supplemental investigations necessary to fill potential data gaps will be submitted to NYSDEC for review and comment.

3.5.1 Subtask A - Literature Survey

The first step in determining the additional data required to complete the scoping of alternatives is the performance of a literature search to identify existing data on similar applications of the technologies. The literature survey will be used to identify existing data as well as to identify vendors capable of performing treatability studies.

3.5.2 Subtask B - Additional Field Investigations

This section discusses additional field investigations which may be pursued. Other investigations may be required based on the findings of Tasks I through IV.

Treatability Studies: A portion of the additional work included in the post-screening field investigations involves bench- and pilot-scale testing to determine the viability of various treatment technologies being considered for the site. These studies will be performed for technologies which require testing site-specific materials to demonstrate effectiveness or feasibility. Examples of each technologies include: solvent extraction, biological treatment, and solidification.

Jordan will prepare work plans for each of the treatability studies. Based on current knowledge of the site, it is reasonable to assume that these studies will be performed by Jordan either on-site or in the Jordan laboratories. The exact technologies to be tested, the extent of testing, and Jordan's capability to perform the studies will be contingent on the results of initial screening of alternatives.

The tests will be designed to determine the following information:

- recovery, removal, or destruction efficiency for hazardous constituents;
- characterization and volumes of all process residuals;
- mass and energy balances for each step of the process;
- major equipment, utility requirements, and through-puts; and
- capital and operating costs for full scale equipment.

Where possible, comparison testing of different products and comparative analyses will be conducted. All results from testing will be presented in a report of results from the RI program.

Groundwater Studies: If contamination is detected in groundwater, additional monitoring wells may be necessary to provide data on the distribution of contamination. These monitoring wells would be located to refine knowledge of the vertical and lateral distribution of the contaminant plume. The need for, and location of these wells will be documented in the Work Plan for the Second Phase RI. These wells will be installed and sampled using the same methods as the First Phase RI wells. Groundwater samples will be analyzed for the same parameters as the First Phase RI wells.

Wetland Studies: Should surface water/sediment samples or biological samples indicate the presence of site-related contaminants within the regulated wetlands, additional studies and sampling may be recommended to NYSDEC to further characterize the site.

Town Dump Investigation: Based on the results of the site reconnaissance, records review, and the First Phase RI activities at the oil dump site, a site characterization program for the closed town dump will be developed. Components of this program will be determined at the completion of the First Phase RI. This program is anticipated to include a ground penetrating radar (GPR) survey, the drilling of approximately four borings and the installation of approximately three monitoring wells. The GPR survey is proposed to verify the method of landfilling and to delineate the boundaries of the closed dump.

Results of the Second Phase RI will be submitted in a summary report to NYSDEC. Included in the report will be boring logs, cross-sections, analytical data, and the data interpretation.

3.6 TASK VI - DETAILED ANALYSIS OF ALTERNATIVES (THIRD PHASE FS)

Results of the field investigations conducted during Task V will be combined with additional data on remedial alternatives during the detailed evaluation of alternatives. During this task, the alternatives will be compared for effectiveness in achieving response objectives, Federal and State ARARs, and other criteria; implementability; and cost of implementation. The goal of this analysis is to produce a recommended alternative which can be successfully implemented at the North Lawrence Oil Dump site.

3.6.1 Subtask A - Screen Alternatives

The detailed analysis of each alternative begins with a detailed description of the alternative. This description includes: a site plan; process flow diagrams; projected life of containment or treatment systems; supporting data from literature surveys; bench- and pilot-scale tests and vendor contracts; and a projection of the extent to which the alternative achieves the response objectives. If appropriate, included in this information is modeling done to predict the performance of the alternative. All of the above data are presented followed by an evaluation of each alternative against the criteria of effectiveness, implementability, and cost. Table 3-7 contains a brief description of the factors considered under each of these criteria.

3.6.2 Subtask B - Compare Alternatives

Following the detailed evaluation of each alternative; the alternatives will be compared to each other using the information collected and the factors described above. Particular attention will be paid to comparison of the effectiveness of each alternative with the relative cost of achieving the effectiveness for alternatives which achieve the same relative degree of protection of human health and the environment; lower cost alternatives will be considered over more expensive ones.

TABLE 3-7

CRITERIA FOR DETAILED ANALYSIS OF REMEDIAL ALTERNATIVES
NORTH LAWRENCE OIL DUMP SITE

EFFECTIVENESS	o Reliability of the alternative in meeting the site-specific response objectives, the goals of SWDA, and achieving significant and permanent reduction in toxicity, mobility or volume of waste; also, an assessment of the useful life of the alternative including a discussion of the long-term uncertainties associated with containment or land disposal.
	o Public Health considering both the degree to which the alternative meets ARARs which are protective of public health and the extent of any adverse impacts on public health associated with implementation of the alternative.
	o Environmental Protection offered by the alternative as measured by the ability to achieve ARARs governing protection of the environment and implementation of the alternative, and the potential short- and long-term adverse effects associated with implementation of the alternative.
IMPLEMENTABILITY	o Technical Feasibility of implementing the alternative under the site conditions.
	o Demonstrated Performance of the technologies on similar wastes or in bench and pilot scale studies.
	o Support Requirements necessary to implement the alternative including pretreatment and post-treatment processes.
	o Availability of process components.
	o Installation considering weather, site conditions, safety considerations and necessary preliminary design and studies.
	o Time to implement alternative and time to achieve a beneficial effect.
	o Safety including short- and long-term threats to workers and nearby communities.
	o Monitoring and Maintenance required for the alternative.
	o Permitting requirements and projected length of time to secure permits.
	o Legal Constraints including siting issues, land acquisition, zoning.
	o Impacts on Historical and Critical Resources including potential impacts on archeological and architectural resources.
COST	o Cost Estimation including capital, operating and maintenance costs and a discussion of the replacement costs if the alternative fails.
	o Present Worth Analysis using a specified interest rate and performance period.
	o Sensitivity Analysis of the effects of changes in design, implementation, operation, interest rates or operating lifetime.

Sources

[1] "Interim Guidance on Superfund Selection of Remedy". EPA OSWER Directive No. 9355.0-19. December 24, 1986.

[2] "Guidance on Feasibility Studies under CERCLA" (EPA OERR/OWPE, June 1985).

[3] Superfund Amendments and Reauthorization Act (SARA) of 1986.

3.6.3 Subtask C - Recommend Remedy

At the conclusion of the detailed analysis of the alternatives, Jordan will recommend a preferred alternative for each of the operable units discussed at the site. The recommended alternatives will be presented at a meeting with NYSDEC. The results of all phases of the FS will then be combined in an FS report which documents the approach and methodology used to select the preferred alternative. This report will be prepared for NYSDEC to present for public comment.

3.7 TASK VII - SELECTION OF REMEDY

Jordan will combine the results of the detailed evaluation with additional comments from NYSDEC, the public or other reviewers and select a remedy which best achieves the selection criteria. This remedy will be further developed into a conceptual plan which may be presented to the public with the completed RI/FS report.

3.7.1 Subtask A - Select Remedy

Jordan will compare alternatives which have passed the detailed analysis and meet the following three criteria:

1. the alternative must be protective of the environment and human health;

2. the alternative must attain ARARs to the maximum extent practicable; and

3. the alternative must be cost-effective.

In addition, a preference will be given to alternatives which involve treatment technologies which permanently and significantly reduce the volume, toxicity, or mobility of the wastes.

Jordan will compare alternatives meeting these criteria and recommend a remedy for the site which best achieves the criteria. This remedy will be presented to NYSDEC in the form of a conceptual plan.

3.7.2 Subtask B - Prepare Conceptual Plan

Following selection of the remedy, Jordan will prepare a conceptual plan for implementation of the remedy. This plan will include: a site plan; process flow diagrams; results of bench- or pilot-scale testing; a proposed implementation schedule; equipment lists; and a cost estimate of the selected remedial alternative.

4.0 PROJECT MANAGEMENT PLAN

The NLODS RI/FS will be conducted using the phased approach outlined by SARA. The phased approach integrates the RI and FS activities during the course of the project, allowing the program to be modified and refined as the project proceeds.

4.1 PROJECT ORGANIZATION AND APPROACH

The services discussed herein will be directed out of Jordan's corporate headquarters located in Portland, Maine. Mr. Donald Cote, P.E., President, will be the Corporate Officer directly responsible for all Jordan activities performed for this project.

Jordan's Project Manager is responsible for the overall day-to-day technical administration of the project and will be the primary technical contact for NYSDEC. The Project Manager is responsible for the following:

- initiation of project activities;

- identification of project staff, equipment, and other resource requirements;

- interfacing with NYSDEC on all costs, contractual, personnel, and other administrative matters;

- development of a Quality Assurance Project Management Plan (QAPMP);

- monitoring task activities, and adjusting efforts on resources, as required, to help assure that established budgets, schedules, and work programs are maintained;

- regular briefings on the status of the project and preparation of monthly reports showing both technical progress and cost status;

- providing assurance that project technical and financial records are kept according to the requirements of NYSDEC and Jordan; and

- implementation of subcontracting as required.

Christina Moore, P.E. and William Fisher, P.E. will be Project Managers for the North Lawrence Oil Dump Site.

The Quality Review Board will review the project work at appropriate stages to provide an independent senior staff-level assessment of the completeness, consistency, and overall quality of the data and interpretations. William R. Fisher, P.E., Division Manager of Environmental Services, J. Elliott Thomas, Senior Hydrogeologist, and Susan L. Santos, Manager of the Risk Assessment Department, comprise the Review Board.

The Task Leaders for the RI and FS programs will be responsible for all technical activities on the project including interfacing with NYSDEC concerning technical matters, and supervising the performance of the project staff and field subcontractors. The Task Leaders are Glenn Daukas for the RI and Roger Hathaway, P.E. for the FS.

4.2 PROJECT MANAGEMENT CONTROLS

The following sections summarize Jordan's approach to managing the proposed project, including lines of authority and communications; schedule maintenance; cost allocation, control, and reporting; quality assurance; and problem prevention and resolution.

4.2.1 Communications

The Project Manager will be the primary contact for NYSDEC and will be responsible for maintaining project documentation and facilitating communications between the Quality Review Board, the Health and Safety Coordinator, the Task Leaders, and the project staff. Project status reports and related information will be conveyed within Jordan's project team and between Jordan and NYSDEC by a variety of mechanisms, including status briefings, monthly progress reports, project review meetings, telephone calls, and miscellaneous project-related memoranda.

4.2.2 Schedule Maintenance

Jordan understands NYSDEC's commitment to complete this project in accordance with a realistic, mutually agreed-upon schedule. This can only be accomplished by establishing realistic task schedules and by frequent schedule maintenance. The frequent project review meetings will facilitate identifying and implementing changes. Adherence to approved work schedules will be the responsibility of the Project Manager. Schedule maintenance will be accomplished by a variety of means, including the following:

- Frequent communications between Jordan and NYSDEC to anticipate potential problems, identify and resolve existing problems, and smoothly implement adjustments in work focus or workloads.

- Frequent communications between the Project Manager and the Task Leaders to coordinate work schedules and manpower requirements (this is particularly effective when redirections of efforts are desirable).

- Monthly forecasts of staff requirements and manpower availability to make certain that adequate project support will be accessible under a variety of workload scenarios.

- Access to corporate-level and senior technical support as required for rapid problem resolution.

4.2.3 Cost Allocation, Control, and Reporting

To provide adequate cost control, Jordan will establish an account number for the RI/FS at the North Lawrence site. Costs will be allocated to the account number as they are incurred at the site. In general, externally billed non-labor costs (e.g., postage, field subsistence expenses, subcontracting, travel costs, long-distance telephone) are allocated daily, labor costs are allocated weekly, and in-house non-labor costs (e.g., photocopying, word processing, microfilming, equipment rental) are allocated monthly. Allocated labor costs are reported to the Project Manager weekly, typically within three working days of the last work week reported. Other direct costs are reported monthly, typically within four working days of the end of the reporting period. Jordan's computerized cost accounting system has been used successfully on a variety of project types, ranging in value from a few thousand dollars to over five million dollars.

4.2.4 Quality Assurance

Quality assurance is an essential component of project management and is the responsibility of the Project Manager. Some of the management-related quality assurance measures to be undertaken on the proposed project include the following:

o The Project Manager will present periodic briefings to the Quality Review Board and other company officials to evaluate project progress and to identify potential problems so that plans can be made to avert them.

- The Project Manager and Task Leaders will hold frequent project staff meetings to ensure work consistency and completeness and to facilitate information transfer.

- The Quality Review Board and the Task Leader will review all project deliverables to evaluate their technical quality.

- The Project Manager and Quality Review Board will meet before (and as needed after) all public hearings to discuss Jordan's role in the meeting and any subsequent activities.

- NYSDEC will have the opportunity to review deliverables to further verify the quality.

- The Project Manager will maintain a file of all project documentation so that project procedures, decisions, and events can be reconstructed, if needed, after project closeout.

4.3 PROJECT SCHEDULE

The project schedule illustrated in Figure 4-1 shows the tasks and activities for the North Lawrence RI/FS. The schedule for the field investigation is dependent on NYSDEC approval of this Work Plan, and on availability of various subcontractors. The schedule assumes ready access to the site. The schedule also assumes there will be no delays due to the securing of required permits,

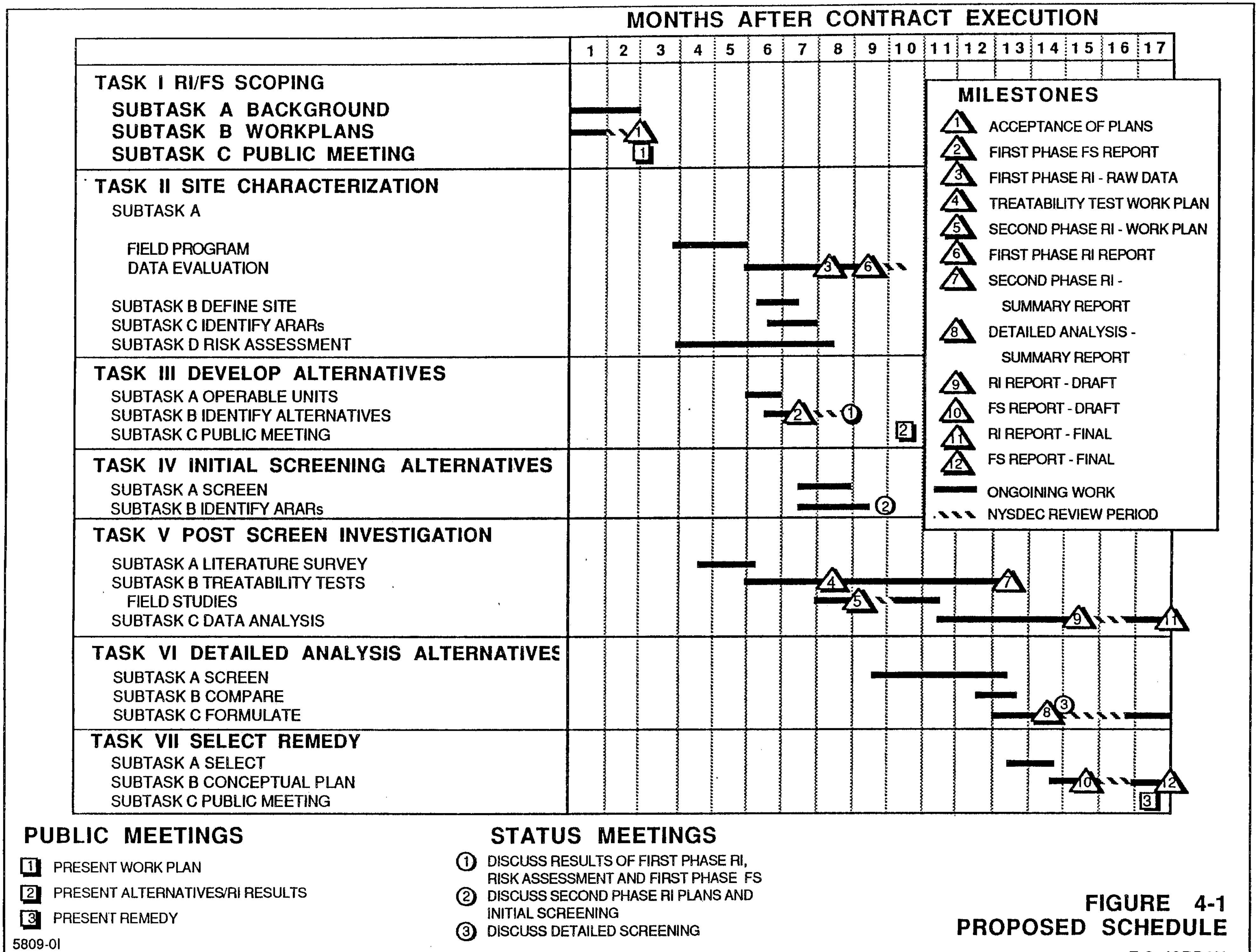

FIGURE 4-1
PROPOSED SCHEDULE

E.C. JORDAN

and that the health and safety personnel protective requirements are Level C dermal, Level D respiratory with the possibility of upgrade to Level C respiratory. It also assumes that severe weather conditions may cause delays and therefore, deviations from the budget, with the approval of NYSDEC.

GLOSSARY OF ACRONYMS

ACGIH	American Conference of Governmental Industrial Hygienists
ARARs	Applicable or Relevant and Appropriate Requirements
AWQC	Ambient Water Quality Criteria
cc	cubic centimeters
CLP	Contract Laboratory Program
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DQO	Data Quality Objectives
ECD	Electron Capture Detector
EO	Executive Order
EPA	Environmental Protection Agency
FID	Flame Ionization Detector
FS	Feasibility Study
GC	Gas Chromatography
GPR	Ground Penetrating Radar
HASP	Health and Safety Plan
MCLs	Maximum Contaminant Levels
mg/kg	milligram per kilogram
mg/ℓ	milligram per liter
mg/m^3	milligram per cubic meter
NCP	National Contingency Plan
NIOSH	National Institute of Occupational Safety and Health
NLODS	North Lawrence Oil Dump Site
NYSDEC	New York State Department of Environmental Conservation
OSHA	Occupational Safety and Health Administration
PARCC	Precision, Accuracy, Reproducibility, Completeness, and Comparability
PCBs	polychlorinated biphenyls
PHE	Public Health Evaluation
PI	Photoionization
QAPP	Quality Assurance Program Plan
QA/QC	Quality Assurance/Quality Control
RAS	Routine Analytical Services
RI	Remedial Investigation
SARA	Superfund Amendment and Reauthorization Act
SVOC	Semivolatile Organic Compounds

TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching Procedure
TOC	Total Organic Carbon
USCS	Unified Soil Classification System
USFWS	U.S. Fish and Wildlife Service
VOCs	Volatile Organic Compounds

APPENDIX A

TARGET COMPOUND LIST

APPENDIX A

Target Compound List (TCL) and Contract Required Quantitation Limits (CRQL)*

	Volatiles	Quantitation Limits** Water ug/L	Low Soil/Sediment[a] ug/Kg
1.	Chloromethane	10	10
2.	Bromomethane	10	10
3.	Vinyl Chloride	10	10
4.	Chloroethane	10	10
5.	Methylene Chloride	5	5
6.	Acetone	10	10
7.	Carbon Disulfide	5	5
8.	1,1-Dichloroethene	5	5
9.	1,1-Dichloroethane	5	5
10.	1,2-Dichloroethene (total)	5	5
11.	Chloroform	5	5
12.	1,2-Dichloroethane	5	5
13.	2-Butanone	10	10
14.	1,1,1-Trichloroethane	5	5
15.	Carbon Tetrachloride	5	5
16.	Vinyl Acetate	10	10
17.	Bromodichloromethane	5	5
18.	1,1,2,2-Tetrachloroethane	5	5
19.	1,2-Dichloropropane	5	5
20.	cis-1,3-Dichloropropene	5	5
21.	Trichloroethene	5	5
22.	Dibromochloromethane	5	5
23.	1,1,2-Trichloroethane	5	5
24.	Benzene	5	5
25.	trans-1,3-Dichloropropene	5	5
26.	Bromoform	5	5
27.	2-Hexanone	10	10
28.	4-Methyl-2-pentanone	10	10
29.	Tetrachloroethene	5	5
30.	Toluene	5	5
31.	Chlorobenzene	5	5
32.	Ethyl Benzene	5	5
33.	Styrene	5	5
34.	Xylenes (total)	5	5

[a] Medium Soil/Sediment Contract Required Quantitation Limits (CRQL) for Volatile TCL Compounds are 100 times the individual Low Soil/Sediment CRQL.

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

** Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis as required by the contract, will be higher.

Target Compound List (TCL) and Contract Required Quantitation Limits (CRQL)*

Semivolatiles	Quantitation Limits** Water ug/L	Low Soil/Sediment[a] ug/Kg
35. Pheonol	10	330
36. bis(2-Chloroethyl) ether	10	330
37. 2-Chlorophenol	10	330
38. 1,3-Dichlorobenzene	10	330
39. 1,4-Dichlorobenzene	10	330
40. Benzyl Alcohol	10	330
41. 1,2-Dichlorobenzene	10	330
42. 2-Methylphenol	10	330
43. bis(2-Chloroisopropyl)ether	10	330
44. 4-Methylphenol	10	330
45. N-Nitroso-Dipropylamine	10	330
46. Hexachloroethane	10	330
47. Nitrobenzene	10	330
48. Isophorone	10	330
49. 2-Nitrophenol	10	330
50. 2,4-Dimethylphenol	10	330
51. Benzoic Acid	50	1600
52. bis(2-Chloroethoxy)methane	10	330
53. 2,4-dichlorophenol	10	330
54. 1,2,4-Trichlorobenzene	10	330
55. Naphthalene	10	330
56. 4-Chloroaniline	10	330
57. Hexachlorobutadiene	10	330
58. 4-Chloro-3-methylphenol (para-chloro-meta-cresol)	10	330
59. 2-Methylnaphthalene	10	330
60. Hexachlorocyclopentadiene	10	330
61. 2,4,6-Trichlorophenol	10	330
62. 2,4,5-Trichlorophenol	50	1600
63. 2-Chloronaphthalene	10	330
64. 2-Nitroaniline	50	1600
65. Dimethyl Phthalate	10	330
66. Acenaphthylene	10	330
67. 2,6-Dinitrotoluene	10	330
68. 3-Nitroaniline	50	1600
69. Acenaphthene	10	330
70. 2,4-Dinitrophenol	50	1600
71. 4-Nitrophenol	50	1600
72. Dibenzofuran	10	330
73. 2,4-Dinitrotoluene	10	330
74. Diethylphthalate	10	330
75. 4-Chlorophenyl Phenyl ether	10	330
76. Fluorene	10	330
77. 4-Nitroaniline	50	1600
78. 4,6-Dinitro-2-methylphenol	50	1600
79. N-nitrosodiphenylamine	10	330

Target Compound List (TCL) and
Contract Required Quantitation Limits (CRQL)*
(continued)

Semivolatiles	Quantitation Limits** Water ug/L	Low Soil/Sediment[a] ug/Kg
80. 4-Bromophenyl Phenyl ether	10	330
81. Hexachlorobenzene	10	330
82. Pentachlorophenol	50	1600
83. Phenanthrene	10	330
84. Anthracene	10	330
85. Di-n-butylphthalate	10	330
86. Fluoranthene	10	330
87. Pyrene	10	330
88. Butyl Benzyl Phthalate	10	330
89. 3.3'-Dichlorobenzidine	20	660
90. Benzo(a)anthracene	10	330
91. Chrysene	10	330
92. bis(2-ethylhexyl)phthalate	10	330
93. Di-n-octyl Phthalate	10	330
94. Benzo(b)fluoranthene	10	330
95. Benzo(k)fluoranthene	10	330
96. Benzo(a)pyrene	10	330
97. Indeno(1,2,3-cd)pyrene	10	330
98. Dibenzo(a,h)anthracene	10	330
99. Benzo(g,h,i)perylene	10	330

a Medium Soil/Sediment Contract Required Quantitation Limits (CRQL) for Semi-Volatile TCL Compounds are 60 times the individual Low Soil/Sediment CRQL.

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

** Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis as required by the contract, will be higher.

Target Compound List (TCL) and
Contract Required Quantitation Limits (CRQL)*

Pesticides/PCBs		Quantitation Limits** Water ug/L	Low Soil/Sediment[a] ug/Kg
100.	alpha-BHC	0.05	8.0
101.	beta-BHC	0.05	8.0
102.	delta-BHC	0.05	8.0
103.	gamma-BHC (Lindane)	0.05	8.0
104.	Heptachlor	0.05	8.0
105.	Aldrin	0.05	8.0
106.	Heptachlor Epoxide	0.05	8.0
107.	Endosulfan I	0.05	8.0
108.	Dieldrin	0.10	16.0
109.	4,4'-DDE	0.10	16.0
110.	Endrin	0.10	16.0
111.	Endosulfan II	0.10	16.0
112.	4,4'-DDD	0.10	16.0
113.	Endosulfan Sulfate	0.10	16.0
114.	4,4'-DDT	0.10	16.0
115.	Endrin Ketone	0.10	16.0
116.	Methoxychlor	0.5	80.0
117.	alpha-chlordane	0.5	80.0
118.	gamma-chlordane	0.5	80.0
119.	Toxaphene	1.0	160.0
120.	Aroclor-1016	0.5	80.0
121.	Aroclor-1221	0.5	80.0
122.	Aroclor-1232	0.5	80.0
123.	Aroclor-1242	0.5	80.0
124.	Aroclor-1248	0.5	80.0
125.	Aroclor-1254	1.0	160.0
126.	Aroclor-1260	1.0	160.0

a Medium Soil/Sediment Contract Required Quantitation Limits (CRQL) for Pesticides/PCBs TCL Compounds are 15 times the individual Low Soil/Sediment CRQL.

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

** Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis as required by the contract, will be higher.

APPENDIX B

POLYCHLOROBIPHENYLS ANALYSIS
NIOSH METHOD 5503

POLYCHLOROBIPHENYLS

METHOD: 5503
ISSUED: 2/15/84

FORMULA: mixture: $C_{12}H_{10-x}Cl_x$ [where x = 1 to 10]

M.W.: ca. 258 (42% Cl ; $C_{12}H_7Cl_2$)
ca. 326 (54% Cl ; $C_{12}H_5Cl_5$)

OSHA: 1 mg/m³ (42% Cl);
0.5 mg/m³ (54% Cl)

NIOSH: 0.001 mg/m³ [1,2]

ACGIH: 1 mg/m³ (42% Cl); STEL 2 mg/m³
0.5 mg/m³ (54% Cl); STEL 1 mg/m³
(skin)

PROPERTIES: 42% Cl: BP 325 to 366 °C; MP -19 °C;
d 1.38 g/mL @ 25 °C;
VP 0.01 Pa (8×10^{-5} mm Hg;
1 mg/m³) @ 20 °C [3]
54% Cl: BP 365 to 390 °C; MP 10 °C;
d 1.54 g/mL @ 25 °C;
VP 0.0004 Pa (3×10^{-6} mm Hg;
0.05 mg/m³) @ 20 °C [3]

SYNONYMS: PCB; CAS #1336-36-3; 1,1'-biphenyl chloro (CAS #27323-18-8); chlorodiphenyl, 42% Cl (Aroclor 1242; CAS #53469-21-9), and 54% Cl (Aroclor 1254; CAS #11097-69-1)

SAMPLING

SAMPLER: FILTER + SOLID SORBENT
(13-mm glass fiber + Florisil, 100 mg/50 mg)

FLOW RATE: 0.05 to 0.2 L/min

VOL-MIN: 1 L @ 0.5 mg/m³
-MAX: 50 L

SHIPMENT: transfer filters to glass vials after sampling

SAMPLE STABILITY: unknown for filters; 2 months for Florisil tubes [4]

BLANKS: 2 to 10 field blanks per set

ACCURACY

RANGE STUDIED: not studied

BIAS: none identified

OVERALL PRECISION (s_r): not evaluated

MEASUREMENT

TECHNIQUE: GAS CHROMATOGRAPHY, ECD (^{63}Ni)

ANALYTE: polychlorobiphenyls

DESORPTION: filter + front section, 5 mL hexane;
back section, 2 mL hexane

INJECTION VOLUME: 4 µL with 1-µL backflush

TEMPERATURE-INJECTION: 250 - 300 °C
-DETECTOR: 300 - 325 °C
-COLUMN: 180 °C

CARRIER GAS: N_2, 40 mL/min

COLUMN: glass, 1.8 m x 2 mm ID, 1.5% OV-17/1.95% QF-1 on 80/100 mesh Chromosorb WHP

CALIBRATION: commercial PCB mixture in hexane

RANGE: 0.4 to 4 µg per sample [5]

ESTIMATED LOD: 0.03 µg per sample [5]

PRECISION (s_r): 0.044 [4]

APPLICABILITY: The working range is 0.01 to 10 mg/m³ for a 40-L air sample [4].

INTERFERENCES: Chlorinated pesticides, such as DDT and DDE, may interfere with quantitation of PCB. Sulfur-containing compounds in petroleum products also interfere [6].

OTHER METHODS: This method combines and replaces Methods S120 [7] and P&CAM 244 [4]. Methods S121 [8] and P&CAM 253 [9] for PCB have not been revised.

REAGENTS:

1. Hexane, pesticide quality.
2. Florisil, 30/48 mesh sieved from 30/60 mesh. After sieving, dry at 105 °C for 45 min. Mix the cooled Florisil with 3% (w/w) distilled water.
3. Nitrogen, purified.
4. Stock standard solution of the PCB in methanol or isooctane (commercially available).*

*See Special Precautions.

EQUIPMENT:

1. Sampler: 13-mm glass fiber filter without binders in a Swinnex cassette (Cat. No. SX 0001300, Millipore Corp.) followed by a glass tube, 7 cm long, 6 mm OD, 4 mm ID containing two sections of 30/48 mesh deactivated Florisil. The front section is preceded by glass wool and contains 100 mg and the backup section contains 50 mg; urethane foam between sections and behind the backup section. Join the cassette and Florisil tube with PVC tubing, 3/8" L x 9/32" OD x 5/32" ID, on the outlet of the cassette and with another piece of PVC tubing, 3/4" L x 5/16" OD x 3/16" ID, complete the union.
2. Personal sampling pump, 0.05 to 0.2 L/min, with flexible connecting tubing.
3. Tweezers.
4. Vials, glass, 4- and 7-mL, with aluminum or PTFE-lined caps.
5. Gas chromatograph, electron capture detection (^{63}Ni), integrator and column (page 5503-1).
6. Volumetric flasks, 10-mL and other convenient sizes for preparing standards.
7. Syringe, 10-µL.

SPECIAL PRECAUTIONS: Avoid prolonged or repeated contact of skin with PCB and prolonged or repeated breathing of the vapor [1,2,10].

SAMPLING:

1. Calibrate each personal sampling pump with a representative sampler in line.
2. Break the ends of the sampler immediately before sampling. Attach sampler to personal sampling pump with flexible tubing.
3. Sample at an accurately known flow rate between 0.05 and 0.2 L/min for a total sample size of 1 to 50 L.
4. Transfer the glass fiber filters to 7-mL vials. Cap the Florisil tubes with plastic (not rubber) caps and pack securely for shipment.

SAMPLE PREPARATION:

5. Place the glass wool and 100-mg Florisil bed in the same 7-mL vial in which the filter was stored. Add 5.0 mL hexane.
6. In a 4 mL vial, place the 50-mg Florisil bed including the two urethane plugs. Add 2.0 mL hexane.
7. Allow to stand 20 min with occasional agitation.

CALIBRATION AND QUALITY CONTROL:

8. Calibrate daily with at least five working standards over the range 10 to 500 ng PCB/mL.
   a. Add known amounts of stock standard solution to hexane in 10-mL volumetric flasks and dilute to the mark.
   b. Analyze together with samples and blanks (steps 10 and 11).
   c. Prepare calibration graph (sum of areas of selected peaks vs. ng PCB/mL).
9. Determine desorption efficiency (DE) at least once for each lot of glass fiber filters and Florisil used for sampling in the calibration range (step 8). Prepare three tubes at each of five levels plus three media blanks.
   a. Remove and discard back sorbent section of a media blank Florisil tube.
   b. Inject known amounts of stock standard solution directly onto front sorbent section and onto a media blank filter with a microliter syringe.
   c. Cap the tube. Allow to stand overnight.
   d. Desorb (steps 5 through 7) and analyze together with working standards (steps 11 and 12).
   e. Prepare a graph of DE vs. ng PCB recovered.
10. Analyze three quality control blind spikes and three analyst spikes to insure that the calibration graph and DE graph are in control.

MEASUREMENT:

11. Set gas chromatograph according to manufacturer's recommendations and to conditions given on page 5503-1. Inject sample aliquot manually using solvent flush technique or with autosampler.

    NOTE 1: Where individual identification of PCB is needed, a procedure using a capillary column may be used [11].

    NOTE 2: If peak area is above the linear range of the working standards, dilute with hexane, reanalyze and apply the appropriate dilution factor in calculations.
12. Sum the areas for five or more selected peaks.

CALCULATIONS:

13. Determine the mass, ng (corrected for DE) of PCB found on the glass fiber filter (W) and in the Florisil front (W_f) and back (W_b) sorbent sections, and in the average media blank filter (B) and front (B_f) and back (B_b) sorbent sections.

    NOTE: If $W_b > W_f/10$, report breakthrough and possible sample loss.
14. Calculate concentration, C, of PCB in the air volume sampled, V (L):

$$C = \frac{(W+W_f + W_b - B-B_f - B_b)\cdot 10^{-3}}{V}, \text{ mg/m}^3.$$

EVALUATION OF METHOD:

This method uses 13-mm glass fiber filters which have not been evaluated for collecting PCB. In Method S120, however, Aroclor 1242 was completely recovered from 37-mm glass fiber filters using 15 mL isooctane [7,12,13]. With 5 mL of hexane, Aroclor 1016 was also completely recovered from 100-mg Florisil beds after one-day storage [4]. Thus, with no adsorption effect likely on glass fiber filters for PCB, 5 mL hexane should be adequate to completely extract PCB from combined filters and front sorbent sections. Sample stability on glass fiber filters has not been investigated. Breakthrough volume was >48 L for the Florisil tube at 75% RH in an atmosphere containing 10 mg/m³ Aroclor 1016 [4].

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[13] NIOSH Research Report-Development and Validation of Methods for Sampling and Analysis of Workplace Toxic Substances, U.S. Department of Health and Human Services, Publ. (NIOSH) 80-133 (1980).

METHOD REVISED BY: James E. Arnold, NIOSH/DPSE; S120 originally validated under NIOSH Contract 210-76-0123.

Table 1. Composition of some Aroclors [3].

Major Components	Aroclor 1016	Aroclor 1242	Aroclor 1254
Biphenyl	<0.1%	<0.1%	<0.1%
Monochlorobiphenyls	1	1	<0.1
Dichlorobiphenyls	20	16	0.5
Trichlorobiphenyls	57	49	1
Tetrachlorobiphenyls	21	25	21
Pentachlorobiphenyls	1	8	48
Hexachlorobiphenyls	<0.1	1	23
Heptachlorobiphenyls	none detected	<0.1	6
Octachlorobiphenyls	none detected	none detected	none detected